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Money and Time Scarcity:

Implications for Economic Decision Making

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The money which a man possesses is the instrument of freedom;

that which we eagerly pursue is the instrument of slavery.

(Jean-Jacques Rousseau, *Confessions*, 1996)

General introduction

In 2015, Heads of State and Government from the United Nations, developed the 2030 Agenda for Sustainable Development[1], with the goal to increase economic prosperity and social well-being, in a sustainable environment. More specifically, one of the goals of the Agenda is to eradicate poverty, allowing to people to fulfill their potential in dignity, equality and in a healthy environment. At present, more than one billion people - one-sixth of the world's population - live in a condition of poverty, therefore, it is very important to better understand the consequences that this condition has to find solutions and develop impactful interventions.

Hagenaars (2017) suggested that poverty might be in general defined as a situation in which needs are not sufficiently satisfied. Poverty, as a multidimensional concept, obviously includes economic and political elements, and none the less social, psychological and cognitive components. Indeed, the study of poverty received a great deal of attention in psychological science and in the study of the cognitive consequences of this condition. Clearly, poverty affects the life of those who live this condition, but it also has economic consequences for the society in which they live. Specifically, the stress related to the scarcity of resources make life just a lot more difficult to deal and depleted people mental resources, making necessary to recognize the relevance of the scarcity on people's lives, to understand the cognitive and behavioral responses to this condition. Those knowledges are essential to provide new insights into why people cannot escape the scarcity loop (Zhao & Tomm, 2018), and to support policy makers to provide effective interventions to stop the scarcity trap. Such interventions and policies could really alleviate the perception of scarcity, making more possible to deal with, and could also

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[1] Agenda for Sustainable Development https://www.un.org/sustainabledevelopment/development-agenda/

provide aids that might elicit more capable and competent behavior. Growing inequality is detrimental to economic growth and undermines social cohesion, increasing political and social tensions and, in some circumstances, driving instability and conflicts (Agenda for Sustainable Development[1]). For this reason, several studies have recently investigated the link between the scarcity of resources and cognitive ability, suggesting that scarcity imposes additional burdens on people's mind, through taxing their attention (Mullainathan & Shafir, 2012, 2013). Supporting these results, Mani, Mullainathan, Shafir, and Zhao (2013) suggested that being poor means coping not just with a shortfall of economic resources, but also with a concurrent shortfall of cognitive resources. The poor, in this view, are less capable not because of inherent traits, but because the very context of poverty, with the attendant concerns, imposes load and impedes cognitive capacity. These findings, in other words, are not about poor people, but about anyone who could find themselves poor. More in general, these shortages of cognitive resources are common in people experiencing a condition of scarcity, that is not necessarily related to money, but that could encounter time constrain (So & Agrawal, 2008) or physical hunger (Briers, Pandelaere, Dewitte, & Warlop, 2006), indicating a common mindset in those who experience the perception of not having enough resources.

Regarding the poverty from not only an economical perspective (Naschold, 2012; McKay & Perge, 2013), it is fundamental to further explore the factors that may help to explain the causes of the perpetuation of poverty and reduce it. Considering the high economic insecurity experienced in many parts of the world and the generalizability of the consequences of the scarcity to everyone, the main goal of my dissertation is to determine whether a scarcity mindset, which has been defined as the perception of "not having enough" to satisfy one's needs or desires (Mullainathan & Shafir, 2013), is common to several resources or whether it is influenced by contextual factors (e.g. how

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information is framed, different type of missing resources). Through three different sets of studies, I investigated how experiencing a condition of scarcity impacts individuals' ability to evaluate resources and how it influences their economic decisions. Specifically, in Chapter 2, I described a set of studies in which I examined the effect of money scarcity on the economic decision. I hypothesize that people experiencing a condition of perceived economic scarcity will be less accurate when making economic decisions and more prone to make, in general, suboptimal and inconvenient decision, than individual not experiencing a scarcity mindset. While, in Chapter 3, I investigated how experiencing perceived economic scarcity influences allocation trade off more than experiencing perceived time scarcity. I hypothesized that, as a resource, time (vs. money) would be undervalued, no matter the type of scarcity people was experiencing. In the last set of studies, in Chapter 4, I presented three studies that investigated the effect of perceived economic scarcity on the perception of the real (vs. nominal) value of the money. Building on prior research on the money illusion bias, I hypothesized that people experiencing scarcity should be less able to think in terms of the real value of the money, as compared to people that did not experience scarcity.

It is relevant to build on and extend a deeper understanding of scarcity, especially because the psychology of scarcity will offer substantial practical implications to individuals, practitioners, and policy-makers. A better understanding of what triggers a scarcity mindset could help prevent its often detrimental downstream consequences in people daily lives and try to point to effective solutions.

<center>**Chapter 1**</center>

<center>**The Theory of Scarcity**</center>

Imagine that your best friend is getting married in a few weeks. Because of a busy period, you postponed for a long time the decision to go shopping the perfect dress, and now you realize that time is running out. Now you are experiencing a scarcity of time. Moreover, your research for the perfect dress overlaps with the end of the season and in all stores the variety of models and sizes is very limited. You already felt the scarcity of time, in addition, you are now experiencing product scarcity. The icing on the cake, you know that you are far from your last salary and that your budget is seriously limited. So, you are also experiencing a scarcity of money. This common life episode demonstrates how it is possible to experience several forms of resource scarcity.

Considering that scarcity touches several aspects of people life and is a ubiquitous phenomenon, it has received considerable attention across a variety of academic disciplines (Roux, Goldsmith, Blair, & Kim, 2014), including marketing (Sharma & Alter, 2012), psychology (Griskevicius et al., 2013; Mullainathan & Shafir, 2013), economics (Banerjee & Duflo, 2011), sociology (Booth, 1984), philosophy (Lerner & Lerner, 1981), political science (Grossman & Mendoza, 2003), and biology (Fülöp, 2004). Even though several disciplines have investigated this phenomenon, it does not exist in the literature a common definition of resource scarcity (Cannon, Goldsmith, & Roux, 2019). In psychology, resource scarcity was previously defined as "the availability of energetic resources and level of competition for these resources" by Griskevicius, Tybur, Delton, and Robertson (2011). Instead, Shah, Mullainathan, and Shafir (2012), considered resource scarcity as a mindset that involves the perception of "having less". Yet another definition was put forward by Sharma, Mazar, Alter and Ariely (2014) who

defined the concept of financial deprivation as an unpleasant psychological state in which consumers feel financially "inferior" or "worse off" relative to a salient comparison. Besides, Mullainathan and Shafir (2013), starting from the definition of Shah and colleagues (2012), demonstrated that the condition of scarcity can be experienced in the form of a scarcity mindset, or a "subjective sense of having more needs than resources". Despite the differences among all these definitions, one notable commonality is the existence of an unfavorable discrepancy in resource levels (Cannon et al., 2019). Therefore, it is this discrepancy between the actual level of a resource and a more desirable benchmark that can elicit the perception of scarcity. As a result, scarcity can be defined as the limited availability of any quantifiable entity that offers utility to the individual and has the potential to be depleted or consumed (Cannon et al., 2019). Thus, this sense of lack and deficiency can be extended across a lot of different resources, including money (Fernbach, Kan, & Lynch, 2014; Sharma & Alter, 2012; Sharma et al., 2014), physical hunger (Briers et al., 2006; Zhu & Ratner, 2015), products (Inman, Peter, & Raghubir, 1997; Cialdini, 2009; Zhu & Ratner, 2015), and time (Monga, May, & Bagchi, 2017; So & Agrawal, 2017; Shah et al., 2012).

The particular mindset of scarcity can be prompted by both objective and subjective experiences of resource scarcity. On the one hand, poverty (Shah, Mullainathan & Shafir, 2015), time constraints (So & Agrawal, 2017), or food restrictions (Briers et al., 2006) among other factors are considered to be objective experiences of resource scarcity, as individuals objectively have fewer resources than needed. On the other hand, perceived financial deprivation (Sharma & Alter, 2012; Sharma et al., 2014), recalling or imaging experiences of scarcity (Roux, Goldsmith, & Bonezzi, 2015), are considered to be subjective experiences of resources scarcity, as individuals subjectively perceive having fewer resources than needed (or wanted) in these situations. In the resource scarcity

literature, many researchers have demonstrated that those that are objectively or subjectively experiencing to have fewer resources, are both more likely to perceive a discrepancy between their resource levels and higher, more desirable reference points (Mullainathan & Shafir, 2013; Mani et al., 2012; Sharma et al., 2013; Cannon et al., 2019). Whether that lack is money, time, friends, or food, scarcity influences human cognition, choices, and behavior in remarkably similar ways: "The mind orients automatically, powerfully, toward unfulfilled needs" (Mullainathan & Shafir, 2013).

1.1. The Scarcity mindset

After the Second World War, a group of researchers from the Minnesota University (Keys, Brožek, Henschel, Mickelsen, & Taylor, 1950) investigated how to reintroduce food in a population that experienced a condition of famine during the war. Thirty-two male volunteers offered themselves as subjects for over a year in a condition closely resembling famine victims. Subjects' physiological and psychological aspects were constantly observed during the time spent in the laboratory and the next period. Although researchers were more interested in the nutritional aspects, they also investigated the impact of hunger, and they stumble upon psychological change. Participants were always thinking about food, that was understandable considering that they were starving, except that they were obsessively thinking about food, going beyond the practical benefits. Keys and colleagues (1950) reported that, for participants, it was impossible not to think about food in every possible declination and that this was not intentional. Instead, it was the famine that caught their attention. The attention for the psychological impact of hunger was very limited in this study, but it was the first study in the literature that opened the door to the study of how scarcity catches people's mind. Subsequently, several researchers (Shah et al., 2012, 2013; Mullainathan & Shafir, 2013), dedicated a large part

of their research activity to the study of how scarcity is not only a material limitation but also a limitation that captures and totally dominates the mind, leading people to behave differently. The scarcity mindset is not only prompt by a real lack of resources, but it is also the result of perceiving as though one does not have enough of something. Scarcity "focuses our attention on using what we have most effectively" (Mullainathan & Shafir, 2013) and does so in milliseconds without conscious intent. In the following sections, I will discuss a presumed process that catches people's mind when in a situation (objective or perceived) of scarcity.

1.1.1. The Focus dividend

Imagine that you have to apply for a grant. When the deadline is far off, you will probably give the priority to other commitments, deadlines, or ordinary duties. But what if the deadline is impending? It is plausible that you will give the priority only to the application, leaving emails, other projects and other deadlines on the side, trying your best to stay focused only on the proposal. In order to meet the deadline and do a good job, this complete focus often pays off. Several studies demonstrated the benefit of deadlines, showing how the shortness of time could increase performance and creativity (Ariely & Wertenbroch, 2002; Kurtz, 2008; Inman & McAlister, 1994; Oyer, 1998). Like food was the priority in the minds of the subjects in the famine study (Keys et al., 1950), similarly, the deadline for the proposal makes this task a top priority. Several authors explained it suggesting that scarcity can lead to what is called a focus dividend, a positive situation in which someone experiences an increase in productivity as a result of being so acutely focused on a single pursuit (Mullainathan & Shafir, 2013; Meuris & Leana, 2015). According to this explication, it is thanks to focus dividend if people are able to complete the proposal in time for the deadline, by reducing distractions, with less procrastination,

and trying their best to avoid wasting time. In this sense, scarcity can positively impact people productivity and efficacy. The focus dividend comes from one of our core mechanisms: scarcity captures the mind (Mullainathan & Shafir, 2013) against all else, unavoidably and beyond our control.

1.1.2. The Tunnel Effect

Unfortunately, the ability to stay focused on something, it is at the same time the ability to keep out something else. Think about the grant application example: You may end up writing a great proposal, but, since you were very focused on it, you could have missed some related important emails or communications for the proposal itself. And despite having an excellent proposal, you did not prepare some documents and your application is not eligible. This is an explanation of what happens with scarcity: it keeps focus on one resource, but at the same time decreases the visual field, as in a tunnel (Mischel, Ebbesen, & Raskoff Zeiss, 1972; Mullainathan & Shafir, 2013), making arduous to see what is outside the tunnel. In this perspective, focusing on what seems, at that moment, to matter the most could be considered as positive, and however, letting scarcity to cause the tunnel effect and to bring us to neglect other aspects cannot be considered that advantageous. The process that underlines both these two processes, focusing and tunneling, was defined goal inhibition (Mani et al., 2013; 2013b; Mullainathan & Shafir, 2013, 2014). Goal inhibition allows focusing on immediate goals thus alleviating present concerns, but at the expense of considering how to achieve other goals that a person might care about.

The ability to stay focused and pay attention is particularly important in daily life, but scarcity brings people to focus on what, in a specific moment, is perceived as the most important task and to fail to consider everything that is outside from the tunnel. The

attentive focus is exacerbated and maintained over time, as thoughts about the resource that is scarce become intrusive and pervasive, and activate itself spontaneously (Shah et al., 2018). But once people are experiencing the scarcity mindset, they neglect information and choices that are not related to the scarce resource, with possible negative implications on their lives.

1.1.3. Attentional bandwidth

Scarcity catches people attention in an involuntary way and brings people to stay focused on the scarcity target, reducing the opportunity to look out to other decisions and to think and solve problems not related to the current lack (Mani et al., 2013; 2013b; Shah et al., 2018). A possible explanation of these impairments comes from previous theoretical and empirical works on the limits of the cognitive system. The human cognitive system has limited capacity (Baddeley, 2012): For instance, people cannot pay attention to a large volume of information. Our attentional capacity is determined by both structural factors, such as the limits of our working memory (Cowan, 2010; Logie, 2011), and the processing speed of neurons (Bays, 2015). Specifically, the cognitive system has a limited capacity, and people can only receive and process a limited amount of information at a time (Baddeley, 2012; Luck & Vogel, 1997; Miller, 1956; Pashler, Johnston, & Ruthruff, 2001). Given this limited capacity, engaging in one process consumes cognitive resources needed for another, thus causing interference (Tomm & Zhao, 2016). It means that when people are paying attention to and processing information (Meuris & Leana, 2015; Chugh & Bazerman, 2007; Kahneman, 1973), allocation of cognitive resources to one issue, inevitably diminish the amount of cognitive capacity left for others, which can result in superficial evaluation and/or neglect. Mullainathan and Shafir (2014) suggested that the perception of not having enough of a

resource constantly draws people to the tunnel, consuming the mental bandwidth available for making overall quality decisions in other areas of their life. This taxation of cognitive resources results in an attentional shift (Mani et al., 2013; Mullainathan & Shafir, 2013; 2014) that inhibits or impairs functions and capacities as fluid intelligence which is fundamental to solve problems, retain information, and engage in logical reasoning; and executive control which is essential to plan, attend, initiate, or control impulses (Hall, Zhao, & Shafir, 2014; Mani et al., 2013; 2013b; Mullainathan & Shafir, 2013; 2014; Bryan et al., 2017).

People that are experiencing a condition of scarcity have their mind occupied by an intense personal concern (Mani et al., 2013; Shah et al., 2018). These internal concerns could lead to an attentional disruption that could be even stronger than that caused by external factors. Exactly as an external noise could distract people from thinking clearly, scarcity generates internal disruption, impacting cognitive functioning. Considering the grant application example aforementioned, the significance of respecting the deadline of the submission is personal and important, therefore it is also persistent. The constant feeling that you must finish, could be distracting and could catch your mind and drag you into the tunnel. Previous research showed the impact of internal thoughts on general cognitive function (Posner & Di Girolamo, 1998) providing evidence about the way the brain focuses and is disrupted. It is important to distinguish between two different types of information processing: "top-down" and "bottom-up". The first one is driven by cognition and is voluntary and conscious; whereas in the "bottom-up" process, attention is captured by more sensory information (Katsuki & Constantinidis, 2017). When there is a high cognitive load, the "top-down" process cannot block "bottom-up" interference (McMains & Kastner, 2011; Cieslik, Zilles, Kurth, & Eickhoff, 2010). Piech and colleagues (2010) firstly investigated the "bottom-up" process in the scarcity mindset

with a study on dietary restriction. Participants were asked to press a button when they saw a red dot on the monitor. Sometimes, participants were presented with other distracting images before the red dot. For participants not on a dietary condition, the confounding image did not affect the recognition of the red dot. Instead, participants in the food scarcity condition were less accurate in recognizing the red dot if the image was representing food. Dieters were mentally distracted creating an attentional capture (Piech, Pastorino, & Zald, 2010). This is an explanation of how scarcity catches people attention, through a "bottom-up" process that is involuntary and beyond our conscious control.

Scarcity constantly overbooks people mind with the task that is perceived as more relevant, leaving fewer resources for other tasks. Scarcity reduces the attentional bandwidth, and its effect impacts on the way people behave, think and make decisions. But scarcity does not have an impact on people's ability, rather it makes it more difficult for them to use their resources efficiently.

1.2. The consequences of a Scarcity mindset

Considering the literature reviewed above, when people feel that resources are low relative to their needs, a scarcity mindset emerges, and this changes how individuals make decisions (Shah et al., 2015). Haushofer and Fehr (2014) have outlined a feedback loop in which the scarcity mindset reinforces itself through exerting an influence on psychological outcomes, which may then lead to behaviors and decision that are potentially disadvantageous, such as decision with intertemporal choices often ending up with the preference of a smaller immediate reward versus a bigger delayed one (Frederick, Loewenstein, & O'Donoghue, 2002), as well as an increase in risky behaviour in areas such as health, sexual behaviour, substance abuse, and gambling (Adamkovič & Martončik, 2017). The authors suggested that this feedback loop may prolong the climb

out of the condition of needs, or even make an escape from this stressful condition almost impossible (Haushofer and Fehr, 2014). In addition to these results, Mani and colleagues' research suggests a causal relationship between the scarcity mindset and mental function. In particular, these authors showed that budget preoccupation could impede cognitive function in real-time, contributing to a long-term impact of poverty on cognition (Mani et al., 2013). They also found that poor individuals performed worse on tasks measuring intelligence and cognitive control after they had been asked to think about their finances and thinking about the possibility of not having sufficient money (high financial worry), compared to thinking about the possibility to having it (low financial worry). This could be due to the activation of the scarcity mindset that reduces the cognitive resources available for the required task (Mani et al., 2013). Taken together, the vast majority of the findings suggests that the perception of scarcity often is associated to negative affect and stress (Santiago, Wadsworth, & Stump, 2011; Haushofer & Fehr, 2014; Iemmi et al., 2016). It is important to notice that an increase of stress levels is related with a consequent increase in cortisol levels in the blood (Van Eck et al., 1996; Chemin, de Laat, & Haushofer, 2013; Haushofer & Fehr, 2014), which could lead to a decrease in memory performance (Newcomer et. al., 1999).

Another author who has contributed significantly to exploring the scarcity mindset is Vohs. She assumed that those who experience a condition of scarcity have to overcome many inescapable pressures and have to make decisions constantly. In particular, since poor people must overcome more urges and make difficult trade-offs more often than the rich do, their mental resources become depleted, leading, in turn, to problematic and sub-optimal behaviors (Vohs, 2013). Consistent with all this, Vohs has shown that having to contend with preoccupations and concerns for a missing resource leaves fewer cognitive resources available to guide choice and action. Therefore, the larger the number of

decisions which require resorting to compromises, something that happens frequently where there is poverty, the larger the number of people who find that their subsequent decisions are driven by impulse and intuition. Hence, the longer the period during which individuals need to exert control over their impulses, the more it will be the case that choices taken at a subsequent time are likely to be sub-optimal, as a result of a snowball effect (Vohs, 2013). In addition, the author suggested that since people with a scarcity mindset must exert a higher degree of restrictive control over their decisions more often than others, they are also more likely to fall prey to their impulses and over-eat, overspend, or enact other problematic behaviors (Vohs, 2013).

A recent psychological work has also shown that scarcity of economic resources can often align certain behaviors more closely with traditional economic predictions and that individuals affected are less susceptible to the classic context effects (Shah et al., 2015; Shah et al., 2018). The scarcity mindset leads individuals to ignore irrelevant contextual cues and instead rely on his or her own standards, therefore it steadily guides evaluations. For instance, it is possible that people with lower incomes may be better at thinking in terms of trade-offs, thus generating their own comparison standards. Moreover, Shah and colleagues (2015) showed that greater scarcity, in general, could elicit more consistent valuations, although they specifically studied reactions to the scarcity of food and time (Shah et al., 2015). Scarcity may also change the cues that people attend to: People experiencing scarcity could be more likely to look at internally generated standards that provide a more stable frame (Shah et al., 2015).

Finally, Roux, Goldsmith, and Bonezzi (2015) suggested that the perception of scarcity drive people to a competitive orientation. This orientation promotes the advancement of the individual's wellbeing, reason why scarcity can lead to either increased selfishness (Holland, Silva, & Mace, 2012; Sasson et al., 2012) or in increased

generosity (Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012; Piff, Kraus, Côté, Cheng, & Keltner, 2010) as a function of the associated benefits to the self. These results suggested that people perceiving a condition of scarcity can cognitively activate a more general competitive orientation, which then affects subsequent decision making in behavioral contexts that are not explicitly linked to the resource that was described as scarce (Roux et al., 2015).

Scarcity, with its consistent and predictable taxation over the bandwidth (Mullainathan & Shafir, 2013; Mullainathan, & Shafir, 2014), creates an additional load on top of all other daily affairs. Scarcity does not just lead people to make sub-optimal economic decisions, it creates a domino effect that impacts many other areas of people lives.

Chapter 2

Money Scarcity and consumer behaviour

2.1. Introduction

A scarcity mindset arises when people feel that their resources are low relative to their needs (Shafir & Mullainathan, 2013), and this condition impacts how individuals make decisions (Shah et al., 2015). People experiencing scarcity face difficult trade-offs between resources, such as working overtime to pay the bills, but having less time to prepare one's meals and increased food-related expenses (Harvey & Mukhopadhyay, 2007). This common scenario clearly illustrates how money and time are resources that people regularly manage and that influence various aspects of people's lives (Mogilner & Norton, 2016). These two resources are essential in everyday life, and more importantly, how people evaluate these resources drive their decision (DeVoe & Pfeffer, 2007).

Which resource is more important for you, time or money? Although classic economic theories of decision making assume that people known their preferences, have a stable perception of values, and the ability to always identify the best choice for themselves (Thaler, 2017), behavioural economics demonstrated that this is often not the case (Kahneman, 2003; Thaler, 2017). Humans' perception and decision are imperfect and people sense of decision is often pliable and influenced by contextual characteristics that are normally irrelevant (Shah et al., 2015). People are susceptible to contextual cues when they have to interpret what surrounds them, and so as the context changes, choices change, too (De Martino, Kumaran, Seymour, & Dolan, 2006). In this regard, Shah, Shafir, and Mullanaithan (2015) tested a classic demonstration of proportional thinking

(adapted from Tversky & Kahneman, 1981 and Hall, 2008) with different income levels participants. Participants were presented with the following scenario:

"Imagine that you go to the store to buy a tablet computer that costs $300 (or $500 or $1,000). The clerk informs you that a store thirty minutes away sells the same tablet computer for $50 less. Would you go to the other store to buy the tablet computer or would you buy it at the current store?"

Previous studies have found that people are more willing to travel for the discount when the price reduction is proportionally higher. A possible explanation was that people have a hazy sense of what a fixed discount of $50 is worth to them, and they look at the total cost to weigh the value of the discount. However, in that study researchers were expecting lower income participants engaging in more trade-off thinking than higher income participants. To do this, in Shah and colleagues' studies (2015), participants were asked to evaluate the value of the $50 discount, trying to determinate how large does it feel and whether is worthy to travel for it. For the analysis the authors considered the responses that reflected trade-off thinking ("other things I won't be able to buy") and those that reflected proportional thinking ("what percentage it is off"). They found that high-income participants were more likely than low-income participants to use proportional thinking, meanwhile, participants with lower income were more likely than participants with higher income to use trade-off thinking, suggesting that scarcity leads people to generate their own comparison standards (Shah et al., 2015). Through two other studies, the same authors investigated how people evaluate discount using the aforementioned scenario. Again, their results showed that higher-income participants were significantly more willing to travel for a proportionally larger discount than for a proportionally smaller discount and that this was not true for lower-income participants

(Shah et al., 2015). Shah and colleagues (2015) noticed that if $50 were too large as a sum to give up for participants with lower incomes, the floor and ceiling effect would indicate consistency for these participants. Instead, high income participants were more likely to travel when the discount was proportionally larger and less likely to move when the discount was proportionally smaller. Thus, the ceiling and floor effect cannot explain the consistency of low-income participants. Such consistency was explained by another experiment, where they used a new scenario involving an appliance instead of a tablet computer. In the small amount condition, participants could save $10 on either a $100 purchase (larger proportional discount) or a $200 purchase (smaller proportional discount). In the large amount condition, participants could save $150 on either a $1,500 (larger proportional discount) or a $3,000 purchase (smaller proportional discount). Results indicated that higher-income participants were more willing to travel for a proportionally larger discount than for a proportionally smaller discount, but this was not true for lower-income participants (Shah et al., 2015). The interaction between proportional discount and income was significant, but it was not related to the absolute amount of the discount. Authors hypothesized that these results would not stand up to extremely small or large sums of money, but for modest payments, those most conspicuous to people' daily lives, low-income participants show more consistent preference (Shah et al., 2015; Shah et al., 2018). In combination with other studies, these results showed how various forms of scarcity bring compromises to the top of the mind (Mullainathan & Shafir, 2013; Shah et al., 2012; Spiller, 2011), and that when these compromises frame one's assessment, one relies less on the external context.

Though, scarcity cannot change the fact that judgements are based on contextual cues, but it does change the cues that people can note. People experiencing a condition of scarcity look at internally generated standards that provide a more stable picture, rather

than looking at external factors that move dangerously (Shah et al., 2012). Considering these aspects, I decided to investigate participants' preference between money and time when they are exposed to a condition of perceived monetary scarcity. To my knowledge, no work has investigated whether and how experiencing monetary scarcity impacts people preference between money and time. According to the previous literature, I begin addressing this gap by investigating how people in a scarcity mindset (vs. control) trade-off money and time in money-saving contexts, testing whether how the experience of scarcity impacts people's valuation of time or money. Specifically, in the first experiment, I measured at which of a series of increasing discount rates people are willing to give up their time to save money on a purchase. In this first study time was kept constant, while the discount varied, thus, in Study 2, I investigated at which of a series of increasing amounts of time people are willing to trade their time to obtain a fixed discount on a purchase. Moreover, in both studies, I measured whether the effect of perceived scarcity is affected by several individual differences such as numeracy skills, the ability to manage emotions (e.g., the trait emotional intelligence), and the way in which people perceive money.

2.1.1. Numerical skills

The strategies people used to make choice may dependent on the characteristic of the decision, but also by the decision maker's ability to understand and use numeric concepts to perform simple mathematical calculations (Dickert, Kleber, Peters, & Slovic, 2011). Knowing that highly numerate individuals tend to be less influenced by the way numerical information is presented (Peters, et al., 2007), I decided to measure numerical skills in order to verify if a better ability to evaluate numerical information, implies a better trade-off between resources.

Past work showed that people have an inborn capacity to discriminate quantity (Lipina & Posner, 2012); In particular, even newborns can quantify small numbers of items without conscious counting (Chi & Klahr, 1975; Silverman & Rose, 1980). Moreover, Wynn (1992), demonstrated that infants can calculate the results of simple arithmetical operations on small numbers of items through the discrimination of the items' quantity. This indicates that infants possess numerical concepts and that humans are innately endowed with arithmetical abilities. Despite this skill is found even very early in life, it does not develop or reach the same level for everyone. Therefore, it becomes an important individual difference to consider (Jasper, Bhattacharya, Levin, Jones, & Bossard, 2013). Lipkus and colleagues showed that substantial differences in numerical ability exist among people (Lipkus, Samsa, & Rimer, 2001): Hence it follows that some people are good with numbers, some are not. Furthermore, the International Assessment of Adult Competencies 2012 (Goodman, Finnegan, Mohadjer, Krenzke, & Hogan, 2013) collected data about adults (ages 16-65) numerical skills in twenty-two different countries, indicating a wide variability across nations. Considering the quantitative world in which we live, innumeracy may be a significant obstacle to making a worthwhile decision in finance, economic administration and, more in general, in daily life. Several studies showed the importance of having an adequate ability to process numerical information (Hamm, Bard, & Scheid, 2003; Peters, Västfjäll, Slovic, Mertz, Mazzocco, & Dickert, 2006; Reyna, Nelson, Han, & Dieckmann, 2009). In particular, Peters and colleagues (2006) showed how people with lower numerical ability were more likely to have difficulty judging risks and providing consistent assessments of utility. They were also worse at reading graphs. Moreover, other studies, indicate that people with lower numerical ability showed larger framing effects, and tended to think that negative low-probability events were more likely to occur (Peters, et al., 2007; Reyna et al., 2009).

Several authors investigated numeracy in medical communication and decision: For example, Hamm and colleagues (2003) showed that higher numeracy was associated with more accurate judgments about probabilities in medical decisions. Other research showed that patients with a higher level of numeracy preferred and choose to receive numbers instead of verbal information in risk communication, with an associated increase in trusting the physician (Gurmankin, Baron, & Armstrong, 2004). Although numeracy typically leads to improved decision making, there is evidence that the increased numerical processing observed in highly numerate individuals can lead to increased affective reactions to numbers, or number comparisons, which, in turn, can result in either optimal or sub-optimal decision making (Weller, Dieckmann, Tusler, Mertz, Burns, & Peters, 2013).

Considering the impact of numerical skills on decision making and the proposed goal to investigate how people with a scarcity mindset (vs. control) trade-off money and time in money-saving contexts, it seemed relevant to investigate whether participants with higher numerical skills are less affected by the scarcity's consequences. More specifically, considering that higher numerical skills improved decision making (Weller et al., 2013), it would be worthwhile to delve if a better ability to evaluate resources, implies a better trade-off between these same.

2.1.2. Money Perception

Considering the importance of the perception of owning resources in the scarcity mindset, it is particularly valuable to explore people's attitudes towards money and understand how money perception can help explain people's decisions when experiencing the scarcity mindset. Researches demonstrated that attitudes towards money are largely independent of an individual's income (Yamauchi & Templer, 1982; Sharma

& Alter, 2012; Sharma et al., 2014; Roux et al., 2015). In this regard, money perception matters to the study of scarcity because even people who are objectively wealthy can still feel that they do not have enough resources and to be economically insecure (Sharma & Alter, 2012; Sharma et al., 2014; Shah et al., 2015). These considerations imply that people can have a very subjective perception of money and diverse attitudes towards the distribution at the individual level of personal wealth (monetary or otherwise) (Wiepking & Breeze, 2012). For example, Sharma and Alter (2012), suggested that when consumers assess their financial status and perceive themselves as in a condition of scarcity, their purchasing strategy tended to reduce their sense of inadequacy. Specifically, they suggested that to counterbalance the relative deficit, consumers were motivated to acquire goods that were scarce rather than abundant (Sharma & Alter, 2012). In addition, there are several studies suggesting that people attached different value to different forms of money (Mishra, Mishra, & Nayakankuppam, 2006). In fact, studying the perception of the value of the money, Raghubir and Srivastava (2008), showed that individuals incur in a series of biases like evaluating a gift card as less valuable than the equivalent amount of cash. Similarly, through five studies, Tessari and colleagues (2011) showed that the perception of the value of the money is conveyed not only by nominal denominations but also by its physical appearance. This perception did not just impact the perceived value of coins and banknotes of equal denomination, but also people's spending and saving decisions (Tessari et al., 2011).

How people perceived money, and its value, have a strong impact on several domains. For example, a recent study showed how the perceived cost linked to a donation is influenced by the way in which donation appeals are presented (Caserotti, Rubaltelli, & Slovic, 2019). Participants were presented with two conditions: In the join evaluation condition both the charities were presented simultaneously, while in the separated

evaluation condition the two charities were presented separately. Authors investigated the subjective judgments about the cost and the benefit associated with the charities in either the conditions. By cost authors mean people's perceptions of the monetary cost involved in contributing to a specific charitable organization. Meanwhile, they considered the benefit in terms of people's perceptions of the value of providing help to individuals in need. Results showed that, regardless of the actual amounts asked by the charities, in join evaluation compared with separate evaluation people's perception of the benefit for the recipients increased for the cause ranked as more important while perceived cost of supporting that cause decreased (Caserotti et al., 2019), showing how the perceived cost of the donation was influenced by the decisional context.

Since the scarcity mindset is prompted by the perception of not having enough resources (e.g., money in this case), I decided to investigate the interaction between money perception and purchasing decisions. In particular, in the following studies, to assess the perception of money, I used two subscales from Furnham's Money Beliefs and Behaviour Scale (1984). These two measurable "money attitudes" were identified by Furnham as Retention and Inadequacy. I selected these two subscales because these allow measuring behaviour related to the perception of opulence, social comparison and preference to spend or save money, all aspects involved in the perception of scarcity. Specifically, retention refers to the degree to which people have a careful approach to wealth and a preference not to spend money on anything (Furnham & Argyle, 1998; Wiepking & Breeze, 2012). People with strong feelings of retention prefer to save money, are fearful of lacking money in the future, often feel guilty about spending money (even on necessities) and have difficulties in making decisions about spending money, regardless of the amount involved and their actual ability to afford it. Whereas, people who feel financially inadequate are those who worry about their financial condition most

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of the time, who states that most of their friends have more money than they do and who believe that other people overestimate their actual financial resources (Furnham & Argyle, 1998; Wiepking & Breeze, 2012).

2.1.3. Trait Emotional Intelligence

For a longtime psychologist supposed that emotions have a distinct pattern of physiological changes, something like a fingerprint (Ekman, 1992). Emotion's fingerprints were supposed to be similar enough from one instance to the other, in different people, and in different culture (Ekman & Friesen, 1971; Ekman, 1992). In one famous study, Ekman and colleagues (Ekman & Friesen, 1971; Ekman et al., 1987; Russell, 1994) went to Papa Guinea to run studies with the local population. Their result indicated that even those indigenous population, with limited contact with western culture, could consistently match the faces to the expected emotion words and stories. Subsequently, in the late 90s, similar studies were run in Korea and Japan (Russell, 1994; Elfenbein & Ambady, 2002), replicating similar results. These shreds of evidences bring researchers to conclude that emotion recognition is universal: no matter your culture, your education, your sex or your experience (Ekman & Friesen, 1971; Ekman et al., 1987; Russell, 1994; Elfenbein & Ambady, 2002).

Even though emotions were considered universal for a long time, this is not necessarily the case. A comprehensive meta-analysis examined one hundred publications on emotions, involving approximatively 1,300 subjects across twenty years. Results showed limited support to the classical vision of the emotions, and no brain region was elected for the fingerprints of a single emotion (Barrett et al., 2007). Recently, Gendron and colleagues ran an experiment using photos from a group of actors (Gendron, Lindquist, Barsalou, & Barrett, 2012). The sample was organized in three conditions:

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participants assigned to the first condition saw only the pictures, those assigned to the second one read only about a shooting scenario, whereas those assigned to the third conditions saw the picture and read the shooting scenario. Participants in the third condition classified the emotion showed in the pictures as resembling fear, and, interestingly, this did not happen for those who saw only the picture, which mostly classified the emotion as surprise (Gendron et al., 2012). Moreover, a recent review showed that emotion is not a *thing* (Barrett, 2006) but a category of instances with a large variety in every category of emotion. Thus, what we are used to call emotion, such as anger, fear or happiness, is better defined by emotion categories. These categories were studied in patients with a brain lesion, finding that brain regions are routinely important to emotion, but that they are neither necessary nor sufficient for emotions (Adolphs & Tranel, 2003; Becker et al., 2012). In fact, Edelman and Gally (2001) demonstrated how an emotion, as for example fear, is not created by only one set of neurons, but by a combination of different neurons. This combination of different neurons was investigated in another study through evocative photos and a functional magnetic resonance imagining. Volunteers were presented with several pictures and then asked how much bodily arousal they felt. Results for women and men were similar for the reported feelings of arousal, but not for the brain activity, indicating that the same experience was associated with different patterns of neural activity (Oosterwijk, Lindquist, Anderson, Dautoff, Moriguchi, & Barrett, 2012). According to the theory of constructed emotion, the hypothesis is that, in a sense, emotions are made and are modeled holistically, as whole brain-body phenomena in context (Barrett, 2017). In this perspective, emotion perception is driven also by the context in which a face and an emotion are encoded (Barrett, 2006). It appears that faces carry affective information (valence and arousal) but

that the emotional meaning of facial actions is further constructed from the context in which they are embedded.

Until now I discussed how emotions are made, but another important aspect is how people react to emotions. This is different in the extent to which people can identify, handle and control those emotions (Mikolajczak, Petrides, Coumans, & Luminet, 2009). Interesting, emotions' evaluation could shape choice and judgments in ways that neither rationality assumptions nor intuition predicts (Shafir & LeBoeuf, 2002). For example, scholars showed that experiencing negative mood, in contrast with positive one, lead to lower life satisfaction and to a higher perception of the frequency of risks and of undesirable events (Johnson & Tversky, 1983; Schwarz & Clore, 1983). Furthermore, moods with equal valence can differently impact judgment: for example, anger seems to lead to more optimistic judgments about future risks, whereas fear, which is also negative, generates pessimism (Lerner & Keltner, 2000). Trait emotional intelligence, henceforth "trait EI", essentially regards people's understanding of their emotional skills and the world (Petrides, Mikolajczak, Mavroveli, Sanchez-Ruiz, Furnham, & Pérez-González, 2016). It refers to how well people perceive themselves at understanding, regulating, and expressing emotions in order to adapt to their environment and maintain well-being. This suggests that people's assessment of different circumstances and reaction to different life events is partly filtered through their perceptions of their emotional abilities (Petrides, Pita, & Kokkinaki, 2007).

Trait emotional intelligence is a distinct constellation of emotional self-perceptions, located at the lowest level of the personality hierarchies (Petrides, et al., 2007; Petrides, 2010). The operationalization of trait EI is straightforward since the construct includes self-perceptions and dispositions, which is in accordance with the subjective nature of how humans experience, attend to, process, and utilize affective information (Petrides &

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Furnham, 2003; Mikolajczak et al., 2009). Because of the overlooked attention to individual differences in the perception and experience of emotion, Sevdalis and colleagues investigated the relationship between trait EI and decision-related affect (Sevdalis, Petrides, & Harvey, 2007), showing the importance of personal factors when people contemplate possible routes of action. In addition, they found that high trait EI individuals were more able to deal with negative events after bad decisions (Sevdalis et al., 2007). Furthermore, other researchers investigated the associations between trait EI, emotion regulation and coping efficiency (Mikolajczak, Nelis, Hansenne, & Quoidbach, 2008). Results showed that participants with high trait EI used more adaptive rather than maladaptive strategies for emotion regulation (Mikolajczak et al., 2008). This demonstrated that people with high trait EI are more inclined to adopt a coping strategy when they have to handle a negative situation, without catastrophizing for any possible problem. Moreover, high trait EI people tend to invoke pleasant thoughts or memories in order to counter a negative emotional state, without blaming themselves for their incapacity to solve a problem (Mikolajczak et al., 2008). Besides, other studies showed that people with high trait EI have lower levels of stress (Mikolajczak et al., 2009) and lower cortisol response (Mikolajczak, Roy, Luminet, Fillée, & de Timary, 2007). In particular, Laborde, Brüll, Weber, and Anders (2011) studied the influence of trait EI in athletes when they have to face the stress of competition in a sample of thirty male handball players. Results showed that high trait EI players cope better with pressure and experienced a lower increase in stress compared to their low trait EI counterparts (Laborde et al., 2011). Additionally, Rubaltelli, Agnoli, and Leo (2018) found an association between runners' trait EI and their finish time in half marathon. In particular, they found that trait EI predicts finish time while controlling for training. These results

confirm previous studies showing that people with high trait EI are more successful in regulating emotions.

Finally, the literature about emotions in financial decision making showed that people with high trait EI are more sensitive to emotional information than people with low trait EI (Sevdalis et al., 2007; Telle, Senior, & Butler, 2011). Likewise, Rubaltelli, Agnoli, and Franchini (2016), investigated people's affective reactions when making a financial decision and the association with trait EI. They found that participants with high trait EI had higher arousal activation (measured through the pupil dilation) than participants with low trait EI when processing the charts depicting the past performance of a fund. Similarly, but in a different domain, Pittarello and colleagues investigated how trait EI could moderate the effect of arousal on cheating behavior (Pittarello, Conte, Caserotti, Scrimin, & Rubaltelli, 2018). Specifically, the authors found that when participants had the chance to cheat, increasing arousal leads to a decrease in cheating. However, there was a significant interaction between arousal and trait EI. Precisely, participants with high (vs. low) trait EI who were more effective at managing their emotional reactions were more likely to cheat when experiencing high arousal (Pittarello et al., 2018). These findings suggest that high trait EI can allow people to overcome the tension between doing right or wrong and license them to bend the rules.

What has been said so illustrated the role of trait EI and the consequences of scarcity over decision making. Thus, through two studies, I examined how scarcity affects the tradeoff between different resources, and how the ability to regulate affective state moderate this preference.

2.1.4. Time as a resource

Time is a crucial factor in people life and plays a fundamental role in many decisions people make. Thus, the comprehension of how people process time is fundamental to better understand how they consider it as a resource. Even if is not clear how timekeeping is implemented in the brain, most cognitive models assume that temporal judgments are determined by three processing phases (Church, 1984; Wittmann & Paulus, 2008). Firstly, people have an internal clock with an oscillatory pacemaker emitting pulses at a mean constant rate, producing subjective time units (Church, 1984; Pouthas & Perbal, 2004). When the signal duration is processed, the time units are gated into an accumulator. Consequently, the subjective perception and duration of time are defined by the number of time units accumulated over a certain time interval (clock stage). Then, at the memory stage, the outcome from the accumulator is processed in a working memory system for comparison with the content of long-term memory depiction of the number of time span accumulated on previous trials. Finally, at the decision stage level, a mechanism compares the current duration values with those in working or reference memory to decide on the adequate temporal response (Church, 1984; Pouthas & Perbal, 2004; see Figure 1).
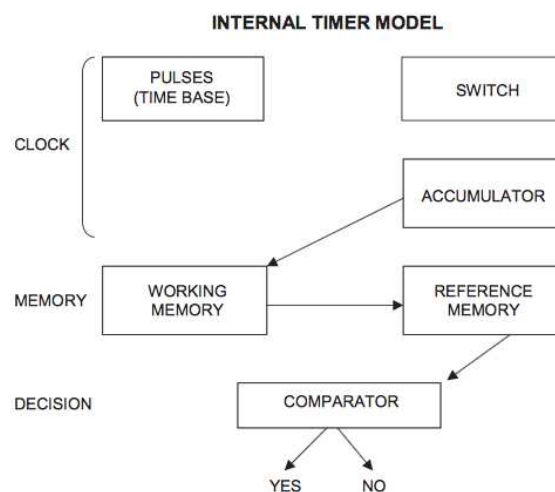
Figure 1. Internal timer model (Church, 1984)

Taking in consideration that the perception of time is strongly linked to our subjective well-being and that different mood states influence the degree to which someone attends to time (Mogilner, Whillans, & Norton, 2018), it is fundamental to better understand to what extent people consider time as a potential resource in their daily decisions. In particular, to explain the outcomes associated with people's choices on the tradeoff between having more time or more money, it is important to clarify the difference between these two resources. "Time is money", but to what extent is this true? Even if both money and time are central resources that people have to manage and balance constantly, researches comparing these resources showed that people react to them differently (Aaker, Rudd, & Mogilner, 2011; DeVoe & Pfeffer, 2011; Mogilner, 2010; Zauberman & Lynch, 2005). Specifically, the extent to which people prioritize time versus money in their everyday decisions might have important yet differential effects for subjective well-being and economic stability. Time is a resource that receives less attention than money, even if is equally pervasive in daily life. An important feature of time is that it has no exchangeable market: every day, everyone has a total of 24 hours, that cannot be recovered or borrowed over days. Instead, money has an exchangeable market, that implies the possibility to save and borrow it across time. Moreover, another difference between the two resources is that time is less fungible than money, with the consequence that people are more prone to carefully plan their temporal expenditures than their financial ones (Soster, Monga, & Bearden, 2010). In addition, because time is more ambiguous than money, people pay less attention to sunk costs involving time than money (Soman, 2001; Soster et al., 2010), and they can more easily rationalize poor or excessive investments of time than money (Okada, 2005; Okada & Hoch, 2004). As a result, people prefer to invest time rather than money to acquire hedonic goods (Okada, 2005) and they have more difficulty in accounting expenditures of time than money (Saini & Monga,

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2008). Furthermore, people also prefer products when they consider how much time they have spent with them than how much money they have spent (Mogilner & Aaker, 2009).

Time and money also differ in their perceived connection to people's self-concepts. For example, Gino and Mogilner (2014) investigated how time could be more than just a resource that people manage in their daily routine. They showed that how people spend their time serve as of measure of people's lives and who they are as individuals, indicating that the evaluation of time is more reflective of the self that money is (Gino & Mogilner, 2014). Other researchers showed that when people think about money, they are more prone to behave in self-interested ways (Mogilner & Aaker, 2009). Consistent, money-thoughts lead people to have a self-focus orientation, preferring to be free of dependency and dependents (Vohs, Mead, & Goode, 2006). Moreover, Vohs and colleagues (2006) showed how mere reminders of money bring people to minimize requests for support and also reduce their willingness to help others. Other researchers found that reminding people of having spent money increased their social distress and physical pain (Zhou, Vohs, & Baumeister, 2009). Additionally, when people decide to donate, they are more prone to give time instead of money (Olivola & Shafir, 2013), and perceived donations of time as more moral and self-expressive than donations of money (Reed, Aquino, & Levy, 2007).

Considering all these aspects, and the constant trade-off that people do in life when they have to balance time and money, the purpose of this chapter is to investigate the effect of the perception of monetary scarcity on the trade-off between money and time in purchasing contexts.

The research protocol for both the studies reported in this chapter was approved by the University Integrated Institutional Review Board of Brooklyn College - The City University of New York (Protocol 2018-1292).

2.2. Study 1

Money Scarcity and discount rates:

When people give up their time to obtain an increasing discount.

In Study 1, I investigated at which of a series of increasing discount rates people were willing to commit their time in order to save money on a purchase. To do this I used a hypothetical purchasing scenario where participants were asked to indicate their preference between paying a full price or obtaining a discount committing their time. Considering the consequences of scarcity on mental resources (Mani et al., 2013, 2013b; Mullainathan & Shafir, 2013, 2014), its tendency to leads to problematic and sub-optimal behaviours (Vohs, 2013), and the ambiguity of time (Soman, 2001; Soster et al., 2010), in Study 1, I hypothesized that people who experience a condition of perceived monetary scarcity should be more prone to commit their time. In addition, I hypothesized that numerical ability, the perception of money, and trait emotional intelligence should moderate the tradeoff between time and money.

Specifically, I hypothesized that:

1) Compared to participants in the control condition, those experiencing a condition of perceived scarcity should be more likely to accept to drive to another store even to save a small amount of money.

2) Participants with high (vs. low) numerical skills should be more likely to commit their time as the discount increases.

3) Participants with high (vs. low) scores in the perception of money scale should be more prone to save money, even if required to commit their time.

4) High (vs. low) trait EI participants should be more likely to commit their time as the discount increases.

2.2.1. Method

2.2.1.1. Subjects

Seven hundred ninety participants (57.23% female, M_{age} = 33 years, ranging from 15 to 81 years old) took part in Study 1. Participants were recruited via Amazon Mechanical Turk (Buhrmester, Kwang, & Gosling, 2011; Paolacci, Chandler, & Ipeirotis, 2010) in exchange for $ .50. All participants were located in the United States and had a response approval rate ≥ 90%. Twenty-six participants were excluded from the analysis because of their inaccuracy in the manipulation task, I also excluded not over 18s participants, and those who did not complete the survey, thus in the final dataset there were seven hundred fifty-five participants (57.92% female, M_{age} = 33 years, ranging from 18 to 75 years old), equally distributed between the four conditions.

2.2.1.2. Procedure

To manipulate the perception of scarcity I used an episodic recall task adapted from Fischhoff, Gonzalez, Small, and Lerner (2003) and Roux and colleagues (2015) (see Appendix 1 for more details). Participants were first asked to recall four episodes about the past, and subsequently, they were asked to describe a couple of them more in detail. Specifically, participants in the scarcity condition were asked to recall episodes in which they felt like they "didn't have enough money", whereas those in the control condition were asked to recall about something they did during the past week. Participants were then randomly assigned to read one of two different scenarios (adapted from Tversky & Kahneman, 1981 and Becker, DeGroot, & Marschak, 1964), manipulated between-subjects. Scenarios presented participants with the following purchasing of either a high-

price or low-price jacket (below is reported the high price condition, while the low-price condition information is in brackets):

Imagine you are purchasing an elegant (casual) jacket at Store A for $350 (or $150) but are told you can find the exact same elegant (or casual) jacket at Store B for cheaper. Please choose whether you would drive 20 minutes for the following discounts, or you prefer to pay the full price.

After reading the scenario, participants were presented with 14 fixed dichotomic choices. Each choice offered them the opportunity between paying the full price or drive a fixed amount of time (i.e., 20 minutes) for an increasingly discount, ranging from $5 in the first choice to $70 in the last choice (in $5 increments at each subsequent choice; e.g., pay full price vs. drive 20 minutes for a $5 discount, see Table 1 for more details).

Drive 20 minutes for $5 less			Pay $350 (or $150)
Drive 20 minutes for $10 less			Pay $350 (or $150)
Drive 20 minutes for $15 less			Pay $350 (or $150)
Drive 20 minutes for $20 less			Pay $350 (or $150)
Drive 20 minutes for $25 less			Pay $350 (or $150)
Drive 20 minutes for $30 less			Pay $350 (or $150)
Drive 20 minutes for $35 less			Pay $350 (or $150)
Drive 20 minutes for $40 less			Pay $350 (or $150)
Drive 20 minutes for $45 less			Pay $350 (or $150)
Drive 20 minutes for $50 less			Pay $350 (or $150)
Drive 20 minutes for $55 less			Pay $350 (or $150)
Drive 20 minutes for $60 less			Pay $350 (or $150)
Drive 20 minutes for $65 less			Pay $350 (or $150)
Drive 20 minutes for $70 less			Pay $350 (or $150)

Table 1. Dichotomic choices from Study 1.

Once participants indicated their preference for each of the fourteen choices, they completed the numeracy scale (Weller et al., 2013) that measures their numeracy skills through a series of questions ranging from simple mathematical operations to logic and quantitative reasoning, as well as comprehension of probabilities, proportions, fractions and the ability to manipulate, and use numerical information. Sample items for this scale are: "If the chance of getting a disease is 10%, how many people would be expected to get the disease out of 1000?" or "A bat and a ball cost $1.10 in total. The bat cost $1.00 more than the ball. How much does the ball cost?". The numeracy scale was administered after the manipulation and after completion of the economic task: This procedure was previously used also in other studies that investigate the role of the numeracy in decision process (Peters, 2006; Dickert, Kleber, Peters, & Slovic, 2011; Kleber, Dickert, Peters, & Florack, 2013).

Thereafter, participants were asked to complete the Money Perception scale (Wiepking & Breeze, 2012). This 7-item scale investigates how people subjectively perceive their financial condition. Answers are provided on a 7-point scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Sample items for this scale are: "I worry about my finances most of the time" or "I often have difficulty in making decisions about spending money regardless from the amount". This questionnaire has two subscales: Inadequacy and Retention. In particular, people who feel to be financially inadequate are those who worry about their economic condition most of the time; meanwhile, the retention factor measures the degree to which people have a careful approach to wealth and a preference for saving. As done in previous studies, the measure of the Money Perception scale, was assessed after the completion of the economic task (Wiepking & Breeze, 2012).

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Finally, I assessed a measure of trait emotional intelligence through the Trait Emotional Intelligence Questionnaire short form (TEIQue-SF; Petrides, 2009). In several previous researches that investigated the role of trait EI, the TEIQue was run after the measurement of the dependent variable (Pittarello et al., 2018; Agnoli, Pittarello, Hysenbelli, & Rubaltelli, 2015; Rubaltelli & Pittarello, 2018). This 30-item scale askes participants to self-report their tendency to regulate, express, and perceive their emotions. Answers are provided on a 7-point scale ranging from 1 ("completely disagree") to 7 ("completely agree"). Adequate internal consistency and broad coverage of the sampling domain of the construct has been reported (Petrides et al., 2007). The measure showed good reliability ($\alpha = .80$). Finally, at the end of the experiment, demographical variables were collected before to debrief participants.

2.2.2. Results

In all the following models, condition (scarcity vs. control) and products' price were considered as categorical predictors, while numeracy, trait emotional intelligence and Money Perception, were all tested as continuous predictors. Furthermore, in the estimated models, we considered the choice repetition, specifically the fourteen increasing discount levels, as continuous predictor. The choice corresponds to the single answer of choice between paying the full price or drive for 20 minutes for a discount and it was considered as dependent variable (dichotomic variable).

To test the effect of the price product on the choice, I ran a preliminary generalized linear mixed effect model with condition (scarcity vs. control), price of product (high vs. low cost), and their interaction as predictors, controlling for the random intercept of participants and choices as dependent variable. Results revealed no main effect of the

price of product ($\chi^2 = 2.80, p = .09$), neither a significant interaction ($\chi^2 = 0.09, p = .77$). Thus, in the following analyses, I collapsed together the two scenarios.

Moreover, since numeracy, Money Perception, and trait emotional intelligence were tested at the end of the study, I checked whether the manipulation had an impact on the scales' scores in the two conditions. A t-test showed that numeracy scores were not significantly different in the two condition, $t(1,757) = -.66, p = .51, d = .05$ ($M_{scarcity} = 3.17, SD = 1.5$ vs. $M_{control} = 3.24, SD = 1.5$). In addition, for the inadequacy subscale, a t-test showed that the difference was significant, $t(1,757) = 5.31, p < .001, d = .36$, although the difference between the two conditions was only .54 ($M_{scarcity} = 4.90, SD = 1.4$ vs. $M_{control} = 4.36, SD = 1.5$). Also for the retention subscale, the t-test showed that the difference was significant, $t(1,757) = 3.65, p < .001, d = .27$, although the difference between the two conditions was only .32 ($M_{scarcity} = 4.94, SD = 1.2$ vs. $M_{control} = 4.62, SD = 1.2$). Finally, for the emotional intelligence, a t-test showed that the difference was significant, $t(1,757) = -2.79, p = .005, d = .20$, even though the difference between the two condition was only .14 ($M_{scarcity} = 4.50, SD = .68$ vs. $M_{control} = 4.64, SD = .70$).

2.2.2.1. Numeracy

I estimated a generalized linear mixed effect model with condition (scarcity vs. control), choice repetition, and numeracy as predictors, choice as dependent variable, and the interactions of interest: condition by choice repetition, condition by numeracy, and choice repetition by numeracy. The model controlled for participants' random effect. Results revealed a main effect of the choice repetition ($\chi^2 = 37.29, p < .001$), a main effect of the condition ($\chi^2 = 7.29, p < .001$), and a main effect of numeracy ($\chi^2 = 42.99, p < .001$). In addition, a significant interaction between the choice repetition and the condition was found ($\chi^2 = 28.78, p < .001$). To explore the nature of this interaction, I conducted

separate slope analyses for each condition. Overall, as showed in Figure 2, participants were willing to drive to the second store as discounts increased, in particular participants in the scarcity condition were more willing to drive to the second store in the first few trials as well ($\beta = .77$, $SE = .03$, $p < .001$) than those in the control condition ($\beta = .94$, $SE = .03$, $p < .001$).

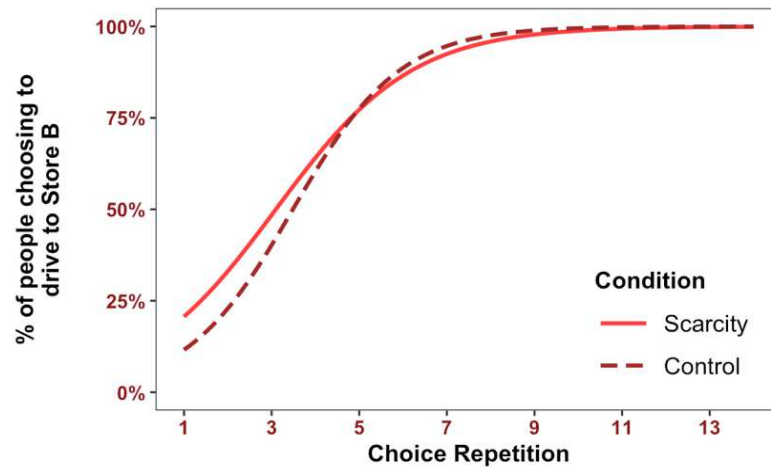**Figure 2.** Interaction between choice repetition and condition.

Moreover, a significant interaction was found between choice repetition and numeracy ($\chi^2 = 240$, $p < .001$). A slope analysis showed that as numeracy increased participants were less likely to go to the second store when the discount was low (see Figure 3).
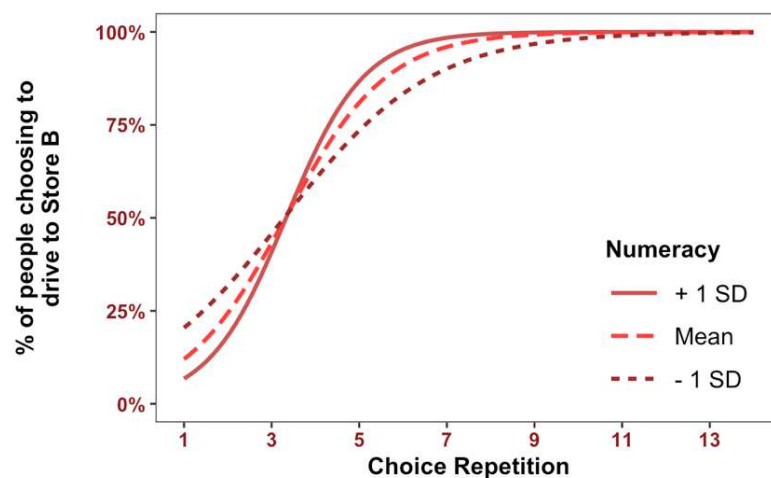
Figure 3. Interaction between choice repetition and Numeracy.

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However, as numeracy increased participants were also quicker at switching to the second store, a behavior that corresponds to a substantial economic benefit (β_{high} = 1.13, SE = .04, p = .00; β_{mean} = .86, SE = .02, p = .00; β_{low} = .59, SE = .02, p = .00). The interaction between condition and numeracy was not significant (p = .27).

2.2.2.2. Money Perception

To investigate how people perceived money, participants were asked to complete the two subscales from the Money Perception scale (Wiepking & Breze, 2012). First, I conducted a factor analysis using a Varimax rotation to reduce the number of factors of the Money Perception scale. Consistent with the expected factorial structure of the scale, this analysis revealed two factors (based on eigenvalues >1). The first factor was inadequacy (α = .82), expressing the feelings related to the perception of the economic availability, whereas the second was labelled retention (α = .74), including the items that assessed how people manage their economic disposability (see Table 2).

	Inadequacy	Retention
I worry about finances most of the time.	.46	
Most of my friends have more money than I do.	.65	
I am worse off than my friends think.	.75	
I prefer to save money, because I am never sure when things will collapse and I need the cash.		.82
Even when I have sufficient money, I often feel guilty about spending money on necessities like clothes etc.		.89
I often have difficulty in making decisions about spending money regardless of the amount.		.95
I often say 'I can't afford it', regardless whether I can or not.		1
Proportion of variance	.34	.30

Table 2. Factorial analysis for the Money Perception subscales (Wiepking & Breze, 2012).

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Then, I ran a generalized linear mixed effect model testing the main effect of condition (scarcity vs. control), the main effect of choice repetition, and the main effect of inadequacy and retention, as predictors, and people's choice as dependent variable. In the same model was tested the interaction between the choice repetition and the condition, and between the choice repetition and, separately, the two subscales of the Money Perception scale. The model controlled for participants random effect. The main effect of choice repetition ($\chi^2 = 51.56$, $p < .001$), condition ($\chi^2 = 15.31$, $p < .001$), as well their interaction ($\chi^2 = 30$, $p < .001$), were significant in this model as well. In addition, results showed a significant interaction between choice repetition and retention ($\chi^2 = 15.99$, $p < .001$). To probe this interaction, I performed a slope analysis showing that an increasing score in retention corresponded to an increasing likelihood to drive to the second store to obtain the discount as the discount increased, compared to those that were less careful to approach wealth and saving ($\beta_{+1SD} = .81$, $SE_{+1SD} = .03$, $p < .001$ vs. $\beta_{-1SD} = .67$, $SE_{-1SD} = .02$, $p < .001$). Finally, the interaction between choice repetition and the inadequacy subscale was also significant ($\chi^2 = 5.68$, $p < .05$), indicating that increasing financially inadequacy and worries about economic conditions led to an increasing tendency to commit their time in order to save money ($\beta_{+1SD} = .70$, $SE_{+1SD} = .02$, $p < .001$ vs. $\beta_{-1SD} = .79$, $SE_{-1SD} = .03$, $p < .001$).

2.2.2.3. Trait Emotional Intelligence

To investigate the effect of the trait EI on the choice to drive to the second store, I estimated a generalized linear mixed effect model considering the main effect of condition, the main effect of choice repetition, and the main effect of trait EI as predictors. Moreover, I tested the interaction between the choice repetition and the condition, the choice repetition and the trait EI, and between the condition and the trait EI. People's

choices were the dependent variable and the model controlled for participants random effect. Again, as for previous analysis the model indicated a main effect of choice repetition ($\chi^2 = 108.3$, $p < .001$), of trait EI ($\chi^2 = 58.74$, $p < .001$), as well as interaction between choice repetition and condition ($\chi^2 = 17.32$, $p < .001$). In addition, results indicated a significant interaction between choice repetition and trait EI ($\chi^2 = 247.6$, $p < .001$). However, what the slope analysis shows is that for participants with high (vs. low) trait EI the curve is steeper, indicating that most of them switched at the same time from not going to the second store to driving there ($\beta_{high} = 1.15$, $SE = .04$, $p < .001$; $\beta_{low} = .58$, $SE = .02$, $p < .001$; see Figure 4). The interaction between condition and trait EI was not significant ($p = .48$).
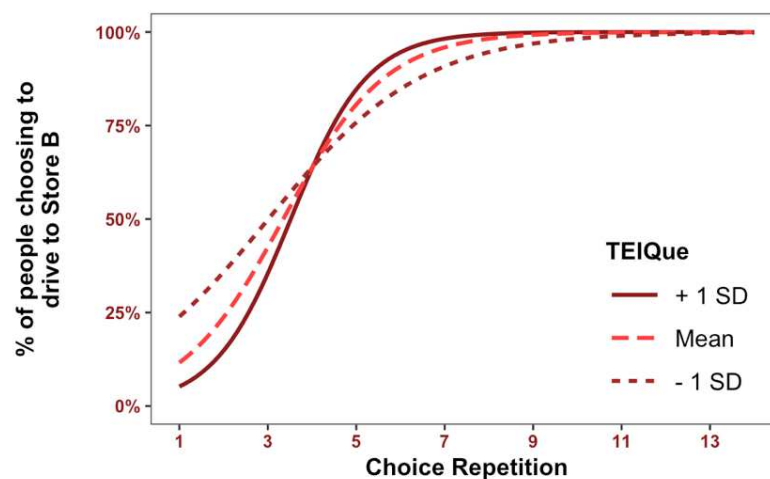
Figure 4. Interaction between choice repetition and trait EI
measured through the TEIQue.

2.2.3. Discussion

Study 1 showed that, overall, participants were likely to commit their time to save on a purchase. Importantly, this tendency was stronger for participants in the scarcity condition than for those in the control condition. As hypothesized, results showed that participants with higher numerical skills were less prone to commit their time for small

discounts, compared to those with low scores on the numeracy scale. In fact, the numeracy by choice repetition showed a quite rational behaviour, and, consequently, a higher ability to estimate the value of time as numerical skills increased. It can be argued that 20 minutes are not worth a $5 discount, but people with higher (vs. lower) numerical skills switched in a more consistent way around the third choice. Differently, people with lower numerical skills were more willing to go to the second store even to save $5 and when they did not, they were less consistent at switching. This finding suggests that people with lower numerical skills are potentially less capable to estimate the value of their time or to translate it into the monetary scale.

Regarding the perception of money, results showed that the scarcity mindset marginally impacts people perception of money, increasing concern about economic condition and also raising attention to wealth and savings. Moreover, participants with a lower perception of Inadequacy were always less prone to commit their time in order to save money. Likewise, those with a higher score in the Retention subscale were more likely to drive to the second store to obtain the discount. In other words, these findings suggest that people who were less worried about the economic condition, were also less exposed to the risk to underestimate the value of time. On the contrary, those who showed a stingy behaviour, were less capacious to recognize the value of their time and more willing to reach the economic discount.

Similar to the results for the numeracy, as hypothesized, results indicated that participants with higher (vs. lower) trait EI were better at estimating the value of the time. Indeed, the trait EI by choice repetition showed a quite rational behaviour, and a higher ability to estimate the value of time as trait EI increased. For those with higher trait EI, 20 minutes worthen more than $5, then around the fifth choice, approximatively $25, the majority switches indicating that the discount was worth the time needed for the drive.

This suggests that people with lower skills in managing emotion are more at risk to commit their time. To summarize, this study showed how participants experiencing a condition of perceived monetary scarcity traded more easily their time (20 minutes) in exchange for a discount than participants in the control condition. An interpretation of the results is that the scarcity mindset might have shifted participants' attention on money, the scarce resources, and therefore increased their utility for money (i.e., the discount), compared to participants in the control group.

It is important to consider that in this study, participants were asked to drive for a fixed amount of time (e.g., 20 minutes) to obtain a discount, that increased from $5 to $70. Thus, the resource that was increasing through the choice repetition was the one supposed to catch people attention in a condition of perceived monetary scarcity. But what if people have to drive longer to obtain the same discount? To assess how people weigh the time dimension over the money one, in Study 2, I investigated how much people are prone to commit their time in order to receive a discount. This study will allow to investigate how perceived scarcity could shift attention toward the resource considered as most relevant, to the disadvantage of other resources falling out of the tunnel. Those information about how framing information to reduce the consequences of the scarcity could be fundamental in the development of effective intervention plans.

2.3. Study 2

Money Scarcity and discount rates:

When people trade their time to obtain a fixed discount.

In Study 2, I investigated at which of increasing amounts of time people are willing to trade their time to obtain a fixed discount on a purchase. Considering that in the previous study the effect of the scenario (high vs. low price) was not significant, in this study, I presented all participants with the same version of the hypothetical purchasing scenario, asking to indicate their preference between paying the full price or committing their time to obtain a discount. Similar to Study 1, I hypothesized that people who experience a condition of perceived scarcity should be more prone to commit their time, compared to those in the control condition. Moreover, I hypothesized that participants numerical ability, money perception and trait emotional intelligence should moderate the tradeoff between time over money. Specifically, I tested the same hypotheses of Study 1, but with a different experimental design.

2.3.1. Method

2.3.1.1. Subjects

One hundred and ninety-six participants (47.95% female, $M_{age} = 35$, ranging from 19 to 73 years old) were recruited via Amazon Mechanical Turk. Participants were based in the U.S. and all had an approval rating >=90%. I used Turkgate (Goldin & Darlow, 2013) to exclude participants who took part in Study 1. Moreover, sixteen participants were excluded from the analysis because they failed to comply with the scarcity manipulation

instructions. As a result, analyses were run on a sample of one hundred eighty participants (48.05 % female, M_{age} = 35, ranging from 19 to 73 years old).

2.3.1.2. Procedure

To manipulate the perception of scarcity, I used the same recall task as in Study 1 (Fischhoff et al., 2003; Roux et al., 2015; see Appendix 1). Even if the adopted scenario was the same as Study 1, in this study, I changed the response matrix: In particular, participants could decide whether to pay the full price for the jacket in the first store or get a $35 discount by driving a certain amount of time to a second store. The twelve dichotomic choices were presented with the same order reported in Table 3.

Drive 60 minutes for $35 less			Pay $350
Drive 55 minutes for $35 less			Pay $350
Drive 50 minutes for $35 less			Pay $350
Drive 45 minutes for $35 less			Pay $350
Drive 40 minutes for $35 less			Pay $350
Drive 35 minutes for $35 less			Pay $350
Drive 30 minutes for $35 less			Pay $350
Drive 25 minutes for $35 less			Pay $350
Drive 20 minutes for $35 less			Pay $350
Drive 15 minutes for $35 less			Pay $350
Drive 10 minutes for $35 less			Pay $350
Drive 5 minutes for $35 less			Pay $350

Table 3. Dichotomic choice for Study 2.

Note that in this experiment the amount of the discount was fixed, whereas what changed in each of the twelve choices was the time required to drive to the second store (from 60 minutes in the first choice to 5 minutes in the last one, see Table 3 for more details).

After making their choices, participants completed the numeracy scale (Weller et al., 2013), the subscales from the Money Perception scale (α= .74 for the inadequacy subscale, and α= .77 for the retention subscale; Wiepking & Breeze, 2012), and the TEIQue-SF (α= .90; Petrides, 2009). Finally, demographic information was collected.

2.3.2. Results

In all the estimated models, condition (scarcity vs. control) was considered as categorical predictor, while numeracy, Money Perception, and trait emotional intelligence were all tested as continuous predictors. In addition, choice repetition, specifically the twelve decreasing driving time levels, was considered as continuous predictor. The choice, correspondent to the single answer between paying the full price or drive for a $35 discount, was considered as dependent variable (dichotomic variable).

Moreover, since numeracy, Money Perception subscales, and trait emotional intelligence were tested at the end of the study, I checked whether the manipulation had an impact on the scores in the two conditions. For the numeracy scale, a t-test showed that there was no difference in the two conditions, $t(1,178) =.42$, $p = .67$, $d = .06$ ($M_{scarcity}$ = 4.23, $SD = 2.2$ vs. $M_{control} = 4.1$, $SD = 2.1$). Also for the inadequacy subscale the t-test showed that the difference was no significant, $t(1,177) = 1.38$, $p = .17$, $d = .21$ ($M_{scarcity}$ = 4.80, $SD = 1.33$ vs. $M_{control} = 4.53$, $SD = 1.28$). The t-test ran for the retention subscale, showed no significant difference between the two conditions, $t(1,177) = .87$, $p = .39$, $d =$ 1.13 ($M_{scarcity}$ = 4.97, $SD = 1.17$ vs. $M_{control} = 4.82$, $SD = 1.14$). Finally, for the trait

emotional intelligence, a t-test showed that there was no difference between the two conditions, t(1,177) = .91, p = .36, d = .13 ($M_{scarcity}$ = 4.65, SD = .9 vs. $M_{control}$ = 4.54, SD = .79).

2.3.2.1. Numeracy

I conducted a generalized linear mixed effect model with condition (scarcity vs. control), choice repetition, and numeracy as main effects and the interactions of interest: condition by choice repetition, choice repetition by numeracy, and the interaction between condition and numeracy. The model controlled for participants' random effects. I found a main effect of the choice repetition (χ^2 = 29.9, p < .001), qualified by its interaction with the condition (χ^2 = 11.37, p < .001). Overall, participants decided to drive to the second store to obtain the discount, but those in the scarcity condition were slightly less likely to change store for small discounts. Anyway, through the choice repetition, participants in the scarcity condition, were increasingly more likely to drive to the second store as the driving time decreased ($\beta_{scarcity}$ = .79, SE = .05, p = .00; $\beta_{control}$ = .50, SE = .05, p = .00).

Furthermore, as showed in Figure 5, a significant interaction between choice repetition and numeracy (χ^2 = 7.56, p < .001) indicated that increasing numerical skills led people to be less willing to go to the second store when driving time was high (β_{+1SD} = .90, SE_{+1SD} = .06, p = .00; β_{-1SD} = .37, SE_{-1SD} = .03, p = .00). However, increasing numerical skills also made participants switch more consistently once they deemed the driving time worth the amount of discount they were offered. No significant interaction between condition and numeracy was found (p = .91).
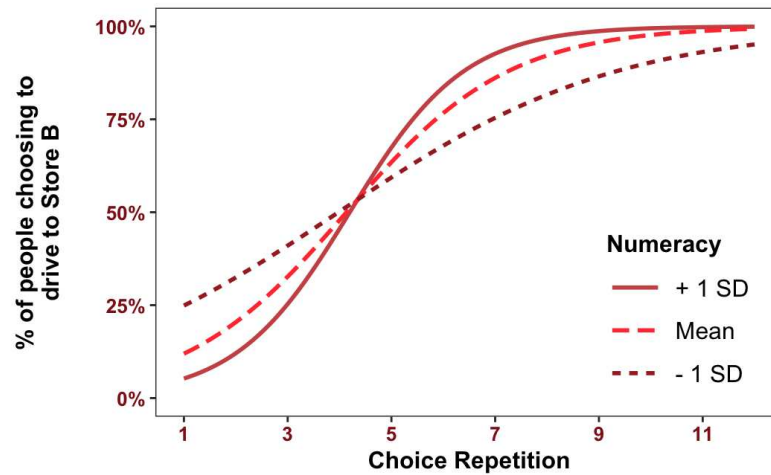
Figure 5. Interaction between choice repetition and Numeracy.

2.3.2.2. Money Perception

Consistent with what was done in Study 1, I conducted a factor analysis with Varimax rotation to test whether the Money Perception scale's items could be reduced to fewer dimensions. Results based on eigenvalues > 1 showed a two-factor solution. The first factor was labelled inadequacy (α = .74) and the second retention (α = .77). I ran a generalized linear mixed effect model testing the main effect of condition (scarcity vs. control), the main effect of choice repetition, the main effect of inadequacy and retention, as predictor, and people's choice as the dependent variable. I also tested the interactions between choice repetition and condition, choice repetition and inadequacy, and choice repetition and retention. The model controlled for participants' random effects. This model showed a pattern similar to the previous analysis. Results revealed significant effects of condition (χ^2 = 5.53, p < .05), choice repetition (χ^2 = 59.62, p < .001), and their interaction (χ^2 = 32.98, p < .001), as well as the main effect of inadequacy (χ^2 = 7.59, p < .01). These findings confirm that participants in a scarcity condition were more likely to change store when the driving time decreased. Moreover, results revealed an interaction between choice repetition and inadequacy (χ^2 = 8.26, p = .004; see Figure 6).

Overall, participants with higher feelings of inadequacy, were more prone to go to the second store even when they had to commit more time (β_{+1SD} = .44, SE_{+1SD} = .04, p = .00), compared to participants with a lower score in the same subscale (β_{-1SD} = .60, SE_{-1SD} = .04, p = .00).
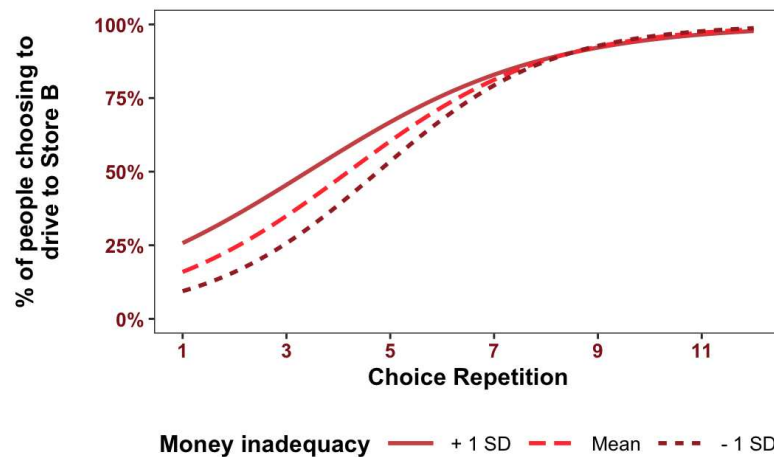
Figure 6. Interaction between choice repetition and Inadequacy.

2.3.2.3. Trait Emotional Intelligence

To investigate the role of trait emotional intelligence in purchasing choices, I ran a generalized linear mixed effect model testing the main effects of condition, choice repetition, and trait EI as well as the interactions between choice repetition and condition, choice repetition and trait EI, and trait EI and condition. People's choice was the dependent variable and the model controlled for participants' random effects. This model showed a similar pattern to the previous analysis for condition and choice repetition, but the interaction between condition and trait EI was not significant (p = .26). However, the interaction between choice repetition and trait EI was significant (χ^2 = 63.1, p < .001; see Figure 7), indicating that as the trait EI score increased participants became less likely to drive longer for the same discount (β = .89, SE = .06, p < .001) compared to those with low trait EI (β = .34, SE = .03, p < .001).
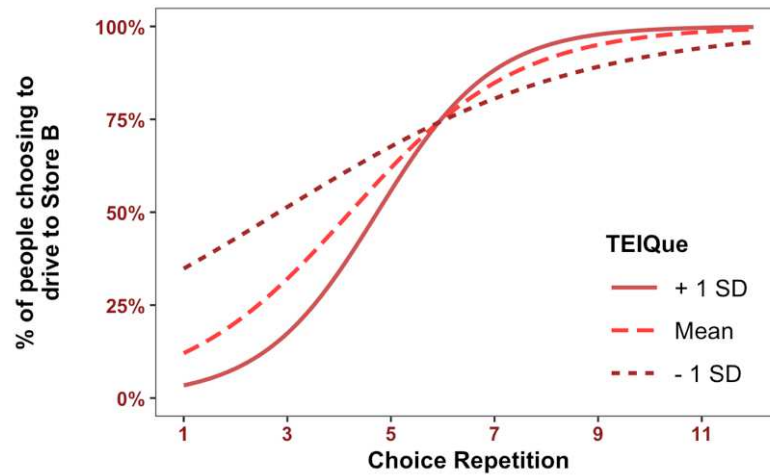
Figure 7. Interaction between choice repetition and trait EI.

2.3.3. Discussion

Results of Study 2, coherently with those of the previous one, showed that overall participants were likely to commit their time to save on a purchase. Considerably, in the scarcity condition (vs. control) participants were progressively more likely to trade time in exchange for money. Interestingly, for small discount participants in the control condition were slightly more likely to drive to the second store than those experiencing the scarcity. For what concern individual differences, as hypothesized, participants with higher numerical skills did not move when the time was too high compared to the discount, but then switched almost all at the same time when they judged the discount worth a specific amount of time. In particular, people with low numerical skills were more willing to go to the second store even when it required 60 minutes. This result suggests that these people are potentially less capable to estimate the value of their time or to translate it into the monetary scale. With regard to the Money Perception scale, results showed that participants experiencing a stronger feeling of inadequacy were more prone to go to the second store even when the required time was high. In short, those who perceived themselves as less economically adequate were more willing to drive to the

second store also when they have to commit 60 minutes for $35 discount. It can be argued that for those participants, $35 definitely worth one hour of their time.

Finally, results showed that participants with higher skills in managing emotions were less likely to drive longer for the discount compared to those with lower skills. This result suggests that participants with higher trait EI were better at estimating the monetary value of time: 60 minutes were worth more than $35 for most of them, and the majority switches to the option to drive to the second store when $35 were valued approximatively 35 minutes or less commitment.

In conclusion, Study 2, confirmed that people are willing to commit their time to obtain a discount. Interestingly, results showed that participants experiencing a condition of perceived scarcity (vs. control) had a stronger preference to change store to obtain the discount. Remarkably, when the required time decreased, these participants were even more prone to switch to the second store, indicating a higher ability to evaluate their time or to translate it into the monetary scale.

2.4. General discussion

These two studies investigated how people experiencing a scarcity mindset (vs. control) trade their time when choosing between paying a full versus a discounted price. In the first study, I measured at which of increasingly discount rates people are willing to give up their time to save money on a purchase. Meanwhile, in the second study, I investigated at which of increasingly amounts of time people are willing to trade their time to obtain a fixed discount on a purchase.

Results showed that, overall, participants were willing to commit their time driving to another store when they were offered with a discount, indicating that in general, people found acceptable to commit their time in order to save a resource, money, of which it is easier to estimate the value. Interestingly, in Study 1, where participants had an increasing discount for a fixed amount of time, those experiencing a condition of perceived scarcity were more likely to drive to the second store also when the discount was low, and consistently more willing to change store when the discount increase and become worthier, compared to those in the control condition. Instead, in Study 2, where participants had a fixed discount and decreasing required driving time, those in the scarcity condition were initially slightly less likely to go to the second store compared to those in the control condition but were progressively more likely to change store as soon the required driving time decrease. In general, participants in the scarcity mindset showed a similar pattern in both the studies: they were less susceptible to classic context effects. More specifically, the perception of scarcity brings participants to recognize the trade-offs that must be made against the economic needs. Over the dichotomic choices, the scarcity mindset frames perception more consistently. In line with Shah and colleagues' results (2018), these findings indicate that scarcity leads to a higher trade-off thinking, showed by the fact that participants of Study 2 were more and more willing to drive to

the second store when the economic benefit increase in relation to the time they were requested to commit it. Surprisingly, what emerges from these results, is that participants in the control condition were more sensitive to the time: they paid less attention to the time as resources and contextual cues and, consequently, less attention to the related sunk costs. Time seems to be considered as less relevant and exert less influence on the decision. In the second study, in particular, has emerged the inattention to perceive the economic benefit proportionate to the time commitment.

Considering the individual differences, higher numerical skills and higher emotional intelligence leads to a substantial economic benefit. Indeed, in both the studies, results showed that participants with higher numerical skills were less likely to change store committing their time. In addition, results showed that the higher the numeracy, quicker is the switch to the more valuable offer. Similarly, for the trait EI, people with higher trait EI skills were less willing to commit their time, and they switched to the second store when the discount is worth the time needed for driving. With regards to the money perception, results showed that people experiencing a stronger feeling of economic inadequacy, no matter what they have to commit, were more prone to change store, probably to reduce the stress related with the scarcity mindset.

In a broader perspective those results are particularly important because they extend previous works showing that people think about time and money in profoundly different ways (Mogilner, 2010; Zauberman & Lynch, 2005), highlighting the relevance of the scarcity mindset and the predominance of money over time. As a consequence, people who commit more time in exchange of a relatively small benefit might end up having less time for other important activities or underestimate the financial cost of longer commutes. In both cases, this can lead to experience both subjective and objective scarcity in the future (Haushofer & Fehr, 2014). Importantly, recent studies showed that people who

prioritize time over money reported experiencing greater happiness (Whillans, Weidman, & Dunn, 2016), thus it is particularly important to understand more deeply why time is underestimated compared to money. More knowledge about this trade-off could be a useful tool to reduce the perception of scarcity and increase, also, subjective wellbeing.

With this regard, in this chapter, I only considered the scarcity of money, but real life is articulated also by a limited amount of time (i.e., tight deadlines, time constraints). So, what could happen if the missing resource is time? In Chapter 3 I directly compared the perceived scarcity of time and of money and examined whether people prefer to spend time to gain money, or money to gain time. This question is particularly interesting because it allows to investigate whether the mindset of scarcity (Mani et al., 2013; Mullainathan & Shafir, 2013, 2014) is common to different resources, money and time, or if instead it is the weight of the resources to be prioritized in decision making between resources itself.

<center>**Chapter 3**</center>

<center>**Money and Time Scarcity impact on the tradeoff between these two resources**</center>

3.1. Introduction

So far, I mostly described the effect of the perceived economic scarcity but as suggested by the previous chapter, real life is also, inevitably led and regulated by other resources, as for example time. People go through concerns regarding not having enough money for their expense, or to have more expenses than available funds, as much as they experience the negative feeling of not having enough time, an incredibly crowded agenda, or too many commitments. What is common in these life's events is the existence of an unfavorable discrepancy in resource levels (Cannon et al., 2019): The discrepancy between the actual level of a resource and a more desirable benchmark could elicit the perception of scarcity (Mullainathan & Shafir, 2013). Although there are clear differences between time and money, people who do not have enough money and those with limited availability of time both showcase the same "irrational" behaviors, such as becoming more prone to commit money (time) that they do not have. This creates a vicious loop where poor (busy) people increasingly fall behind their commitments (Haushofer & Fehr, 2014). Specifically, Mullainathan and Shafir (2013) found that people experiencing a scarcity of money tend to manage that resource inefficiently, and thus fall into a loop where scarcity reinforces itself, due to the fact that scarcity poses a burden on people's mind. Furthermore, people in economic or time restrictions, both experienced a reduction of healthy choice and behavior (e.g., food quality, sport activity; Venn & Strazdins, 2017). Given the observed similarities between money and time scarcity and their interdependence in people daily life, it is particularly interesting that prior works have always investigated them separately, without considering the potential interactive effects

between these types of resources scarcity. For instance, both money and time scarcity impair cognitive functions, as people in conditions of economic restrictions experience impaired deliberative processes due to their budget-related preoccupations (Mani et al., 2013), and people in conditions of time restrictions tend to resort to heuristic, and thus less deliberative, thinking (Saini & Monga, 2004). Specifically, considering that temporal expenditures are harder to account for compared to monetary one and imply a qualitatively different form of decision making, the authors suggested that heuristics were used more for time evaluations (Saini & Monga, 2004).

The goal of this chapter was to investigate how people tradeoff between time and money when one of the resources was perceived as scarce. For instance, do people experiencing time scarcity value their time differently from those who experience money scarcity or no scarcity at all? Are they more likely to perceive their time as a valuable resource that needs to be preserved? Through four different studies, I investigated how experiencing a perceived scarcity of money or a perceived scarcity of time impacts tradeoffs between those two resources, money and time. In particular, in Study 3, I investigated whether people experiencing a perceived scarcity of money or of time value both resources differently. The aim of Study 4 was to expand the results of the previous study, introducing a different manipulation for the scarcity, handling both the perception of scarcity and the type of resources that was scarce. In Study 5, I investigated whether the effect of scarcity affects reaction times in a task of words recognition. Finally, in Study 6, I investigated wheatear people experiencing a scarcity mindset differently equalize money and time.

The research protocol for all four studies described in this chapter was approved by the Human Research Ethics Committee Office of Research at Concordia University (Montréal, Canada; Protocol 30009519).

3.2. Study 3

Money and Time Scarcity:

The tradeoff between resources

In Study 3, I investigated at which level participants in perceived money or perceived time scarcity prefer to spend money to gain time, or whether they would rather prefer to spend time to earn money. To do this I used four hypothetical scenarios in which participants were asked to indicate their preference between spending money to earn time or spending time in order to gain money (see Appendix 2 for more details). Considering the effect of the scarcity mindset on attentional resources (Mani et al., 2013) and the negative downstream consequences (Vohs, 2013), and moreover, considering the results of the previous chapter, I hypothesized that overall, people should be more prone to underestimate the value of time than that of money, if they are not experiencing a scarcity of time. This means that even if in general people perceived money as a predominant resource over time, when the mindset of the scarcity is activated, people should preserve the resource perceived as missing. Therefore, participants exposed to the condition of perceived time scarcity should be less likely to sacrifice their time to increase their economic resources. In addition, I hypothesized that trait emotional intelligence, namely the way people manage and control emotions, should moderate the way participants cope with the discomfort induced by a condition of scarcity (Sevdalis et al., 2007; Mikolajczak et al., 2008; Pittarello et al., 2018) allowing them to make the best evaluation of the resources that are available.

Specifically, I hypothesized that:

1) Even if in general people should underestimate the value of time, those experiencing a perceived scarcity of time should be less prone to commit their time to get more money.

2) Participants with high (vs. low) trait EI should be more likely to cope with stressful situations and use more adequate emotion regulation strategies. In particular, I hypothesized that they should be more able to recognize the most evaluable resource, money, and preserve it.

3.2.1. Method

3.2.1.1. Subjects

Seven hundred ninety participants (49.87% female, $M_{age} = 44$ years, ranging from 19 to 88 years) took part in Study 3. Participants were contacted via Amazon Mechanical Turk (Buhrmester et al., 2011; Paolacci et al., 2010) and paid $1 in exchange for their participation. All participants were from the United States. Fifty-six participants were excluded from the analysis because of their inaccuracy both in the manipulation task and in the task, thus the analyses were running with a final sample of seven hundred thirty-three participants (50.1% female, $M_{age} = 37$ years, ranging from 19 to 88 years).

3.2.1.2. Procedure

Participants were randomly assigned to one of three experimental conditions where exposure to reminders of resource scarcity (money or time vs. a control condition) was manipulated between-subjects. Participants completed the same episodic recall task that was used in the previous chapter (adapted from Fischhoff et al., 2003 and Roux et al., 2015). To achieve the goal of the study to investigate both the effects of experiencing perceived money scarcity and perceive time scarcity, I adapted the episodic recall task to

manipulate the scarcity of time (see Appendix 1). Specifically, participants were asked to list four episodes in which they felt like they "didn't have enough time" or "time was scarce". Subsequently, as for the other two conditions, they were asked to describe more in detail two of the episodes they mentioned.

Participants were then presented with two scenarios (spend money to earn time vs. spend time to gain money), each one with two vignettes (adapted from Becker et al., 1964), that elicit tradeoffs between money and time. Participants were randomly presented with a vignette for each scenario. In the first scenario, participants were invited to indicate their preference between investing their money to save time or accept a default choice (see Appendix 2 for more details). For example, in one of these vignettes, participants could decide whether to skip a line paying a fee or just wait the expected time. In general, in this scenario, the time that can be skipped and the corresponding fee to be paid increase progressively across nine choice options. Conversely, in the other scenario, vignettes were asking to express the preference between using the time to earn money or the default option. This scenario provided the possibility to choose between the default behavior (e.g. take the plane on time and arrive on schedule) or use one's own time (e.g. from 30 minutes to 5 hours) to get a voucher (e.g. from $50 to $500), as a compensation for the time that was sacrificed.

After answering the scenarios, participants were asked to complete the inadequacy and retention subscales from the Money Perception scale (Wiepking & Breeze, 2012), as in the previous studies. As seen so far, inadequacy refers to people who worry about their financial condition most of the time. Whereas, people with a high score in retention have a careful approach to wealth and a preference not to spend money on anything and have difficulties in making decisions about spending money (Furnham & Argyle, 1998; Wiepking & Breeze, 2012). In this study as well, the factorial analysis confirmed two

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factors for the Money Perception scale and good reliability for both the subscales: inadequacy (α = .79) and retention (α = .90). In this study, I considered these subscales as covariates, to test the robustness of the manipulation. Moreover, to measure the perception of time scarcity, I modified the two subscales of the Money Perception scale to measure people's perception of the time resource. For example, the item "I worry about my finances most of the time" was changed into "I worry about my available time most of the time". This led to the creation of a Time Perception scale (see Appendix 3 for more details), a 7-item scale where participants' answers were provided on a 7-point scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). I conducted a factor analysis using a Varimax rotation to assess whether the same two subscales (time-inadequacy and time-retention) were present for the time resource as well. Consistent with the expected factorial structure of the Money Perception scale (Wiepking & Breeze, 2012), this analysis revealed two factors (based on eigenvalues > 1), both showing satisfactory levels of reliability: time-inadequacy (α = .81) and time-retention (α = .88). Specifically, time-inadequacy refers to people who are constantly worried about their time and believe that other people have more available time than them. Instead, a high rate in time-retention refers to people preference for saving time, showing that they are fearful of lacking time in the future and have difficulties in making decisions about how to best use their time.

After that, participants completed the Trait Emotional Intelligence Questionnaire short form (TEIQue-SF, Petrides & Furnham, 2001), to assess a measure of global trait EI. The measure showed good reliability (α = .84). Finally, in the last part of the survey, participants were asked to answer some demographic questions before to be debriefed.

3.2.2. Results

Since Money and Time Perception and trait EI, were tested at the end of the study, I checked whether the scarcity manipulation impacted the scores in all the three conditions. An analysis of variance showed that the perception of money-retention was not influenced by the scarcity manipulation (F (2,730) = .45, p = .64) and a Tukey multiple comparison showed no significant comparison (p = .61 or higher). Differently, analysis of variance for the effect of the three conditions on the money-inadequacy showed a significant result (F (2,730) = 4.58, p = .01). Tukey multiple comparison showed an effect of the condition on the perception of money-inadequacy only in the comparison comparing money scarcity and control (p = .01). Other comparisons were not significant (p = .06 or higher). I then replicated these two analyses of variance for time-retention and time-inadequacy. Considering the time-retention, the analysis of variance showed a significant effect of the condition (F (2,730) = 5.96, p < .001). A Tukey multiple comparison indicated an effect of the condition in the comparison between time scarcity and control (p < .001) and between time scarcity and money scarcity (p < .05). The comparison between money scarcity and control condition was not significant (p = .89). Moreover, also the analysis of variance considering the effect of the scarcity manipulation on time-inadequacy showed a significant result (F (2,730) = 8.28, p < .001). Tukey multiple comparison showed an effect on the perception of time-inadequacy in the comparison between time scarcity and control (p < .001) and between time scarcity and money scarcity (p < .001). The comparison between money scarcity and control was not significant (p = .99).

Finally, an analysis of variance showed that the trait EI was not influenced by the scarcity manipulation (F (2,730) = .65, p = .52). Tukey multiple comparison showed no significant comparison (p = .54 or higher).

In all the following models, the condition (scarcity vs. control) was considered as categorical predictor, while trait EI was tested as continuous predictor. Money Perception's subscales and Time Perception's subscales were considered as covariates. In addition, I considered the choice repetition, namely the set of proposed options, as continuous predictor. Finally, the choice, the reported preference between money and time, was the dependent variable (dichotomic variable).

A first generalized linear mixed effect model was estimated including condition (money scarcity vs. time scarcity vs. control), choice repetition, and type of scenario as predictors and the choice as dependent variable. Moreover, in the same model, I also tested all the two-way interactions and the three-way interaction between the three variables of interest. The model controlled for participants' random effect. Results revealed a main effect of the type of scenario ($\chi^2 = 245.85$, $p < .001$), a main effect of choice repetition ($\chi^2 = 246.61$, $p < .001$), as well as the three-way interaction between condition, choice repetition and type of scenario ($\chi^2 = 5.63$, $p < .05$; see Figure 8).
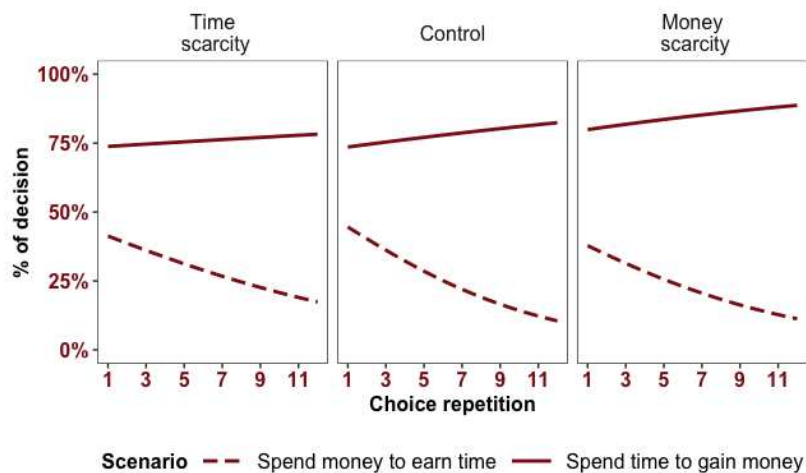

Figure 8. Three-way interaction between condition, choice repetition and type of scenario.

To interpret the three-way interaction, I conducted a slope analysis finding that participants were less willing to spend money to save time as the amount of money

required increased (that is, across choice repetition: $\beta_{Time} = -.11$, $\beta_{Control} = -.18$, $\beta_{Money} = -.14$, $ps < .001$). On the contrary, when participants could earn money they were increasingly more prone to commit their time ($\beta_{Control} = .05$, $\beta_{Money} = .06$, $ps < .001$). Importantly, in the time scarcity condition, even if participants were still prone to commit their time, the effect of choice repetition was not significant ($\beta_{Time} = .06$, $p = .13$). This result suggests that the perception of scarcity activates a common mindset in both the money and time scarcity conditions, but that money was still perceived as prominent compared to time and people were increasingly less willing to invest it as the amount increased. In addition, results suggested that a money scarcity mindset impacted more the willingness to accept to spend time to gain money than the time scarcity mindset, but the two mindsets impacted the willingness to pay money to earn time in a similar way. A possible interpretation is that the scenario asking to spend time to gain money was perceived as more flexible, while the scenario asking for spending money to earn time was considered as more stable, due to a more valuable loss aversion.

Finally, to test the robustness of the interaction between condition, scenario, and choice repetition I estimated a second generalized linear mixed effect model introducing as covariate the main effect of the four factors resulting from the Money and Time Perception scales (see Table 4 for more details). Adding these subscales, did not increase the variance explained by the model (Variance $_{Mod.1}$ = 1.66; Variance $_{Mod.2}$ = 1.63) and the three-way interaction was still significant ($\chi^2_{Mod.1} = 5.63$, $p_{Mod.1} < .05$ vs. $\chi^2_{Mod.2} = 6.13$, $p_{Mod.2} < .05$), confirming the strength of the interaction.

	Model 1			Model 2		
	β	SE	p	β	SE	p
Condition	-.04	.09	.65	-.03	.09	.75
Scenario	1.30	.08	< .001	1.30	.08	< .001
Choice repetition	-.14	.01	< .001	-.14	.01	< .001
Condition*Scenario	.19	.10	.06	.19	.10	.07
Condition*Choice repetition	-.02	.01	.11	-.02	.10	.10
Scenario*Choice repetition	.19	.01	< .001	.19	.01	< .001
Condition*Scenario*Choice repetition	.04	.02	.017	.04	.02	.014
Money - Inadequacy	-	-	-	-.00	.04	.90
Money - Retention	-	-	-	.06	.04	.11
Time - Inadequacy	-	-	-	.11	.04	.005
Time - Retention	-	-	-	-.08	.04	.06

Table 4. Comparison between Model 1 and Model 2.

3.2.2.1. Trait Emotional Intelligence

To investigate the effect of the trait EI on the tradeoff between the two resources, I performed a generalized linear mixed effect model including condition (money scarcity vs. time scarcity vs. control), scenario, as well as trait EI as predictors and people's choices as the dependent variable. Moreover, I tested the three-way interaction between scenario, condition, and trait EI. The model controlled for participants random effect. Results indicated a main effect of the scenario ($\chi^2 = 12.21$, $p < .001$), and a significant effect for the three-way interaction between condition, scenario and trait EI ($\chi^2 = 22.29$, $p < .001$). A slope analysis showed that in the money scarcity condition, people with

higher (vs. lower) trait EI, who are more able to regulate emotions, made more effective tradeoffs (βmoney = .46, p = .00; see Figure 9), being more likely to commit their time to gain money. No significant interaction between trait EI and scenario emerged in the control and time scarcity conditions.
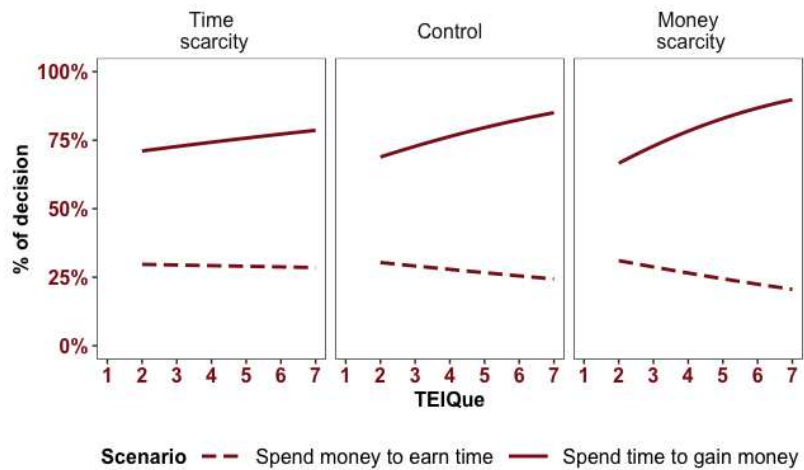
Figure 9. Three-way interaction between condition, scenario and trait EI.

3.2.3. Discussion

Study 3 confirmed the results from the previous two studies showing that, overall, people underestimate the value of time as a resource. Specifically, the results of this study showed that people were less likely to spend money to save time but increasingly more willing to commit their time when they could earn money. Importantly, confirming the first hypothesis, these results also highlighted that, despite participants' willingness to commit their time when experiencing a scarcity of time, they were increasingly less willing to commit it as the amount of time required increased. This finding suggests that even if the effect of scarcity has a different weight for different resources, there is a similar mindset that makes people less likely to commit the missing resource to earn another one, exactly as happened with the scarcity of money. Still, these results also suggest that different types of resources triggered a different intensity of reaction because results

showed that the trend was stronger for the perception of money scarcity than for that of time scarcity.

In addition, as hypothesized, participants with higher (vs. lower) trait EI were more able to make a more effective tradeoff but only when money was perceived as scarce. Indeed, the trait EI by scenario by condition interaction revealed that participants with higher trait EI showed a quite consistent behavior and a higher tendency to focus on the missing resource. This reaction could be explained by the focus dividend, the positive situation in which someone is so acutely focused on a single pursuit (Mullainathan & Shafir, 2013; Meuris & Leana, 2015), which, however, did not result in the tunnel effect, the negative consequences of being too focus of something (Mani et al., 2013; Mullainathan & Shafir, 2013; 2014). One of the reasons why results did not show the same effect in the time scarcity condition, is probably to be found in the intrinsic nature of time as a resource, more ambiguous and difficult to evaluate than money (Soster et al., 2010), which makes it more complicated to consider as a resource.

Considering these results and the fact that people, despite being exposed to a common mindset, weigh time and money differently, in Study 4, I decided to use a two by two manipulation to consider the interaction between the scarcity and type of resources.

Study 4

Money and Time Scarcity:

Another look at it

The aim of Study 4 was to replicate results of Study 3, investigate wheatear participants prefer to spend money to earn time, or where they would rather spend time to gain money, introducing a different experimental design. Specifically, in this study I used a different manipulation for the scarcity that allowed to manipulate the perception of scarcity and the specific missing resources in a 2 x 2 experimental design. I hypothesized that people should be more inclined to commit their time if they are not experiencing a condition of time scarcity. Moreover, I hypothesized that a higher ability to manage and control emotions should allow people to better evaluate the available resource. Specifically, I tested the same hypotheses of Study 3, but with a different manipulation and a different experimental design.

3.3.1. Method

3.3.1.1. Subjects

One-hundred and seventy-eight undergraduates from Concordia University (55.61% female, M_{age} = 24 years, ranging from 18 to 37) took part in the study in exchange of course credits. Participants were randomly assigned and equally distributed across the four conditions. No participants were excluded from the analysis.

3.3.1.2. Procedure

The perception of scarcity (vs. not) and the type of resource were manipulated using a deprivation task (adapted from Haisley, Mostafa & Loewenstein, 2008; see Appendix 4 for more details). Specifically, participants in the money scarcity condition were asked to indicate trough a slider how much money they get every week on a scale from CAD 0 to CAD 2,000 (vs. CAD 100 in the no money constraint condition). Similarly, those in the time scarcity condition were asked to indicate trough a slider how much leisure time they have available on a scale from 0 hours to 100 hours (vs. 10 hours in the no time constraint condition). Based on previous work that used this manipulation, participants with a wider slider should experience a higher perception of scarcity.

Right after the manipulation, participants were presented with two of the scenarios previously used in Study 3 (adapted from Becker et al., 1964; see Appendix 2 for more details), and considered as more adequate for Canadian undergraduates' life. Participants were presented with both scenarios in a counterbalanced order: In the first scenario, they were invited to indicate their preference between spending money to save time or accept a default option; in the second scenario, participants were asked to express the preference between using time to earn money or the default option. Subsequently, participants were asked to complete the trait EI (Petrides & Furnham, 2001). The measure showed good reliability ($\alpha = .87$). Finally, before being debriefed, participants were asked to answer to some demographic questions.

3.3.2. Results

Since emotional intelligence was tested at the end of the study, I checked whether the manipulation had an impact on the scores across the conditions. An analysis of variance showed that the trait EI was not influenced by the scarcity manipulation (F

(1,277) = 2.89, p = .09), neither by the type of resources that was manipulated (F (1,277) = 3.05, p = .08). Moreover, in both the case thr Tukey multiple comparison showed no significant comparison (p = .08 or higher). Thus, in the following models, condition (scarcity vs. no constraint) and the type of resource (money or time) were considered as categorical predictors, while trait emotional intelligence was tested as continuous predictor. In addition, choice repetition, namely the set of proposed options, was considered as continuous predictor. The choice, the reported preference between money and time, was considered as dependent variable (dichotomic variable).

I conducted a generalized linear mixed effect including condition (scarcity vs. no constraint), type of resource (money vs. time) and scenario as predictors and choice as the dependent variable. In the same model I also tested all two-way interactions, and the three-way interaction between condition, type of resource, and scenario. The model controlled for participants' random effect. Results revealed a main effect of type of scenario (χ^2 = 4.60, p < .05) and a significant interaction between scenario and condition (χ^2 = 4.65, p < .05). Results also showed a nearly significant interaction between condition and type of resources (χ^2 = 3.15, p = .07) and a significant three-way interaction (χ^2 = 7.81, p < .01). Figure 10 and the relative slope analysis reveal that when participants experienced a condition of scarcity (β_{money} = -.41, SE = .19, p = .03; β_{time} = -.39. SE = .19, p = .04) they were generally more prone to commit their time in order to gain money, no matter the type of resource that was missing. Remarkably, this behavior was also found in the money no constraint condition when participants were invited to assess money disposability, and participants were more prone to commit their time to gain money (β_{money} = -1, SE = .02, p = .00). Conversely, in the time no constraint condition, results did not show significant differences between the two scenarios, suggesting that in this case, participants were less willing to commit their time, indicating that they did not

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underestimate its value (β_{time} = .10, SE = .19, p = .62). Results of Study 4 confirmed that the scarcity manipulation activates a common mindset, although the two resources, money and time, were weighed differently by people.
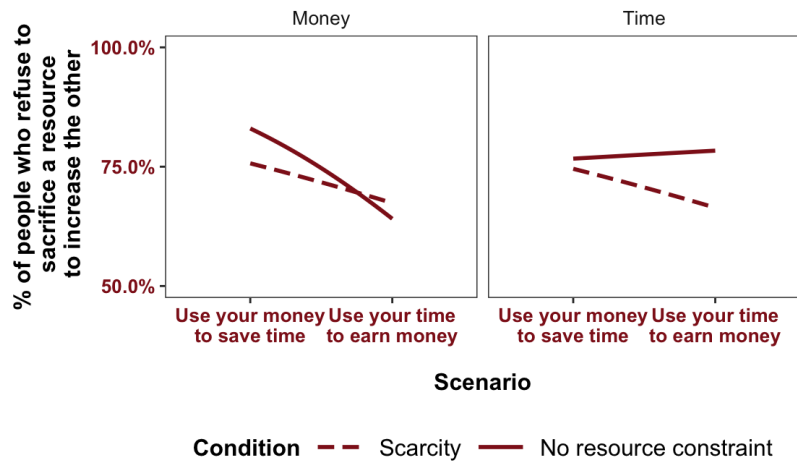
Figure 10. Three-way interaction between condition, scenario and type of resource.

Moreover, to test the effect of choice repetition on decision, I tested a generalized linear mixed effect model including condition (scarcity vs. no constraint), type of resource (money vs. time), choice repetition itself, as predictors, and choice as the dependent variable. In the same model was also tested the three-way interaction between condition, type of resource, and choice repetition. The model controlled for participants' random effect. Results only revealed a main effect of choice repetition (χ^2 = 6.22, p < .05), and a two-way interaction between the type of resource that was manipulated and the choice repetition (χ^2 = 4.10, p < .05), confirming that people were progressively more prone to use time to gain money as the amount of money they could earn increased, and less willing to spend money as the amount required to gain time increased.

3.3.2.1. Trait Emotional intelligence

To investigate the effect of trait EI on the tradeoff between the two resources, I ran a generalized linear mixed effect model considering type of resource, scenario, and trait EI

as predictors and participants' choices as the dependent variable. Moreover, I tested all two-way interaction and the three-way interaction between the scenario, the type of resource, and trait EI. The model controlled for participants random effect. Results showed a main effect of the type of resource that was manipulated ($\chi^2 = 4.99$, $p < .05$), and an interaction between the type of resources and respectively trait EI ($\chi^2 = 6.54$, $p < .05$) and the scenario ($\chi^2 = 6.26$, $p < .05$). Moreover, results showed a significant three-way interaction ($\chi^2 = 8.91$, $p < .01$; see Figure 11).
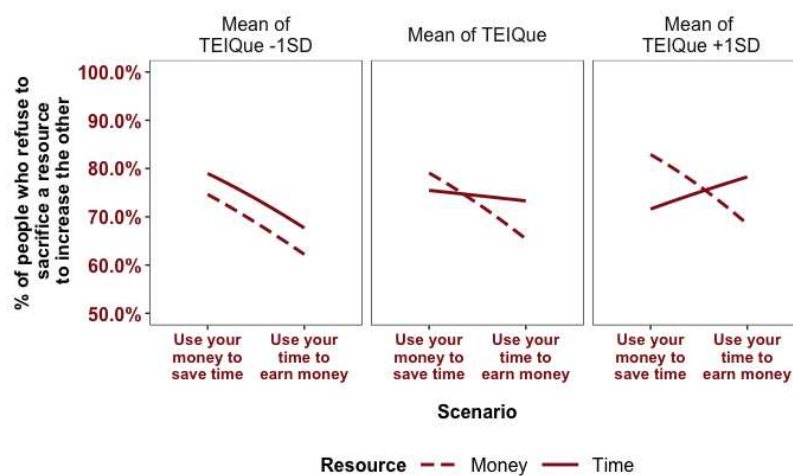
Figure 11. Three-way interaction between scenario, type of resource and trait EI.

To probe this interaction, I performed a slope analysis showing that decreasing trait EI scores led to an increasing tendency to undervalue time as a resource ($\beta_{money} = -.57$, $SE = .20$, $p = .00$; $\beta_{time} = -.58$. $SE = .19$, $p = .00$). Instead, as trait EI increased participants were progressively less willing to give up their time to gain money, even when they were primed with money as the scarce resource ($\beta_{money} = -.81$, $SE = .19$, $p = .00$). On the contrary, no effect was found when they were asked to consider their time availability ($\beta_{time} = .35$. $SE = .20$, $p = .08$), thus participants with higher trait EI, when primed to consider time as a scarce resource were less likely to underestimate it. These results suggest that when people have a higher ability to manage emotion, they are more able to

recognize time as a resource and do not commit it only when it is instrumental to gain money.

Finally, to study the impact of the trait EI in regulating how much participants were willing to commit resources, I performed a generalized linear mixed effects model in which condition (scarcity vs. no resource constraint), choice repetition, and trait EI were included as predictors. Furthermore, I tested the two-way interaction between the predictors and the three-way interaction between condition, choice repetition, and trait EI. People's choices were the dependent variable and the model controlled for the participants' random effect. Results showed a nearly significant main effect of the condition ($\chi^2 = 3.60$, $p = .057$), a main effect of choice repetition ($\chi^2 = 8.09$, $p < .01$), and a main effect of trait EI ($\chi^2 = 6.37$, $p < .05$). Results also showed an interaction between condition and choice repetition ($\chi^2 = 6.36$, $p < .05$), and between choice repetition and trait EI ($\chi^2 = 9.89$, $p < .01$). Moreover, results showed a significant interaction between condition, choice repetition and trait EI ($\chi^2 = 8.91$, $p < .01$; see Figure 12).
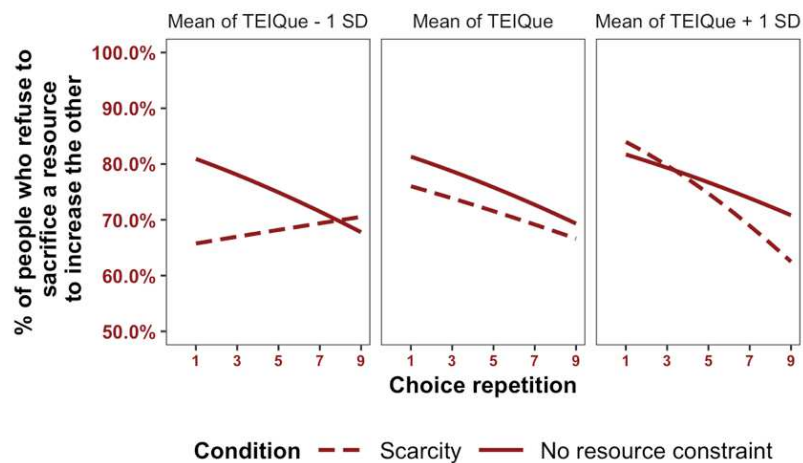

Figure 12. Three-way interaction between condition, choice repetition and trait EI.

A slope analysis showed that those in the scarcity condition and with high trait EI were initially less prone to commit a resource (money or time) in order to gain the other (respectively, time or money), but then became progressively more willing to do so when

the amount of the resource to be sacrificed increased. This effect could be related to the fact that participants with higher (vs. lower) ability to manage and regulate emotion, regulated the stress induced by the condition of scarcity and were more able to estimate the tradeoff between the two resources.

3.3.3. Discussion

Study 4 confirmed previous results showing that in general people have the tendency to undervalue time as resource, in particular when they are exposed to the concept of money. Interestingly, as showed by Figure 10, participants experiencing a condition of scarcity behave similarly, suggesting that the perception of "not having enough" (Mullainathan & Shafir, 2013) activate a similar mindset. Considering my first hypothesis, I was expecting that participants in a condition of time scarcity should have committed less of their time that what they did, but perhaps the manipulation wasn't effective enough to activate the specific shortage of time, and only activated a more general perception of lack. Otherwise, it is possible that the ambiguous nature of time makes it difficult to assess. It is also possible that the concept of time includes a plurality of broader meanings that go beyond a single definition of this resource.

Moreover, as hypothesized, results highlight the fact that people with a higher ability to recognize and process emotions were more able to recognize time as a resource and were less willing to commit it to gain money. In fact, the interaction between trait EI, type of resource and scenario, showed that as trait EI increased participants were progressively less willing to give up their time to gain money, even when they were primed with money as the scarce resource.

Finally, considering the impact of trait EI in regulating how much participants in scarcity were willing to commit a resource, results indicated that participants with lower

ability to regulate emotions were in general more prone to commit one resource for the other, and progressively less prone, trough the nine dichotomic choices, to commit a resource to obtain the other. On the contrary, those with higher trait EI were initially less willing to sacrifice a resource for the other, but as the resources they can gain increased they tended to be more conducive to sacrifice the other. This behavior is similar to those in the no constraint condition and suggest that as long as the quantity of the resources to commit is estimate as affordable compared to what they can earn, those with high trait EI were more willing to sacrifice time for money and vice versa. One possible explanation is that due to emotion regulation they could adjust the negative emotions related to the perception of scarcity (Santiago et al., 2011; Haushofer & Fehr, 2014; Iemmi et al., 2016) and overcome this condition, trying to get the biggest gain.

3.4. Study 5

The effect of Money and Time Scarcity on

reaction times in a word recognition task

One of the limits of the previous studies is that the choices were all context related, thus, in Study 5, I decided to study whether people with different types of resource scarcity have different responsiveness to cues related to money and time concepts. Considering that scarcity keeps one's focus on the resource that is perceived as scarce (Mischel et al., 1972; Mullainathan & Shafir, 2013), and that goal inhibition makes possible to focus on immediate goals allowing to manage present concerns (Mani et al., 2013; Mullainathan & Shafir, 2013; 2014), I hypothesized that people on a scarcity condition should be particularly responsive at recognizing stimuli that are conceptually closer to the resource that they perceive as missing. For example, someone in a condition of perceived monetary scarcity should quickly recognize concepts such as debt or cash, that clearly evoke the idea of money, compared to neutral words. Consistent, in a recent study, participants were asked to take part in an experiment around lunchtime (Radel & Clement-Guillotin, 2012). Only half of the participants had the chance to have lunch, whereas the other had nothing to eat for at least three to four hours: thus, half of the participants were sated, and half were hungry. They were then invited to watch a screen and recognize the words that were presented on it. Consistent with scarcity and goal inhibition, the hungry participants were quicker at recognizing food-related words than other categories of words. These results indicate that when a concept occupies people's thoughts, they are quicker at recognizing words related to it than when the same concept is not primed in their minds: So, when the hungry participants recognize food related words quicker than sated participants, results suggest that the concept of food was at the

top of their mind. This phenomenon is not specific to hunger, in fact, Aarts and colleagues (2001) demonstrated that when people have a special need, such as thirst, they are quicker to recognize words related to it, for example, "water" (Aarts, Dijksterhuis, & Vries, 2001). Scarcity captures attention whether the mind's owner wishes it or not. Thus, considering the literature just described and the results of the previous studies indicating that people undervalue the importance of time, in this study I decided to investigate the semantic activation of the two concepts under conditions of scarcity.

In particular, I hypothesized that:

3) Participants in the money scarcity condition should be faster at recognizing money related words, while participants in time scarcity condition should quickly recognize both time- and money-related words.

4) The ability to manage emotions should moderate how quickly participants recognize money- or time-related words.

3.4.1. Pretest

One hundred-ten undergraduates from Concordia University (50.9% female, M_{age} = 22 years old, ranging from 18 to 38) took part in a pretest in exchange of course credit. Participants were presented with a list of words related to the concept of money and time. First, they were asked about how familiar they were with each word. They answered on a 7-point scale, ranging from "not at all familiar" to "extremely familiar". Subsequently, participants were asked to indicate to what extent the presented word made them think about the concept of time or money. They answered using a 7-point scale ranging from "not at all" to "completely". Subsequently, I selected 10 words for each category, based on the level of familiarity and the association with the concepts of time and money. Specifically, the words related to the concept of time were the following: minute, late,

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deadline, waiting, hour, schedule, day, punctual, night, expired. The following words were selected for the concept of time, instead: cash, salary, expense, price, savings, rent, wallet, bank, pay, deposit. Neutral words were adapted from a previous experiment (Roux et al., 2015), and were the following: beige, typical, grey, tan, neutral, plain, water, goldfish, tree, comma. Length of the words was controlled for and was approximatively balanced in all the categories ($M_{time} = 5.9$; $M_{money} = 5.3$; $M_{neutral} = 5.3$).

3.4.2. Method

3.4.2.1. Subjects

In Study 5, I tested a sample of one hundred twenty-three undergraduates from Concordia University (48.3% female, $M_{age} = 21$ years, ranging from 19 to 32) who took part in the experiment in exchange of course credit. Participants that took part in Study 3 and in the pretest of Study 5 could not participate in Study 5.

3.4.2.2. Procedure

In this study part of the procedure was run on Qualtrics while the reaction times task was implemented on Inquisit Lab 4 (Millisecond, I. 2015). Inquisit Lab is a dedicated software that allows to design and administer psychological tests and experiments and gave me the chance to accurately measure the reaction times. On Qualtrics, I manipulated the perception of money and time scarcity using the same recall task as in Study 3 (see Appendix 1 for more details). Participants were asked to think about episodes of their life when they did not have enough money or time to satisfy their needs. As in Study 3, in the control condition participants were invited to think about and talk more in detail about something that they did in the previous week.

Right after the scarcity manipulation, participants were moved to Inquisit Lab 4 to assess the reaction times task. All participants ran the test using computers with identical characteristics: desktop resolution = 1680x1050, refresh rate = 59Hz, bit depth = 8-bit, and color format = RGB. In the semantic activation task, participants were presented with a list of string of letters and they were asked to classify each stimulus as word or non-word. Specifically, between the words that were presented, ten were associated with the concept of time, ten were related to the concept of money and ten more were classified as neutral words. In addition, thirty strings of randomly created letters (non-words) were included in the list for the task. At the begging participants received the instruction on how to complete the task, and they were told that an asterisk would be presented at the center of the screen and that a string of letters will briefly appear after it. Participants received the instruction to press the "I" key for a valid word and "E" key for a non-word. Moreover, they were invited to classify the strings of letters as quickly and accurately as possible. The strings of letters were presented on the monitor for 700ms, and between each string there was an interval of 950ms. Participants had six practice trials during which they could practice and become familiar with the task, afterwards, before moving on with the experimental task, they were reminded again of the instructions.

After the semantic recognition task, participants were redirected to Qualtrics and invited to complete the trait EI scale (Petrides & Furnham, 2001). The measure showed good reliability (α = .87). Finally, before being debriefed, participants were asked a few demographic questions and to self-report their level of knowledge of English language using a 7-point scale ranging from "very basic" to "native or bilingual."

3.4.3. Results

In the analysis, I excluded data from the practice trials and I considered a latency range between 300ms and 2000ms. Moreover, considering that trait EI was measured at the end of the study, I verified whether the manipulation had an impact on the scores in the three conditions. An analysis of variance showed that the trait EI was not influenced by the scarcity manipulation (F (2,67) = 1.19, p = .31). Tukey multiple comparison showed no significant comparison (p = .29 or higher).

A generalized linear mixed effect model with distribution Gamma (link = log) was used to test all the following models (Lo & Andrews, 2015), by satisfying normality assumptions. In the following models, condition and word list were considered as categorical predictors, while the self-reported measure of English was considered as continuous predictor.

In the first model condition, word list and the interaction between condition and word list were considered as predictors while response latency was the dependent variable. The model controlled for participants' random effect and for the strings random effect. No significant effect was found neither for the main effect of condition (p = .22) or word list (p = .43), neither for their interaction (p = .13). Thus, since the results of this first model were unsatisfactory, I then ran a second model adding the self-reported level of English knowledge as a covariate. Results were again not significant (see Figure 13).

Regardless, considering that my initial hypothesis was to compare the reaction times for words belonging to the money and time word lists, I assessed an additional generalized linear mixed effect model with distribution Gamma (link = log) with only the lists of money- and time-related words, condition (money scarcity vs. time scarcity vs. control) and their interaction as predictors, and latency as the dependent variable. The model controlled for participants' and for the strings random effect. Results showed a main

effect of the word lists ($\chi^2 = 35, p < .001$), as well as an interaction between the condition and the word lists ($\chi^2 = 2107, p < .001$).
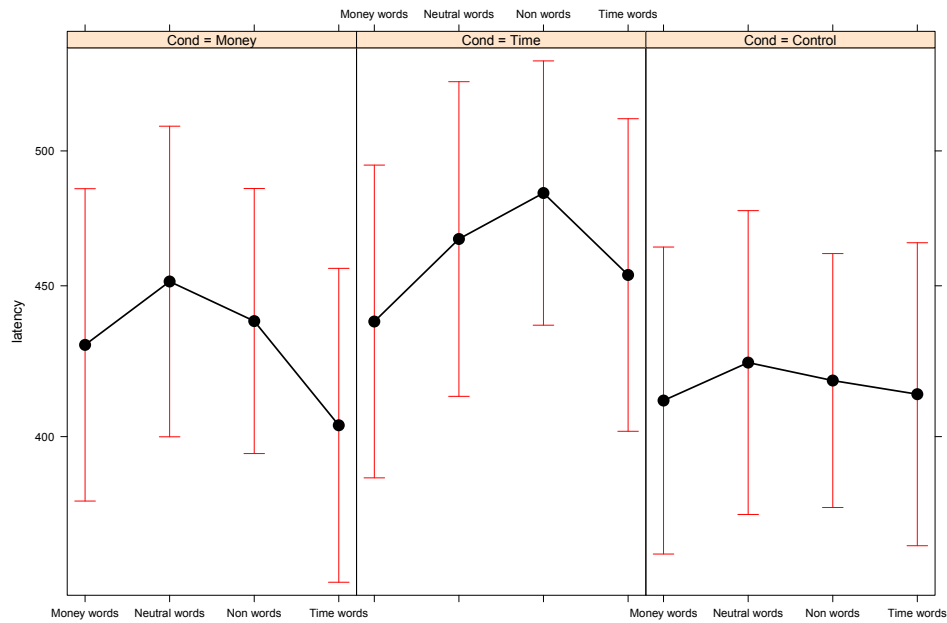
Figure 13. Plot of the model testing the interaction between word lists and condition and considering the self-reported level of English knowledge as a covariate.

Surprisingly, as showed in Figure 14, participants in the money scarcity condition were slower at recognizing money-related words compared to time-related words. While, those in the time scarcity condition were equally slower in recognizing both money- and time-related words. Participants in the control condition reported faster reaction times in the recognition of both word lists.
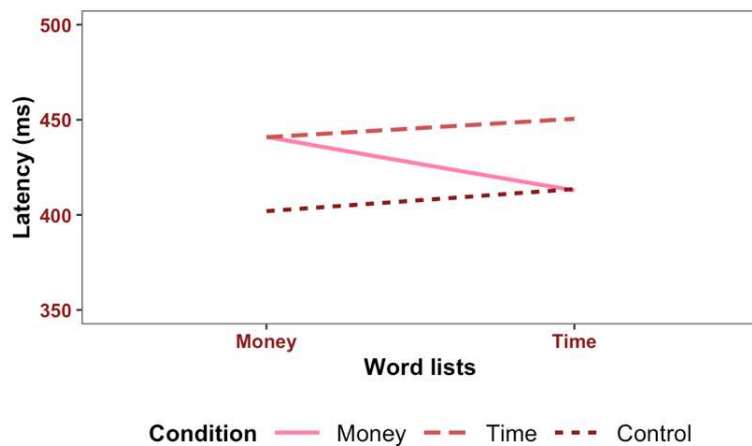
Figure 14. Interaction between condition and selected word lists.

Finally, to test the robustness of the model I added the self-reported measure of English knowledge as a covariate, finding a nearly significant interaction between the condition and the word lists ($\chi^2 = 5.09$, $p = .07$), indicating the role of the knowledge of English in the model.

3.4.3.1. Trait Emotional intelligence

To investigate the effect of the trait emotional intelligence (considered as continuous predictor) on response latency, I ran a generalized linear mixed effect model with distribution Gamma (link = log) with condition (money scarcity vs. time scarcity vs. control), word list, and trait EI as predictors and latency as the dependent variable. The model included all the two-way interactions and the three-way interaction among condition, word list, and trait EI. Moreover, I controlled for participants' and strings random effects. In contrast with the hypothesis, results showed a two-way interaction between the words list and trait EI ($\chi^2 = 12.49$, $p < .01$), suggesting that participants with higher (vs. lower) ability to manage emotions were generally faster in recognizing words in general. To test the robustness of the model, I added the self-report knowledge of English as a covariate, and this did not impact the interaction between word list and trait EI ($\chi^2 = 12.40$, $p < .01$; Variance $_{Mod.1} = .14$; Variance $_{Mod.2} = .14$).

Finally, regarding my hypothesis about the comparison between reaction times for words belonging to the money and time word lists, I ran the same model considering only the money and time word lists. I did not find any significant results. I then ran the same model adding the self-reported knowledge of English as a covariate finding main effects for condition ($\chi^2 = 8374$, $p < .001$), word lists ($\chi^2 = 8196$, $p < .001$), knowledge of English ($\chi^2 = 1626$, $p < .001$), and trait EI ($\chi^2 = 5677$, $p < .001$). Results showed a significant effect of the three-way interaction between condition, word list and trait EI ($\chi^2 = 457$, p

< .001) showing that participants with higher score in trait EI, were faster to recognize words related to the missing resources both in the time and in the money scarcity condition (see Figure 15). Interestingly, in the scarcity conditions, participants with higher ability to manage emotions, had slower reaction times for word lists belonging to the list supposed to be the most relevant: Specifically, in the money scarcity they took more time for money-related words, and, in the time scarcity condition, they took equally longer for time and money related words.
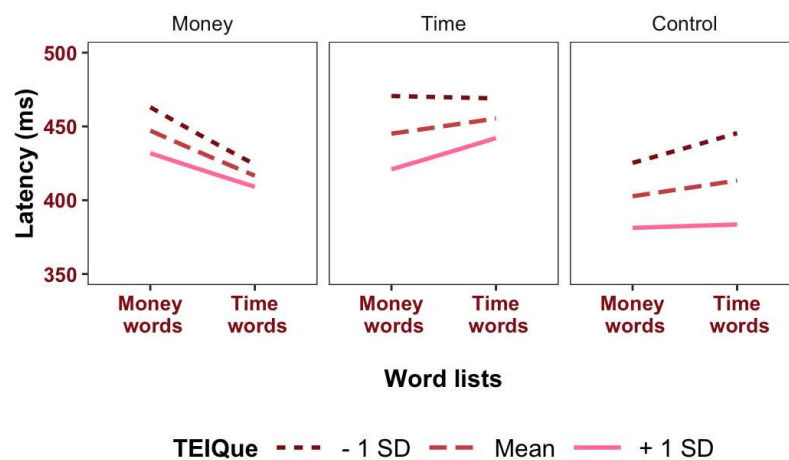
Figure 15. Three-way interaction between word lists, condition, and trait EI.

3.4.4. Discussion

In Study 5, I hypothesized that the scarcity mindset should impact the recognition of words related to the concept of money and time, in line with the literature (Radel & Clement-Guillotin, 2012; Aarts et al., 2001). Surprisingly, results for response latency showed a different trend compared to my hypotheses, showing that participants in the time scarcity condition did not have large differences in latency for money or time words. Instead, participants in the money scarcity condition were slower in recognizing words related to the concept of money, compared to time-related words and compared to the other conditions. Interestingly, my prediction about the reduction of the latency was incorrect, but it clearly emerges that the manipulation of time scarcity activates concepts

that go beyond just concepts related to time and results in aspects that include economic assessments, as demonstrated by the similarity of reaction time. Moreover, these results confirmed that the perception of scarcity activated a common mindset across the two different resources. Observing these data, it is interesting to note that in the money scarcity condition, response latency was longer compared to the control condition only for the words related to the concept of money. Unlike in the time scarcity condition, longer response latency emerges both for words related to the concept of time and for those related to the concept of money. These findings suggest that these two resources were similarly processed when people experienced a scarcity of time but not when they experienced a scarcity of money. A possible explanation for these results is that the scarcity's trap (Haushofer & Fher, 2014) activate negative and stressful thought that slow the reaction to the lacking resource. Moreover, in the two aforementioned studies (Radel & Clement-Guillotin, 2012; Aarts et al., 2001), participants were exposed to real hunger or real thirst and not to a manipulation of these feelings. This aspect could have probably made a difference: it is possible that hunger and thirst are kind of vital needs, whereas money and time scarcity may not be (especially considering that the scarcity mindset was manipulated and not objective). These aspects could have made a difference from previous results.

Consistent, in Study 5, a higher ability to manage emotions reduced the reaction times. In fact, with regard to the hypothesis about the ability to manage emotions, my prediction was confirmed, showing that in general higher trait EI reduces response latency in the word recognition task. This effect emerged both from the four word lists and for the word lists specifically related to the time and money categories. Despite similar results in different conditions, it would be interesting to learn more about the role of the trait EI in regulating the emotions arising from the perception of scarcity.

The greatest limitation of this study lies in the linguistic knowledge of the participants: In fact, the data collection was carried out in Montreal, an area of Canada where the official language is French and many participants (60%) were not native English speakers[2]. A solution to increase the robustness of the results would be to have a sample composed only of native speakers, so as to avoid this confounding factor.

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[2] Linguistic Profile of Concordia's Students 2018/19 https://www.concordia.ca/about/fast-facts.html#tab3

3.5. Study 6

Equalization between Money and Time as resources

Results from the previous studies suggested that the perception of scarcity activate a similar mindset regardless of the resource that is lacking. However, an important aspect that emerges from previous studies is that different resources, such as time and money, are weighed differently. In fact, previous studies showed that, under a condition of time scarcity, even if people were less and less willing to commit the lacking resource as its amount increased, they were still inclined to use their time in exchange for additional money. These results confirmed that people generally perceived money as predominant over time as resource, preferring to increase their money availability. Furthermore, these findings suggested that people attribute a different value and different importance to these resources.

Taking these aspects into account, in Study 6, I have chosen to investigate how people value time and money in comparable contexts. Specifically, I hypothesized that:

5) Participants in the scarcity condition, no matter the type of scarcity they are experiencing, should be more prone to undervalue time as resource and to attach a higher value to money.

3.5.1. Method

3.5.1.1. Subjects

Two hundred and thirty-nine undergraduate from Concordia University (61.93% female, M_{age} = 21 years, from 18 to 44) took part in the experiment in exchange of course

credit. Participants that participated in the previous studies were excluded from the subject pool.

3.5.1.2. Procedure

In Study 6, I used the same recall task used in Studies 3 and 5 to manipulate the perception of time and money scarcity and for the control condition (see Appendix 1 for more details). To assess the value that people attribute to money and time, I adapted the scenarios used in Study 4 (see Appendix 5 for more details). Specifically, participants were asked to estimate how long they would wait in order to obtain a fixed amount of money (as a gift certificate or voucher), or to indicate how much should the gift certificate (or voucher) be worth in dollars if they had to wait a fixed time to have it. Participants were randomly assigned to two of the scenarios, and the order of the presentation was counterbalanced between the scenario asking to evaluate waiting time and the scenario asking to evaluate the monetary reward. The counterbalanced scenarios gave the chance to indicate how much the gift card should to be worth for participants to accept to wait for a specific amount of time or how long they would be willing to wait in order to obtain an economic compensation. After they answered to both the scenarios, participants were asked to complete a few demographics questions. Finally, they were invited to report how much money they get per week (on a slider going from CAD 0 to CAD 2500) and their weekly amount of leisure time (on a slider going from 0 to 40 hours).

3.5.2. Results

To analyze the data, for both estimates (time and money), I firstly excluded answers that were beyond 3 standard deviation from the mean. Subsequently, I converted to minutes the time estimated expressed in hours. Further, considering that the four

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scenarios asked for answers that were either in a temporal or economic scale, I converted the answers into a comparable scale. Specifically, in the condition where participants provided an estimate of the economic reward, I used the following formula:

$$Estimated\ Amount = \frac{Time\ request\ to\ wait\ by\ the\ scenario}{Monetary\ esteem\ made\ by\ participants}$$

Instead, in the condition where participants provided an estimate of how long they would be willing to wait, I used the following formula:

$$Estimated\ Amount = \frac{Time\ esteem\ made\ by\ participants}{Monetary\ discount\ provided\ by\ the\ scenario}$$

I ran a first generalized linear mixed effect model including the condition (money scarcity vs. time scarcity vs. control) and the type of resource (money vs. time) as categorical predictors and participants' estimates converted in a common scale as the dependent variable. Results showed a main effect of the type of resource ($\chi^2 = 19.23$, $p <$ .001). Subsequently, I ran a second generalized linear mixed effect model adding the interaction between the condition and the type of resource. Results confirmed only a main effect of resource ($\chi^2 = 19.16$, $p < .001$), indicating that the two different rewards were generally estimated differently, no matter the condition in which participants were (see Figure 16). In particular, time was generally underestimated compared to money. To verify the robustness of this first model, I added as covariate the amount of leisure time and money available per week, both previously transformed in standard values. No effect of the covariates was found (respectively, $p = .38$ and $p = .99$), suggesting that the

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underestimation of time as resource is independent not only from the manipulation but also from individuals' availability of each resource.
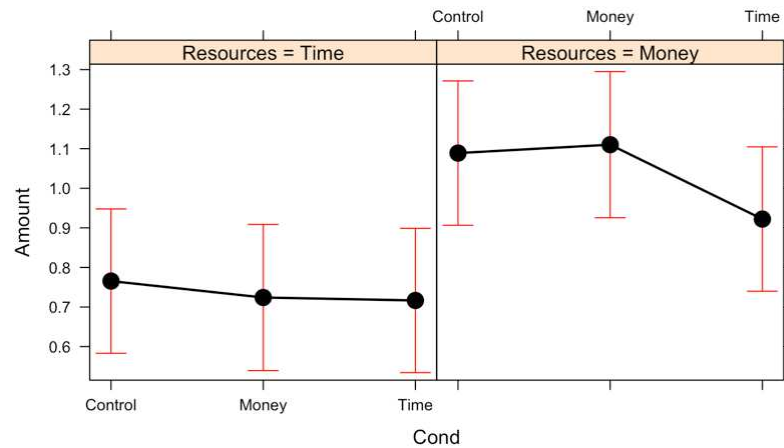
Figure 16. Time and money esteem per condition.

3.5.3. Discussion

Results of this last study showed that when people had to estimate the value of a reward, they usually estimated it as higher when the answer was in monetary format rather than time. Consistent with the results from the previous studies, people are overall considered money as prominent compared to time, no matter if they are experiencing a condition of scarcity or not. Although not statistically significant, at an exploratory stage, it is interesting to note the behavior of participants in the time scarcity conditions which, compared to participants in money scarcity or in control conditions, attribute a lower value to the economic reward. This result integrates the results of Study 3 where a general effect of the scarcity mindset emerged, but with a different intensity depending on the resource that is lacking.

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3.6. General discussion

The aim of this chapter was to investigate, through four different studies, how people tradeoff between time and money when the perception of scarcity impacts both these resources. In the first two studies, through two different manipulations of the scarcity, I investigated the impact of experiencing money and time scarcity on people decision to give up a resource to gain the other. In Study 5, to reduce the effect of the context decision, I studied how the perception of money and time scarcity impacts people reaction times in the recognition of words related to the concept of money and time. Finally, in the last study, I investigated how people equate both resources when they are exposed to a different type of shortage of resources.

Results supported the findings from the previous chapter showing that in general people perceived money as predominant, underestimating the value of time. Interestingly, people experiencing a condition of time scarcity were slightly less prone to commit their time confirming that the perception of scarcity influences human cognition, choices, and behavior in remarkably similar ways, orienting automatically people toward unfulfilled needs (Mullainathan & Shafir, 2013). In general, these findings confirmed that the perception of scarcity brings people to a common mindset (Shah et al., 2012; Mullainathan & Shafir, 2013), however, the results also showed that, overall, participants weighed time and money differently in all conditions (scarcity and control). In Study 3, results showed that participants were generally more likely to commit time to gain money and that this behavior emerged for participants in money and time scarcity condition, although the latter were progressively less likely to sacrifice time to earn money. Study 4, again, confirmed that participants exposed to the concept of scarcity in general, and money specifically, were more prone to sacrifice their time. Surprisingly, participants in a condition of time scarcity reacted exactly as participants in the money

scarcity, suggesting that perhaps the concept of time includes a plurality of broader meanings that go beyond the single definition of time, and that probably also include aspects related to money. This interpretation is consistent with results of Study 5, which showed how participants in a condition of scarcity were both slower, compared to those in the control condition, at recognizing the words associated with the resource that was scarce to them. In addition, those in the condition of time scarcity showed similar reactions times for both the list associated with the concept of time and the one associated with the concept of money. This trend suggests that the experience of time scarcity similarly impacts the latency in the recognition task and also that the concept of time has a broader definition, which goes beyond the classic definition of time but also encompasses other aspects, maybe including money. Finally, the results of Study 6, confirmed that people perceived money as prominent compared to time.

This tendency to perceived money as a prominent resource in daily life is moderated by the ability of people to recognize and regulate emotions. Results of Study 4 clary indicated that participants with higher (vs. lower) trait EI were less likely to underestimate the value of time. Moreover, considering the experience of scarcity, my findings suggested that higher trait EI (vs. lower) led people to be less prone to commit a resource which was lacking. In particular, they were less willing to use their time to earn money and even more so if they were not experiencing a condition of money scarcity. A reasonable interpretation for these findings is that the ability to regulate emotions helps people to reduce the negative and stressful feelings induced by the perception of scarcity (Santiago et al., 2011; Haushofer & Fehr, 2014; Iemmi et al., 2016), allowing for an effective tradeoff between the two resources.

A limit of these studies is the fact that the scenarios presented implied contextualized choices, that could have impacted the weight of the two resources in the tradeoff. A

possibility to overcome this limitation could be to ask participants to equate two different scenarios, respectively implicating an evaluation of time and money. After this, participants should be asked to indicate an initial preference between the two proposed and evaluated scenarios. Afterward, participants will be exposed to the manipulation of the scarcity and will be invited again to consider the preference between two scenarios in order to investigate if their preference change because of the perception of lack.

Chapter 4

Scarcity, Retirement and Financial behavior

4.1. Introduction

Recent researches on scarcity showed that people in a condition of restriction tend to manage their resources inefficiently, showing "irrational" behaviors (Mani et al., 2013; Haushofer & Fehr, 2014; Mullainathan & Shafir, 2013). Moreover, in the studies discussed above, I showed people's tendency to perceive money as prominent over other resources and to overestimate the value of economic factors in the regulation of daily life. In this chapter I am going to discuss the financial decision, specifically the effect of scarcity on people's ability in recognizing the real value of the money. In particular, I considered how the condition of retirement, where people have fewer opportunities for resources replenishment and a more stationary economic condition in this stage of their life, impacts financial decisions. Considering these aspects, and the consequent importance of managing economic resources efficiently when the perspective to increase them is limited, I decided to study money illusion and the potential lack of rationality it entails.

Through three different studies I investigated whether people with lower economic availability and higher perception of scarcity, that have to make retired people decision, are more prone to money illusion than those who do not experience the scarcity constraints. In particular, in Study 7 I used a hypothetical manipulation of scarcity to investigate people's perception about having adequate economic resources and the effect of this condition on money illusion. Through the same hypothetical manipulation in Study 8, I replicated the results of Study 7, integrating it with a measure of individual differences. Finally, in Study 9, I considered the actual income of a sample of retired

people, their perception of having an adequate lifestyle, their financial decision and I also assessed a measure of fluid and crystallized intelligence.

4.2. Theoretical background of Money Illusion

The term money illusion was coined by Fisher (1928), who defined it as "failure to perceive that the dollar, or any other unit of money, expands or shrinks in value" (Fisher 1928, p. 4). Further, Leontief (1936) defined the money illusion as a violation of the "homogeneity postulate" that demands that all nominal prices depend upon relative prices but not upon the absolute price level (Fehr & Tyran, 2001). This definition introduced a clear distinction between the nominal and real value of a product or service. Specifically, the nominal price of a good represents its value in terms of currency, such as dollars or euros, and goes with it that is simpler and more salient to understand. Instead, the real value represents the value of money in terms of some other good, or service, and is the one that captures the true value of transactions. This definition diverges from Fisher's one for two reasons: First, it refers to people's reactions to a change in the level of prices rather than to a change in the rate of change of prices. Second, this definition describes the money illusion as a property of potentially observable supply and demand functions, thus in an operational way.

Based on these assumptions, the economic literature debated for a long time whether money illusion could be defined as a psychological bias because the evaluation of transactions often represents a combination of nominal and real evaluations, which gives rise to money illusion (Fisher, 1928; Leontief, 1936; Fehr & Tyran, 2001). In this regard, people are generally aware that there is a difference between real and nominal values, but because at a single point in time, or over a short period, money is a salient and natural unit, people often think of transactions in predominantly nominal terms. For this reason,

in the economic literature, the term money illusion was used to describe any failure to distinguish monetary from real magnitudes (Howitt, 1989). Namely, the money illusion is defined as the tendency to think of economic transactions in nominal rather than real terms, with the implication that people are usually aware that there is a difference between real and nominal values but often think of transactions in predominantly nominal terms. To this effect, Shafir, Diamond, and Tversky (1997) investigated the comparative evaluation of real and nominal value. In their experiment, they presented subjects with two job offers: One offer includes a higher yearly salary in a company where others peers with similar position earn more, instead of the other position offered a lower salary in a company where others colleagues with similar position earn less (Shafir, Diamond, & Tversky, 1997). Specifically, the scenario was the following:

"Consider two individuals, Carol and Donna, who graduated from the same college, and upon graduation took similar jobs with publishing firms. Carol was said to have started with a yearly salary of $36,000 in a firm where the average starting salary was $40,000. Donna started with a yearly salary of $34,000 in a firm where the average starting salary was $30,000".

After having read the scenario, participants were asked to indicate who they thought was happier with her job and, instead of, who was more likely to quit the job. Eighty percent of the respondents indicate Donna, the employee with the better relative position, as the happiest one. On the contrary, 66% of the respondent choose Carol, the one with the lower relative position, as the more likely to leave the job. In other words, even if the greater majority of the participants chose the job with the higher absolute salary, most of them anticipated higher satisfaction in the job with the higher relative position but lower salary. Even in cases where it is clear that an offer is economically predominant, people

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sometimes expect to be happier with lower earning, when it is favored by comparative considerations. In line with this, Tversky and Griffin (1991), investigated similar discrepancy between an absolute and a comparative evaluation, in particular they presented two hypothetical job offers: One includes a higher yearly salary in a company where others peers with similar position earn more, instead of the other position offered a lower salary in a company where others colleagues with similar position earn less (Tversky & Griffin, 1991; Shafir et al., 1997). Specifically, the scenario was the following:

"Consider two people, Ann and Barbara, who graduated from the same college and who took similar jobs with publishing firms. Ann started with a yearly salary of $30,000. During her first year on the job, there was no inflation, and in her second year, Ann received a 2% ($600) raise in salary. Barbara also started with a yearly salary of $30,000. During her first year on the job, there was a 4% inflation, and in her second year Barbara received a 5% ($1,500) raise in salary".

Results indicated that only when researchers reported the economic values (e.g., $600) most of the participants correctly evaluated the scenario in real rather than in nominal terms. Otherwise, when the emphasis prescinds economic evaluation, as for example happiness's attribution, the evaluation is driven primarily by a nominal rather than a real evaluation. Hence, the money illusion effect emerges in the attribution of happiness, also when an analysis in terms of real value is easily accessible. Thus, although an evaluation in real terms is prominent when people are asked to make an economic evaluation, it seems that a nominal representation influence less economical judgment, activating analysis that are biased (Shafir et al., 1997). Therefore, these biased evaluations imply a lack of rationality that is inconsistent with classical economic theories. These

results were confirmed also by Patinkin (1965), who defined the money illusion as any deviation from "real" decision making. More precisely, he wrote: "An individual will be said to be suffering from such an illusion if his excess-demand functions for commodities do not depend solely on relative prices and real wealth".

According to Shafir and colleagues (1997), people attend to nominal value because it is salient, easy to gauge, and in many cases provides a reasonable estimate of real worth. This implies that the evaluation of transactions can generate the mistaken feeling that an amount of money is only a nominal value irrespective to the purchasing value, which leads to money illusion (Shafir et al., 1997; Weber, Rangel, Wibral, & Falk, 2008). It is important to notice that this deviation from rationality is not, strictly speaking, related only to nominal values but can also affect individuals' perception of happiness and wellbeing (Shafir et al., 1997). In this regard, Kahneman, Knetsch, and Thaler (1986) tackle how money illusion impact judgements of fairness. To study this, they created two scenarios in which they described a condition of economic recession in a company that is making a modest profit. In particular, participants were told that there was no inflation (or 12% inflation) and that the company decided to decrease (increase) salaries by 5% (or 7%). Sixty-two percent of the participants judged the action of the company unfair in the case of the nominal cut, but only twenty-two percent in the case of the nominal raise. It is evident that judgments of fairness are based largely on nominal rather than on real changes, even if, in the two conditions, the change in real income is the same.

According to these results, the detrimental consequences of a misperception of the value of money could impact people economic life, through disadvantageous economic decision making. These decisions could have an impact on living conditions, choice of leisure activities, and health care quality (Taylor & Geldhauser, 2007; Wang & Shi, 2014). When these decisions are disadvantageous and bring to economic instability, this

could subsequently lead to chronic stress and anxiety and could increase retirees' feelings of helplessness (Pinquart & Schindler, 2007; Reitzes & Mutran, 2004). Considering that these factors have important influences on the longevity and mortality of the people (Tsai, Wendt, Donnelly, De Jong, & Ahmed, 2005), the confusion about the difference between real and nominal interest rate can have a significant impact on people's daily life. Despite plenty of evidence showed that thinking in nominal terms is common and that simple nominal changes can affect individual choices, I believe that it is very important to understand how perceived monetary scarcity impacts the extent to which people incur in the money illusion effect. In this regard, I hypothesized that when participants expect to receive a lower pension, they should perceive as particularly difficult to cope with their financial condition. Moreover, I hypothesized that when participants expect to receive a lower pension should be more influenced by money illusion.

The research protocol was approved for all the studies of this chapter by the Ethical Committee for the Psychological Research of the University of Padova (Protocol: 2181).

4.3. Study 7

The effect of Scarcity on Money Illusion

In Study 7, I manipulated the perception of scarcity using a scenario in which participants read about the hypothetical monthly amount of their future pension. Considering the cognitive fatigue of people in a condition of scarcity (Mani et al., 2013), and the tendency to make disadvantageous choices that made almost impossible to move out from them in the loop of scarcity (Haushofer &Fehr, 2014) in Study 7, I hypothesized that people who expect to be in a condition of low economic disposability should be more prone to evaluate money in nominal terms because this should facilitate cognitive elaboration. Furthermore, this prediction is consistent with previous works showing that, under economic scarcity, people are more concerned about cost, and that economic impairment can cause depletion of mental resources, leading, in turn, to problematic and suboptimal behaviors (Vohs, 2013; Mani et. al., 2013; Shah et al., 2018).

In view of that, I hypothesized that people with scarce and static economic resources should be more prone to the money illusion effect. In addition, I hypothesized that participants experiencing a condition of perceived economic scarcity could have more difficulties to manage economic emergencies and a lower perception of having an adequate lifestyle, showing a higher perception of scarcity.

Specifically, I hypothesized that:

1) When participants are in lowest pension amount condition (versus the highest one), they should perceive as particularly difficult to cope with an economic emergency and to have an adequate lifestyle, showing a higher perception of scarcity.

2) When participants are in lowest pension amount condition (versus the highest one), they should be more influenced by money illusion.

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4.3.1. Method

4.3.1.1. Subjects

One hundred and seventy-six people from Italy (50.56% female, M_{age} = 26, ranging from 17 to 49 years old) took part in Study 7. They were randomly assigned to one of three conditions in which I manipulated pension amount. Participants were contacted with a link via mail or social networks.

4.3.1.2. Procedure

Initially, participants were required to provide some demographic information (age, sex, education, whether they were students or had a job, and, if employed, which type of contract). With the purpose to test the effect of the scarcity on money illusion, participants were presented with a scenario where was manipulated the amount of the pension they will hypothetically receive per month once retired. In order to manipulate monthly pension amounts in a realistic way, the three between-subjects amounts (€500, €1,500 and €2,500) were set based on the distribution of pensions in Italy (ISTAT, 2017[3]; see Appendix 6 for more details). Considering the amount of the hypothetical pension amount, it follows that the participants assigned to the condition with the lowest pension amount, compared to the other two levels, should experience a higher condition of scarcity, especially due to the inadequacy of the monthly allowance in relation to the cost of living.

After reading the scenario, participants were asked to answer a questionnaire that allowed to measure participants' perception of scarcity. Specifically, participants were asked to use a 7-point Likert scales (ranging from 1 = "strongly disagree" to 7 = "strongly

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[3] ISTAT (2017) http://dati.istat.it/Index.aspx?QueryId=33432

agree"), to indicate if they agree with the following statements "I think that with this pension amount I could live properly" and "I feel ready to cope with economic emergency".

Afterward, participants were presented with a test of money illusion were participants read two different scenarios adapted from Kahneman and colleagues (1986), previously used to assess how standards of fairness impact economic behavior and decision. Specifically, I asked participants to rate how much they think the following scenarios were fair using a scale from 1 to 7, where 1 indicates "not at all" and 7 "very". The first scenario asked:

"Due to a severe economic crisis, the country is facing a difficult time. There is a strong recession and zero inflation. The government is forced to reduce pensions by 3%. How acceptable do you consider the government decision?" (pension cut version).

The second scenario was:

"Due to a severe economic crisis, the country is facing a difficult time. There is a strong recession and 12% inflation. The government decides to raise pensions by 5%. How acceptable do you consider the government decision?" (pension rise version).

It is noteworthy to mention that, despite looking better in nominal value, the pension rise version of the scenario (7% loss in purchasing power) was a lot worse in real terms than the pension cut version (3% loss in purchasing power).

4.3.2. Results

4.3.2.1. Descriptive statistics and correlations

First of all, I looked at how the condition influenced our variables of interest. As showed in Table 5, people in the €500 condition rated themselves as least able to cope with an economic emergency whereas people in the €2,500 condition have perceived themselves as those with less trouble by coping with an emergency (with people in the €1,500 condition falling in between). This pattern was also found for the question asking participants whether they thought they could live adequately with the assigned pension amount. Finally, in the money illusion pension cut scenario (the one with zero inflation) there seemed to be a difference between participants assigned to the highest pension amount condition and the other two groups. This difference did not replicate in the money illusion pension rise scenario (with twelve percent inflation).

	Coping with an economic emergency		Can have an adequate life-style		Money Illusion - Pension cut		Money Illusion - Pension Rise	
	M	SD	M	SD	M	SD	M	SD
€500	1.89	1.42	1.78	1.11	2.35	1.39	3.78	1.9
€1,500	3.15	1.29	3.88	1.82	2.52	1.55	4.02	1.93
€2,500	4.27	1.62	5.20	1.59	3.89	1.67	3.93	1.84

Table 5. Descriptive statistics for Study 7.

Further, looking at the whole sample, I found a positive correlation between the pension cut version of the money illusion question and people's perceived ability to cope with an emergency ($r = .32$, $p < .001$) and to live according to an adequate lifestyle ($r = .30$, $p < .001$). The same correlations were very low for the pension rise version of the

money illusion question ($r = .11$ or lower). The two money illusion questions did not show a particularly high correlation ($r = .11$, $p = $ ns).

4.3.2.2. Emergency and life style

I ran a first linear regression model with condition as categorical predictor and participants' ratings of their perceived ability to cope with financial emergency as the dependent variable (Adj. $R^2 = .30$). Condition was coded according to two different contrasts: the first contrast compared the group with the highest pension amount (€2,500) with the other two groups collapsed (€1,500 and €500), whereas the second contrast compared the two groups with lower pensions amounts (€1,500 vs. €500). Results showed a significant effect of both contrasts (respectively: $\beta = .59$, SE $= .08$, $t = 7.65$, $p < .001$ for the first contrast and $\beta = .63$, SE $= .14$, $t = 4.63$, $p < .001$ for the second contrast). These effects showed that participants in the €2,500 condition perceived the highest ability to cope with a financial emergency, followed by participants in the €1,500 condition, whereas those in the €500 conditions reported the lowest ratings on this variable. Moreover, to test the robustness of the model I estimated a second linear regression model introducing as covariates the main effect of employment ($p = 1.00$) and educational level ($p = .35$). Adding these two variables did not increase the variance explained by the model ($Mod_1 = .30$, $Mod_2 = .30$, $p = .62$), and the main effect of the condition did not change.

Subsequently, I estimated a linear regression model to investigate the effects of condition on participants' perception that they could have an adequate lifestyle (Adj. $R^2 = .44$). Condition was coded according to the contrasts previously used for the financial emergency, hence the first contrast compared the group with the highest pension amount with the other two groups collapsed, whereas the second contrast compared only the two

groups with lower pensions amounts. Results showed a significant effect of both contrasts (respectively: $\beta = .78$, SE $= .08$, $t = 9.52$, $p < .001$ for the first contrast and $\beta = 1.05$, SE $= .15$, $t = 7.24$, $p < .001$ for the second contrast). Again, these results revealed that participants in the €2,500 condition perceived that they could easily live with an adequate lifestyle, followed by participants in the €1,500 condition, whereas those in the €500 conditions reported the lowest ratings on this variable. Moreover, to verify the robustness of the model, I estimated another model adding as covariates the main effect of educational level ($p = .07$) and of employment ($p = .03$). Adding those two variables to the model sensibly increase the variance explained by the model ($R^2_{Mod.1} = .43$; $R^2_{Mod.2} = .45$, $p = .05$).

4.3.2.3 Money Illusion

To investigate how people reacted to the money illusion scenarios, I estimated a multilevel linear model. In all the following model, condition and scenario were considered as categorical predictors, while the ratings of how acceptable was perceived the change in pension amount as continuous variable. In the model I entered scenario (pension cut vs. pension rise), condition, and the interaction between scenario and condition as predictors, and ratings of how acceptable was perceived the change in pension amount as the dependent variable. Furthermore, I controlled for subjects' random effects. Results revealed a significant effect of scenario ($\chi^2 = 45.02$, $\beta = 1.16$, SE $= .17$, $t = 6.71$, $p < .001$), and a significant effect of condition ($\chi^2 = 12.59$, $p = .002$). However, the effect of condition was only significant for the first contrast comparing the €2,500 condition with the other two lower pension amounts ($\beta = .32$, SE $= .09$, $t = 3.52$, $p < .001$). Finally, I found a significant interaction between scenario and condition ($\chi^2 = 6.49$, $p = .04$), but it was only significant for the contrast comparing the €2,500 condition and the other two groups ($\beta = - .31$, SE $= .12$, $t = - 2.53$, $p < .01$). Moreover, a slope analysis

showed that the difference between the highest pension amount condition (€2,500) and the other two band (€1,500 and €500) collapsed was significant for the question reporting that pensions amounts would be reduced ($t = 3.49$, $p < .001$), but not for the question reporting that pension amount would be increased ($t = .12$, $p = .91$; see Figure 17).
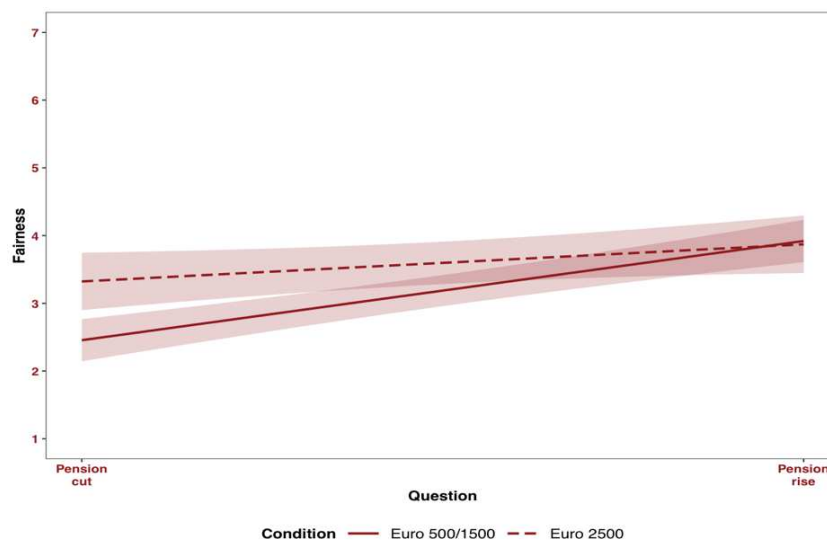

Figure 17. Interaction between money illusion scenarios and condition. Shades indicate 95% confidence intervals.

To test the strength of the model, I estimated an additional model adding to the previous one the employment status and the educational levels as covariates. Results showed no significant effect neither for employment ($p = .19$) or the educational level ($p = .63$) and adding these predictors did not reduce the variance explained by the model ($Mod_1 = .32$; $Mod_2 = .26$, $p = .03$).

4.3.3. Discussion

In Study 7, I manipulated the perception of scarcity through three different pension amounts to study how the economic perception of a future retirement check impacts people's perception of being able to cope with an economic emergency and to have an adequate lifestyle, no matter their educational level.

Furthermore, in this study, I investigated if people with higher perception of scarcity and lower pension amount (versus lower perception of scarcity and higher pension amount) were more influenced by money illusion. In particular, I expected participants to rate as fairer an increase of the pension amount, rather than a decrease, despite the fact that, in real terms, the latter had a lower impact on purchasing power. Results showed that participants in the lowest pension amount condition felt to be less able to cope with an economic emergency and also regarding the perception of being able to have an adequate lifestyle, participants in the lowest amount condition reported the lowest rating. With regards to money illusion, as hypothesized, results showed that people in the two lowest amount conditions perceived an increase in the pension check as fairer than a decrease despite the fact that the real value of the pension decreased less when it was cut down rather than raised. In other words, people experiencing a condition of scarcity were more prone to interpret the scenario with the increase of the salary in a nominal way, instead of considering the real value and the actual impact that the change in the pension amount could have on their purchasing power and, consequently, on their already unsatisfactory economic conditions. Participants in the two low-pension groups reported ratings that could significantly impact their finances and wellbeing as they did not pay enough attention to the change in the real value of the pension. Conversely, participants experiencing a less demanding economic status were less likely to show the money illusion bias. These people were less prone to stick to the nominal value, although they too did not find the decrease in the pension amount as fairer than the rise as they should have from an economical point of view.

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4.4. Study 8

The effect of Scarcity and individual differences on Money Illusion

Starting from the findings of the previous study, in Study 8, I investigated how individual differences influence the perception of being able to cope with financial hardship, and, moreover, I considered how individual differences in environmental sensitivity influence the effect of pension amount on money illusion. I decided to consider individual differences because it is widely recognized that the way in which people react to positive and negative life events is related to both environmental conditions and personality traits (Caspi & Moffitt, 2006). Indeed, individual differences in personality traits and life events have been shown to independently and jointly influence psychological functioning, as illustrated by Trait by Environment research approaches (Aron, Aron, & Jagiellowicz, 2012) and individual differences in such heritable psychological traits can moderate the response to contextual factors (Pluess, 2015). This stream of research led to the development of the environmental sensitivity construct, which is conceived as an adaptive trait that allows individuals to accommodate to both adverse and positive life circumstances, thus representing the basis for human flexibility and plasticity (Pluess et al., 2018). Environmental sensitivity is an important higher-order personality dimension whose different aspects are reflected, captured, and described in many existing psychological concepts. Moreover, this ability to register, process, and respond to external factors, is decisive for adapting successfully to contextual conditions, and individuals tend to develop different level of sensitivity to the environment (Pluess, 2015). Considering these aspects, and that several works suggest that the perception of scarcity leads to negative affect and stress (Santiago et al., 2011; Haushofer & Fehr, 2014; Iemmi et al., 2016), I found it interesting to measure how individual differences in

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environmental sensitivity regulate people's ability to manage financial hardship, and how people with different level of environmental sensitivity react to the scarcity.

Therefore, in addition to testing again both the hypothesis of the previous study, I hypothesized that:

3) As environmental sensitivity increases, the impact of different pension amounts on the perception of financial hardship should reduce.

This hypothesis entails, that in the €500 condition, financial hardship should always be perceived as quite high since this pension amount creates an objective economic constraint. However, in the other groups, pension amounts are higher and the perception of financial hardship should be influenced by individual differences in environmental sensitivity. In addition, I hypothesized that:

4) As environment sensitivity increases, the impact of different pension amounts on participants' likelihood to display the money illusion bias should reduce.

4.4.1. Method

4.4.1.1. Subjects

Three hundred and seventeen participants (52.36% female, M_{age} = 23.34, ranging from 18 to 34 years old) took part in Study 8. Participants received the link for the experiment via mail or social network and they were randomly assigned to one of three experimental conditions.

4.4.1.2. Procedure

Once again, in Study 8, the perception of scarcity was manipulated using the scenario with different levels of hypothetical monthly income once retired. The questionnaire devised for Study 8 included the same questions about the perception of scarcity as in

Study 7, and further extended the measurement of perceived ability to cope with an economic emergency and to live adequately by using a new set of questions. Specifically, adding a series of 7-point Likert items (ranging from 1 = "strongly disagree" to 7 = "strongly agree"), participants were asked to indicate if they agree with the following statements: "I think that with this pension amount I could live properly" and "I think that with this pension amount it is impossible to live properly". In addition, with a different 7-point Likert scales (ranging from 1 = "easy" to 7 = "hard"), I asked participants to make the following judgments: "With a pension of this amount, how easy would be to get to the end of the month?", "With this pension, how easy would be to handle unforeseen events/expenditures?", and finally, "With this pension amount, how easy would be to find €500 in 24 hours to cope with a sudden expenditure?".

The scenarios used for the money illusion problems were the same of the previous study, but this time, scenarios were presented in a within-subjects design, therefore, participants could see information in both scenarios and should have been in a perfect condition to assess the best option. Following these questions, I investigated environmental sensitivity with the short form of the Highly Sensitivity Person Scale (HSPS; Aron & Aron, 1997; Pluess, 2015). The scale was designed to assess the trait of sensory processing sensitivity and includes twelve questions (e.g., "Do you seem to be aware of subtleties in your environment?" and "Do changes in your life shake you up?") to be answered on a 7-point Likert scale (ranging from 1 = "strongly disagree" to 7 = "strongly agree"). Scores are computed by adding up the answers to each item and yield an overall score, with higher value indicating higher levels of sensitivity. For the purpose of this study and considering that the data collection was done with a sample of Italian speakers, the 12-item HSPS inventory was translated to Italian using a standard translation—back translation procedure. Aron and Aron (1997) reported good internal

reliability for the original version of the HSPS, with Cronbach Alphas ranging from .87 and .85. Similar values have been reported for the 12-item scale in the current study, where internal consistency of the measure was $\alpha = .72$.

In the last section of the questionnaire, I asked participants to report the same demographic information as in Study 7. After that, participants were asked a series of questions about their actual economic condition (e.g., "I have enough money to buy things I want" or "I don't need to worry too much about paying my bills") to be answered on 7-point scales (ranging from 1 = "strongly disagree" to 7 = "strongly agree"; Griskevicius, Tybur, Delton, & Robertson, 2011; Piff, 2014).

4.4.2. Results

4.4.2.1. Descriptive statistics and correlations

First of all, I looked at how scarcity influenced our variables of interest. Before assessing the effect of the manipulation, I ran a factor analysis to assess whether the factors related to the ability to cope with an economic emergency and to live adequately could be clustered into a single factor. I used a Varimax rotation and factor loadings were selected based on eigenvalues (>=1). Results from the factorial analysis showed that all these five items loaded on a single factor, which I labeled financial hardship ($\alpha = .90$). I then looked at how the condition influenced the variable of interest. As showed in Table 6, people in the €500 condition rated themselves as the least able to cope with financial hardship, whereas people in the €2,500 condition perceived themselves as those experiencing the least financial hardship (with people in the €1,500 condition falling in between). Finally, in the money illusion scenarios, quite a difference seemed to emerge when the pension decrease was presented. In this case, people presented with the highest pension amount seemed to consider the cut fairer than the other two groups. No much

difference seemed to emerge when the money illusion scenario presented participants with a rise in the pension amount.

	Financial hardship		Money illusion – Pension cut		Money illusion – Pension rise	
	M	SD	M	SD	M	SD
€500	5.72	.95	2.65	1.49	3.68	1.70
€1500	4.03	1.12	3.37	1.56	3.81	1.79
€2500	2.67	1.195	3.98	1.92	4.24	1.89

Table 6. Descriptive statistics for Study 8.

Correlations showed that across the whole sample, environmental sensitivity was positively related with how fair the pension cut was rated ($r = .18$, $p < .01$), whereas it did not correlate significantly with neither the pension raise question nor with financial hardship. The perception of financial hardship was negatively correlated with judgments of fairness for both money illusion questions, although the correlation was higher when a pension cut was described (respectively, $r = -.41$, $p < .001$ for the pension cut scenario and $r = -.17$, $p < .01$ for the pension rise scenario).

4.4.2.2. Financial hardship

I ran a first linear regression model with condition as categorical predictor, environmental sensitivity as continuous predictors, and the model also estimated the interaction between condition and environmental sensitivity. Participants' perception of financial hardship was considered as continuous dependent variable. Results showed a significant effect for the contrast comparing the two low-pension groups (€500 vs. €1,500; $\beta = -1.99$, SE = .43, $t = -4.68$, $p < .001$), but not for the contrast comparing the highest amount (€2,500) with the other two groups ($p = .21$). Moreover, results showed a

significant interaction effect between environmental sensitivity and the contrast comparing the €500 and €1,500 conditions (β = .27, SE = .10, t = 2.74, p = .01). To further investigate this interaction effect, I performed a slope analysis that showed how environmental sensitivity had a significant effect in the €1,500 condition (t = 2.00, p = .04) but not in the €500 condition (t = - 1.60, p = .10). Specifically, participants in the €1,500 condition perceived financial hardship as significantly lower when they had low environmental sensitivity, whereas no significant effect was found in the €500 condition. To verify the robustness of the model, I estimated a second model adding to the previous one the main effect of income and educational level: Results showed no main effect of the income (p = .70) neither for educational level (p = .94), moreover adding this variable did not increase the explained variance (Mod.$_1$ = .59; Mod.$_2$ = .59, p = .19).

4.4.2.3. Money Illusion

To investigate how participants reacted to the money illusion scenarios, I estimated a multilevel linear model entering scenario as a within-subject factor, condition as categorical predictors, environmental sensitivity as continuous predictor, all two-way interactions and the three-way interaction. The ratings of how fair the change in pension amount was considered as the dependent variable. Furthermore, the model controlled for subjects' random effects. Results revealed a significant effect of scenario (χ^2 = 5.75, β = 1.82, SE = .77, t = 2.38, p = .02) and a significant effect of environmental sensitivity (χ^2 = 6.47, β = .42, SE = .12, t = 3.36, p = .001). These effects showed that participants perceived an increase in the pension amount as fairer than a decrease. In addition, people with higher environmental sensitivity perceived the change in the pension amount as fairer than people with low environmental sensitivity. Moreover, results showed a significant interaction between scenario and condition (χ^2 = 6.49, p = .04). This effect was

significant only for the contrast comparing the €500 and the €1,500 condition ($\beta = -2.36$, SE = .96, $t = -2.46$), whereas the contrast comparing the highest amount (€2,500) with the two lower pension amount groups was not significant ($p = .66$). The interaction between condition and environmental sensitivity was also significant, but only for the contrast comparing the highest pension amount with the other two groups (€500 and €1,500 collapsed, $\chi^2 = 6.63$, $\beta = .20$, SE = .09, $t = 2.27$, $p = .02$). To further investigate the interaction between scenario and condition, I ran a slope analysis that showed an effect of the money illusion scenarios in the €500 condition ($t = 2.94$, $p = .003$), but not in the €1,500 condition ($t = -.48$, $p = .63$; see Figure 18).
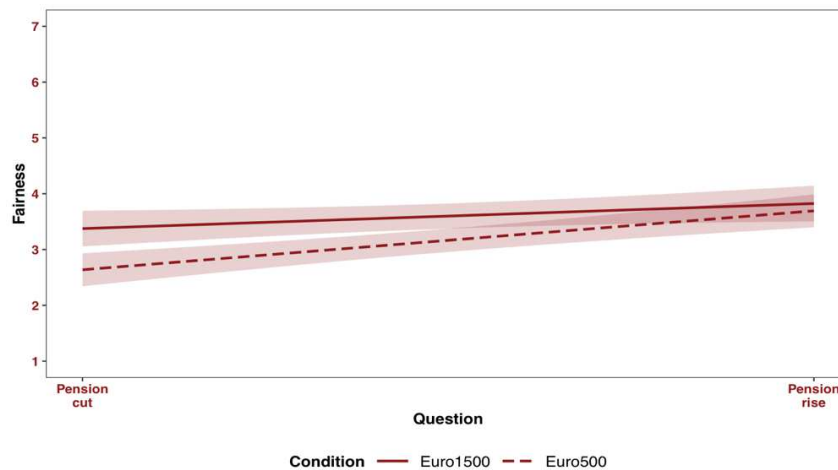

Figure 18. Interaction effect between money illusion question and condition. Shades indicate 95% confidence intervals.

Further, a slope analysis investigated the interaction between condition and environmental sensitivity. Results revealed that environmental sensitivity had no significant effect on how fair the changes in pension amount were perceived by participants in the highest pension amount condition ($t = .51$, $p = .61$), whereas it had a significant impact on the fairness ratings of participants in the two low amount conditions ($t = 4.05$, $p < .001$). Finally, the three-way interaction was not significant.

As we did for the previous analysis, I estimated a new model considering as predictors income and educational level. Results showed no main effect of the income (p

= .19) neither of the educational level (p = .34), moreover adding these variables did not increase the explained variance (Mod.$_1$ = 2.84; Mod.$_2$ = 2.84, p = .27).

4.4.3. Discussion

In Study 8 I investigated how individual differences influenced the effect of pension amount on money illusion and how those influenced the perception of being able to cope with financial hardship and the perception of scarcity. Consistent with Study 7, in this study I created three different groups based on the monthly amount of the pension, using exactly the same three conditions (€500, €1,500, and €2,500). Further, a factor analysis showed that questions on the perception of scarcity clustered into a single broader factor, which was labeled financial hardship. In line with the hypothesis, results showed that participants with a low pension amount and a high environmental sensitivity had a less intense perception of financial hardship.

With regard to money illusion, results showed a significant effect of scenario and environmental sensitivity, indicating that participants with higher pension amount perceived a cut in the pension amount as fairer than those in a condition of lower economic disposability. Moreover, as hypothesized, the effect of environmental sensitivity on how the pension changes were perceived increased as pension amount increased. In other words, environmental sensitivity influenced both the perception of financial hardship and the rating of fairness of the change in pension amount in the money illusion scenarios. Finally, consistently with initial hypothesis, the educational level and personal income availability did not impact the effect of the scarcity mindset neither on the ability to cope with financial hardship neither on the money illusion effect. Those results seem explain the scarcity mindset, confirming previous results showing how scarcity catches people mind (Shah et al., 2013).

4.5. Study 9

The effect of Money illusion in a sample of retired people

Based on the results of the previous two studies showing that money illusion is influenced by economic disposability and not by educational level, and knowing the social consequences of economic insecurity, I decided to test a sample of retired people. Therefore, the aim of Study 9 was to replicate the previous findings (hypothesis 1 and 2) with people who are actually retired and to assess money illusion based on their real pension amounts, rather than manipulating this variable in a hypothetical way. Moreover, recent works suggested a causal relationship between poverty and mental functioning (Mani et al., 2013; Mullainathan & Shafir, 2014) showing how a condition of scarcity reduces the mental bandwidth available for making quality decisions and how this taxation of cognitive resources results in an attentional shift that inhibits or impairs functions and capacities. Considering these aspects, in Study 9, I decided to investigate the effect of different economic disposability and the perception of scarcity on fluid intelligence.

Specifically, I hypothesized that:

6) Retired people with lower pension amount should also have higher perception of scarcity and lower fluid intelligence scores.

4.5.1. Method

4.5.1.1. Subjects

Fifty-seven Italian retired people (45.6% female, $M_{age} = 67$ years, ranging from 56 to 80 years) took part in the study. I considered as retired a person who is permanently out of the labor force with the intention of staying out (Lazear, 1987). The average retirement income was €1,659 (ranging from a minimum of €450 to a maximum of €8,000).

4.5.1.2. Procedure

The questionnaire devised for the present study had the goal of measuring participants' decision-making processes as well as a number of other variables like fluid and crystallized intelligence. I created two versions of the questionnaire and participants completed both at a one-week distance and in a counterbalanced order. Both versions of the questionnaire were structured in two different sections. Participants reported demographic information only in the first version of the questionnaire. They were asked to indicate their age, gender, year in which they retired, amount of their pension check, former occupation, education, household size, and the number of people who contributed financially to the household expenses (e.g., a spouse or their children). Then in both versions of the questionnaire, participants were asked to rate their perceived ability to cope with financial difficulties and to live adequately, as in Study 7. These questions were answered using two 7-point scales (ranging from 1 = "completely disagree" to 7 = "completely agree"). In addition, in this section, I presented the same two money illusion scenarios as in the previous two studies.

Furthermore, in Study 9, I assessed individual differences in crystallized intelligence and fluid intelligence through the following scales: Culture Fair Intelligence Test - Scale 2 (CFIT; Cattell & Cattell, 1983) and Wechsler Adult Intelligence Test – Vocabulary Scale (WAIS; Wechsler, 2008). The CFIT is a fluid intelligence test that assesses people's ability to respond to completely new situations measuring basic skill, speed in solving problems, and basic operations in dealing with and processing information. During the first data collection, participants completed version A of the scale, while version B was completed in the second data collection assessed one week after the first. The WAIS is a measure of crystallized intelligence, represented by the depth and breadth of general

knowledge that a person possesses. This test was presented at the end of the first data collection immediately before the CFIT version A.

4.5.2. Results

4.5.2.1. Preliminary analyses

First of all, I investigated the distribution of pension amounts across all participants and excluded one participant because of the extremely high monthly income (€8,000 while the next highest value was €4,100) and the average for the whole sample was €1,546. In addition, I computed an index of financial support by summing up the answers to the questions asking about additional financial income, whether people owned a house, presence of children who support with the expenses, and presence of a spouse's income. For each question, participants were asked to say whether these conditions were met, therefore the financial support index ranged from zero (all no answers) to four (all yes answers).

Pension amount was positively correlated with fluid intelligence (CFIT score; $r = .43$, $p < .001$) while the correlation with crystallized intelligence (WAIS score) was much lower ($r = .16$, $p = .24$). CFIT and WAIS scores were positively correlated ($r = .36$, $p < .01$). How much participants felt to have good financial support correlated with the size of their household ($r = .34$, $p < .01$) and with pension amount ($r = .27$, $p < .05$), but it did not correlate with CFIT ($r = .02$, $p = .88$) or WAIS ($r = .14$, $p = .29$).

4.5.2.2. Emergency and lifestyle

At this point, I turned my attention to how participants perceived their financial situation in terms of their ability to face economic emergencies and to live adequately. Both these questions were presented in both data administration of the questionnaire. For

the economic emergency, the responses in the two data collections were significantly and positively correlated ($r = .85$, $p < .001$), therefore I averaged them. In a first linear regression model I considered pension amount, age, gender and family support as predictors while people's ability to cope with economic difficulties was considered as dependent variable. Results showed that pension amount significantly predicted people's ability to cope with economic difficulties ($\beta = .001$, $t = 2.48$, $p < .05$; Adj. $R^2 = .22$). In a second linear regression model I added other predictors like crystallized intelligence, CFIT, and educational level. Consistent with the predictions, people with a higher CFIT score reported a higher perception of being able to cope with economic struggles ($\beta = .05$, $t = 2.37$, $p < .05$; Adj. $R^2 = .27$).

Subsequently, I ran a similar model to test which variable predicted participants' perception of their ability to live an adequate life. Again, answers given in version A and B of the questionnaire were positively correlated ($r = .63$, $p < .001$), therefore I averaged them. In a first linear regression model I considered pension amount, age, sex and family support as predictors and people's perceived ability to live well from a financial point of view as dependent variable. Results showed a main effect of the pension amount ($\beta = .001$, $t = 3.39$, $p < .01$; Adj. $R^2 = .30$). Then, in a second linear regression model, I added crystallized and fluid intelligence and the educational level. The second model explained a higher amount of variance ($R^2 = .33$), but pension amount was still significant ($\beta = .0008$, $t = 2.57$, $p < .05$) and fluid intelligence was nearly significant ($\beta = .035$, $t = 1.99$, $p = .052$), suggesting that people with a higher CFIT score had a higher perception of their ability to live an adequate life.

4.5.2.3. Money illusion

Participants answered the two scenarios in both version A and B of the questionnaire. The answers were positively correlated (respectively: $r_{pension\ cut}$ = .66, p < .001; $r_{pension\ rise}$= .80, p < .001), therefore I averaged them. Then, to investigate how participants reacted to money illusion, I ran a linear mixed effect model and I entered the scenario, the pension amount, and scenario by pension amount interaction, as predictors and ratings of how fair was the change in pension amount as the dependent variable. Furthermore, the model controlled for subjects' random effects. Results revealed a significant effect of scenario (β = 4.38, SE = .88, t = 4.97, p < .001), a significant effect of pension amount (β = .01, SE = .001, t = 4.33, p < .001), and a significant effect of the scenario by pension amount interaction (β = -.002, t = -4.45, p < .001, Adj. R^2 = .21). These effects showed that retired people perceived an increase in the pension amount as fairer than a decrease. In addition, retired people with a lower pension amount reported higher ratings of acceptability.
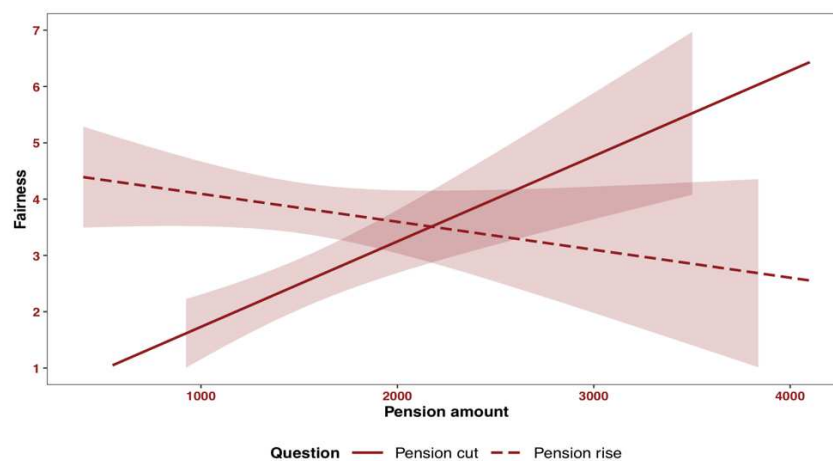

Figure 19. Interaction effect between money illusion question and condition. Shades indicate 95% confidence intervals.

Finally, a slope analysis showed that the effect of pension amount was significant for the question reporting a pension cut (t = 4.09, p < .001), but not for the question reporting

a pension rise ($t = -1.34$, $p = .18$; see Figure 19). Specifically, as hypothesized, people with lower economical disposability were less prone to find acceptable a cut to their pension.

In addition, to test the strength of the previous model I added as covariate the educational level, the fluid intelligence and the crystallized intelligence. Results showed only a significant effect of the fluid intelligence ($\beta = -.004$, $t = -2.27$, $p = .02$), but adding these covariates did not increased the variance explained by the model ($Mod_1 = .49$, $Mod_2 = .35$, $p = .16$) neither impacted the interaction between scenario and pension amount remained stable ($\beta = -.002$, $t = -4.45$, $p < .001$).

4.5.3. Discussion

In study 9, I studied a sample of retired Italians, investigating the consequences of real economic disposability on the money illusion effect. In addition, in this study, as in the previous two, I investigated the ability to face an emergency and to have an adequate live style. Results showed that the pension amount predicted participants' perception of their ability to cope with economic difficulties. Consistent with my predictions, people with a high score in the CFIT reported a higher perception of being able to face economic struggles. Similarly, results showed that the pension amount predicted the perceived ability to live well. In other words, retired people with economic restriction were less able to cope with an emergency and had a lower perception of the ability to live well. These results were consistent with previous studies' results confirming my hypothesis that the quality of life is not only strictly related to the economic status but that the perception of one's resources also exerts a fundamental influence on living conditions and quality of life.

Moreover, as we hypothesized, the extent to which people were prone to the money illusion bias increased as their pension amount decreased. This means that the retired people with a lower pension amount found fairer to raise pensions rather than to cut them, despite the fact that the former case was, economically, the least advantageous to them because of a larger real decrease in purchasing power.

4.6. General discussion

In all the studies of Chapter 4, results showed that participants with a lower pension amount felt to be less able to manage an economic emergency and less able to have an adequate lifestyle. In addition, with regards to money illusion, results showed that people with lower financial disposability perceived an increase in the pension amount as more acceptable than a decrease, despite the fact that the real value of the pension decreased less after being cut when it was rather than raised. Moreover, in Study 8, I considered the impact of individual differences in environmental sensitivity. When pension amount was above the lowest value, decreasing scores in environmental sensitivity led people to perceive a decreasing intensity of the financial hardship. Moreover, results revealed that environmental sensitivity had a significant impact on the fairness ratings only of participants in the two low amount conditions, indicating that those in the lowest condition were more prone to experience the money illusion bias. In addition, in Study 9, I measured people's fluid intelligence score. Results showed that retired people with a higher CFIT score reported a higher perception of being able to face economic struggles than those with a lower score.

Those three studies confirmed the previous literature on the effect of money illusion, which confirms that people tend to mainly think about transactions in nominal rather than real terms (Shafir et al., 1997; Weber et al., 2008). In addition to this, these findings have added something new to the theory of money illusion and the knowledge about scarcity mindset, showing how the perception of not having sufficient resources moderates the risk of being exposed to the effect of money illusion.

Furthermore, all the three studies' results showed that the educational level did not impact the effect of the scarcity mindset neither on the ability to cope with financial hardship or perceived to live adequately neither on the money illusion bias. An

explanation of these results is that the scarcity mindset shifts attentional allocation, confirming previous results that showed how scarcity catches people mind (Shah et al., 2013). Interestingly, participants from Study 7 and Study 8 were randomly assigned to a condition of perceived monetary scarcity, and results from both these studies were replicated in Study 9, a field study, reinforcing the hypothesis that scarcity is not just a material issue, and bandwidth taxation suggests that there is also a reduction in mental resources. Those results support previous works showing that scarcity change how people allocate attention (Shah et al., 2013; 2015). This attentional shift could be explained by the fact that cognitive load increase especially for people experiencing a condition of scarcity, with more problems to manage economic resources (Vohs, 2013; Haushofer & Fehr, 2014), making more difficult to escape from the scarcity trap. Those results are in line with previous literature supporting that scarcity is not only a material restriction but also a limitation that captures and dominates the mind without conscious intent, changing people behaviour (Mullainathan & Shafir, 2013; 2014; Roux et al., 2015; Goldsmith, Roux, & Ma, 2018; Cannon et al., 2019). In this regard, the inefficient way in which participants with lowest economic disposability managed their economic choices could have a significant impact in prolonging their condition of scarcity and enacting a loop from which they can find it difficult to get out. It could be possible that people with a low pension amount are more likely to reason in nominal values (vs. real values) because rise is always perceived as good news when you don't have enough money (regardless from the real purchasing power). Nevertheless, the consequences of this inefficient tendency could be really dangerous for the economic management of the resources and could worsen the economic condition of people that are already struggling.

Considering more practical implications these studies showed the importance to support retired people with a low pension with adequate policy programs, in order to

reduce their stay in a condition of scarcity and to avoid exacerbating their economic struggles. Better management of their savings and of their pension amount could reduce future social costs.

5.   Conclusions, limits, and future directions

People make several decisions every day, from the simplest, as for example what to eat for breakfast, to the most complicated choices, as for example how to organize the day or be on time with the payments, with potentially serious implications. If you have too many deadlines to meet, then time will not be sufficient to do other things. Just as delaying the payment of bills and rent can lead to an increase in interest or other costly consequences. Both these situations will most likely lead to an attempt to stay afloat. So, I wonder, what happens when a decision-maker is in a scarcity condition? How people experiencing a condition of scarcity make economic decisions? Do people experiencing a scarcity of different resources react in the same way?

In a series of nine studies, I tried to answer these questions and to provide a more nuanced understanding of the scarcity, pointing out potentially effective solutions. My dissertation addressed two different topics related to the perception of scarcity: In the first two experimental chapters I studied how people tradeoff between two fundamental resources in daily life, time and money, and how the perception of scarcity influences this tradeoff. Instead, in chapter four, I studied how scarcity affects financial decisions. The main purpose of this project was to expand the knowledge about scarcity, studying dynamics and aspects that govern and influence people's lives on a daily basis.

The state of art showed that the perception of scarcity is not only a material restriction but also a limitation that captures and totally dominates the mind without conscious intent, leading people to behave differently (Mullainathan & Shafir, 2013; 2014; Roux et al., 2015; Goldsmith, Roux, & Ma, 2018; Cannon et al., 2019). In other words, the scarcity mindset is prompt by the result of perceiving as though one does not have enough of something. Furthermore, scarcity leads to possible negative implications, impacting people lives and prolonging the negative effects of this mindset (Mullainathan & Shafir,

2013; 2014; Haushofer & Fehr, 2014; Roux et al., 2015; Cannon et al., 2019). In view of these aspects, it was inevitable to ask whether resources (time and money) that are fundamental in people's everyday life weigh equally in their choices when experiencing a condition of scarcity. Interestingly, prior works have always investigated the consequences of resource scarcity, considering every resource separately and never looking at the interaction of different type of resources. Thus, in the first two experimental chapters, I investigated how people tradeoff between money and time, when one of the resources was perceived as scarce. Firstly, I considered the perceived economic scarcity and, subsequently, I added the effect of the scarcity of time. Considering the prominent role of time in people daily life and wellbeing (Strazdins et al., 2011) it is particularly relevant and useful, to better understand how individuals process and evaluate this resource, in order to develop plans and interventions that can really be effective for the reduction of the dysfunctional perception of not having enough.

Results from the first two studies, clearly showed that participants preferred to commit their time to save on a purchase, especially when they were experiencing a condition of money scarcity. Overall, the tendency to undervalue the time as a resource to gain money when in a condition of money scarcity, would be perfectly justified by the focus activated by the scarcity mindset (Mischel et al., 1972; Mullainathan & Shafir, 2013; Shah et al., 2018), as it is expected that people will be more concentrated in saving the resource perceived as scarce, that could eventually bring to the tunneling condition (Mischel et al., 1972; Mullainathan & Shafir, 2013; Shah et al., 2018). What happens then was that those who felt that they did not have enough monetary resources were more inclined to sacrifice other resources to increase their monetary availability. However, this effect was also found for people assigned to the control condition, even if slightly more attenuated. Although the results for the scarcity condition were consistent with previous

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works, the results related to the preference of money over time constitute new evidence and important addition to the literature.

In view of these results, it was therefore necessary to investigate how people decide to use time when the time itself is perceived as scarce. So, in the third chapter, I focused on the study of both economic and time perceived scarcity, and how this affects the tradeoff between the two resources. Consistent with the results from the previous studies, data from four additional studies, confirmed that people generally perceived money as predominant over time, but that when people perceive time as scare they are generally less inclined to sacrifice it. These results support previous studies highlighting the existence of a common scarcity mindset as response to the perception of lack for different resources (Mani et al., 2013; Mullainathan & Shafir, 2013; 2014; Vohs, 2013). Importantly, these results also revealed the idea that distinct resources are evaluated as differently important in everyday life, supporting the hypothesis that people underestimate the importance of time in their daily evaluations, by giving predominance to money.

Moreover, investigating the role of individual differences in the tradeoff between time and money, I found that higher numerical skills led people to be less willing to commit their time and more aware about the relevance of time as a resource. These results confirmed previous findings showing that lower numerical skills reduce the ability to have consistent assessments of utility and also showed a larger framing effect (Peters et al., 2006, 2007). In addition, these results suggest that people with higher numerical skills are better able to evaluating time and its inherent ambiguity (Soster et al., 2010).

Furthermore, to the best of my knowledge, the moderating effect of trait EI (namely people's understanding of their emotional skills and the world) on the perception of scarcity, was never considered before, thus these results are quite innovative. Results

showed that participants with higher trait EI were on the whole more likely than those with lower trait EI to perceive money as less prominent compared to time. In other words, people with higher trait EI were less willing to use their time to gain money, especially if they were not experiencing a shortage of money. A reasoned interpretation for these results is that the ability to regulate emotions helps people to reduce the stress and the negative feelings related to the perception of scarcity (Santiago et al., 2011; Haushofer & Fehr, 2014; Iemmi et al., 2016) and brings to more effective compromises among the available resources.

To summarize, these first six studies, confirmed the presence of a common mindset that drove people's behavior when experiencing a condition of scarcity. Interestingly, the intensity of the response induced by the scarcity mindset is moderated by the value that individuals attribute to a specific resource. In fact, as showed by results from the third chapter, people experiencing a scarcity of time showed similar behavior to those in the economic scarcity condition. Despite this, behaviors in conditions of time scarcity were attenuated compared to those in a scarcity of money. Probably, as suggested by Study 4 and 5, the concept of time has a broad meaning that goes beyond the single notion of time, and that may also include aspects related to money. Perhaps, the ambiguity behind the definition and comprehension of time is accentuated by the various functions that this resource assumes in our lives.

These results are relevant for several reasons, such as their theoretical, educational and policy-making implications. Considering the theoretical contribution, these first six studies expand the knowledge about the scarcity mindset, showing how, despite the existence of a general scarcity mindset, distinct resources have a different weight when in a tradeoff. Even interdependent resources such as time and money are also valued differently, probably reflecting cultural aspects and social pressure. For example, as

suggested by Okada and Hoch (2004), Europeans may value time differently compared to American and to Indian people. This is related to a different religion, a different concept related to the works and different work's experience that bring people to think about time and money very differently.

Looking at the educational aspect, knowing that, no matter what, people have the tendency to consider money as prominent over time, the present findings demonstrate that it would be important to raise awareness of individuals to balance these two resources more effectively. This is especially important when considering the implication of time scarcity on several dimension of people lives. Specifically, several studies found an effect of time scarcity on dietary habits (Jabs & Devine, 2006), on people health (e.g., poorer self-rated health, more sleep problems, and health dissatisfaction; Zuzanek, 2004), and also with psychosomatic symptoms (e.g., headaches and digestive disorders; Cawley, 2004; Strazdins et al., 2011). Moreover, other studies found a link between time scarcity and depression (Roxburgh, 2006; Zuzanek, 2004). Therefore, the health and wellbeing costs of treating these severe consequences could be reduced if we educate people to make a more responsible estimate of the value of time.

With respect to policy-making, institutions should have a greater awareness of the value of time when developing social plans and interventions. For instance, the present findings bring to light the need to develop not only interventions that protect people's wealth, but also programs to allow for more free time and for effective management of temporal resources. These considerations could also be applied to management issues. In fact, there are interesting and innovating companies who are already moving towards reducing working hours of employees and allow for additional family and free time to raise the quality of their life with a resulting higher return on investment. Recently, Ernst & Young Oceania offered to their employee a flexible vacation policy (up to 12 weeks of

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leave or part-time solution) hoping that through a time-off policy they will be able to draw and retain talented employees. Or again, it is becoming more and more common to have companies offering innovative childcare options to employees, such as company nurseries and kindergartens, that help reduce their stress, save time, and increase wellbeing and productivity.

Scarcity and its consequences creep up in multiple choices and contexts of our lives. To this end, the last three studies had the goal of investigating how scarcity impacts financial decisions and the wellbeing of retired people. Specifically, I investigated how the perception of not having enough resources fulfill end meets impacts people's preference for thinking about money in nominal rather than real value, namely money illusion. Previous work showed that the money illusion effect is due to the fact that people attend to nominal value because it is salient, easy to evaluate, and in many cases provides a reasonable estimate of real worth (Shafir et al., 1997). So, through a series of three studies, I investigated wheatear the detrimental effect of the scarcity impacts also people's ability to recognize adequate financial decisions. This decision was justified by the fact that confounding the difference between real and nominal interest rate can have a significant impact on people's wealth and daily life. Previous studies have reported that money illusion could influence judgements of fairness (Kahneman et al., 1986), people's quality of life, the quality of their health care (Taylor & Geldhauser, 2007; Wang & Shi, 2014) and even affects chronic stress and anxiety (Pinquart & Schindler, 2007; Reitzes & Mutran, 2004).

Consistent with the hypothesis, results from the two lab studies showed that participants in the scarcity condition felt to be less able to manage an economic emergency and less able to have an adequate lifestyle. Moreover, results showed that people experiencing a condition of scarcity were more prone to fall into the money

illusion bias. In fact, these participants perceived an increase in the pension check as more acceptable than a decrease, despite the fact that the real value of the pension decreased less when it was cut down rather than raised. In addition, in the second study, I measured environmental sensitivity (a measure of the ability to process and react to external factors, Pluess, 2015) as moderator in the decision to accept or not the change in the pension check. Results showed that environmental sensitivity reduced the perception of financial hardship, indicating that participants with higher ability to process and regulate their reaction to contextual factors were less prone to experience the effects of scarcity. Moreover, in both the study, results were not influenced by participants' educational level, confirming that the results were due to the scarcity mindset.

Finally, a field study with actual retired people replicated the results from the lab. In fact, as in the previous two studies, results showed that the pension amount predicted the ability to cope with economic difficulties and also with the ability to live adequately. Specifically, as the pension amount decreased, people reported being increasingly less able to deal with economic emergencies and to have an adequate lifestyle. Moreover, in this last study, I also measured participants crystallized and fluid intelligence. Results indicated that participants with a higher fluid intelligence score, no matter their economic condition, described themselves as more able to face economic struggles. These results confirmed not only the previous literature but also supported the hypothesis that the perception people have about the quality of their life does not depend exclusively on the actual economic condition but also on the way they perceive their wealth.

Results from these last three studies clearly support previous literature about the money illusion effect, confirming that people tend to think about transactions predominantly in nominal terms rather than real terms (Shafir et al., 1997; Weber et al., 2008). In addition to this, these findings added something new to the money illusion

theory and to the scarcity theory, showing how the perception of not having enough resources increase the risk to be exposed to the money illusion effect. In fact, also in Study 9, results were not affected by the educational level of the participants, suggesting that is the scarcity mindset that bring people to overthink about the nominal value of decision (Mullainathan & Shafir, 2013, 2014), diminishing the amount of cognitive capacity left to evaluate the real value of their financial decision. For people experiencing a condition of economic scarcity, concerns about money, even when no financial decisions are needed and thus the money is not directly involved, emerged spontaneously and are difficult to suppress (Shah et al., 2018). According to Shah and colleagues (2018) these constant economic concerns shape the connections that people see between things, always bringing everything back to an economic assessment. However, another possible interpretation is that scarcity brings people only to consider the aspect of increasing or reducing the monthly check as immediate and prominent information that can be used to assess one's future ability to spend and can be connected easily to their perceived economic condition. Instead, assessing the real value of the change in the retirement check could be trickier to do and likely requires more attention and cognitive resources to compute it.

However, it is a fact that people can be exposed to contextual factors when they have to make a financial decision, and the effects of these factors can be exacerbated when people feel they do not have enough resources because of an objective condition or just a subjective perception. It is important to consider these reactions and decision blunders to devise effective policies to help people to overcome the scarcity mindset. Offering to people experiencing the scarcity a clearer and simple context to make economic and financial decision should be definitely helpful to support them move out from economic shortage and, probably, reduce their perception of scarcity.

The importance of studying the effect of the scarcity mindset on retirement and also on financial decision making is justified by the incessant number of economic decisions that people have to take every day. Finding a way to make the context for this kind of decisions easier and clearer could help improve people's behavior and, in particular, reduce the risk of non-advantageous choices for those experiencing a condition of scarcity. Improving the economic and financial decision-making skills of individuals facing a condition of scarcity undoubtedly offers them an overall economic advantage as well as improving their lives as a whole.

The nine studies described in this dissertation clearly contribute in important ways to the theory of scarcity and no less relevant are the practical implications that can derive from these results. Despite this, it is important to recognize the limits of these studies. First of all, although the hypothetical approach is widely used in research on scarcity (Roux et al., 2015; Goldsmith et al., 2018; Zhu & Ratner, 2015), eight out of nine studies were hypothetical. Moreover, in studies one to six, I recruited participants through Amazon Mechanical Turk or from a subject pool of college students, providing participants with an economic compensation or course credits. The reward, in particular the economic one, could have impacted on participants' decision to the tradeoff between time and money, making even more prominent the relevance of money over time. In general, considering that in these studies I investigated the tradeoff between money and time using convenience samples (colleges students and Amazon Mechanical Turk workers), it would be appropriate to try and replicate these findings with a sample of people who have a full-time job or with managers (people who have a time demanding job but are compensated accordingly to the time they commit to their profession), with a non-monetary or time reward.

The second limit of these specific studies lies in the scenario: it would have been appropriate to choose more comparable money and hours amounts through the different scenarios, in order to reduce the discrepancy between the resources. A reasonable possibility would have been to use the same scenario used for Study 1 and 2, also when the time scarcity had been introduced. In this way, using scenarios from previous studies, and then possibly adding new scenarios, would have allowed to better control the effect of the context.

Another weakness of the scenarios lies in not considering the opportunity cost related to alternative uses of time or money. In order to avoid confounding effects in how people might use the saved resources when trading them off, it may be appropriate to reorganize the scenarios giving the participants the opportunity to indicate what they would use the saved resource for already on the tradeoff. In this way, participants should indicate their preference in a more ecological setting evaluating their preference for money or time having something more personal to consider. In this direction, a possibility for future studies, inspired by the literature on the prominence effect (Slovic, 1975), is to create equally valued alternatives considering time and money. Manipulating the perception of the scarcity after people specify the alternatives they prefer, and asking them to decide between equally valued multi-attributed alternatives, would allow to find out the dimension that is prominent. In this way, participants will choose between alternatives that should have the same value to them. As a result, if they consistently choose the alternative offering more money, then it clearly indicates that this resource is prominent to them. This could be a way to reduce the context effects or the confounding arising because of the opportunity cost.

Moreover, the study with the word recognition task (Study 5), was run with a sample of undergraduates from Concordia University, an international university in Quebec, the

French province of Canada. One of the limits of this study lies in the fact that it was used an English dictionary for the word recognition task in an area where English is not the first language for many people, although many natives are almost bilingual, and with a high percentage of international students (more than 50%[4]). A possible solution could be to run a new study accepting only native or bilingual speaker, so that language proficiency would not be an issue.

Considering the studies on money illusion, it is important to notice that, in two out of three studies, I used a hypothetical manipulation in which people were told different pension amounts between-subjects, and asked to imagine how their life in retirement would be. First of all, it is possible that the manipulation was most effective because of the pension amount rather than because of a different perception of scarcity. In fact, the manipulation was quite essential, and the most salient information was about the amount of the retirement check. With this in mind, a limit is that the questions about the perception of having resources to live adequately or to be able to deal with a financial emergency were probably not enough detailed to obtain a specific measure for the perception of scarcity. In future studies it would be reasonable, to use more details to describe the scenario focusing more on the concept of having not enough resources to manage needs. Moreover, in regard to this last chapter, it is important to consider that in the field study, although the results replicated what was found in the lab, the sample size was rather small. This was due to the difficulty of finding subjects willing to participate in the two sessions of the experiment without compensation and in good health. For future studies, a solution could be to use a shorter survey to assess fluid intelligence in order to reduce the data collection to a single session.

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[4] Linguistic Profile of Concordia's Students 2018/19 https://www.concordia.ca/about/fast-facts.html#tab3

A further interesting observation regarding the present results is that I mostly ran the experiment with western-culture people and the results may not be easily generalizable beyond this culture. For instance, it is possible that the prominence of the money over time is perceived in North American culture and not in the rest of the World. As for the money illusion study, it is possible that the results apply to the Italian population and the specific economic conditions of this specific country. In both cases, to have broader and more generalizable results, it would be interesting to run cross-cultural studies in the future.

To conclude, I would like to pick up on the words with which I began this dissertation: "*The money which a man possesses is the instrument of freedom; that which we eagerly pursue is the instrument of slavery*" (Rousseau, 1996). This statements clearly describe the fundamental needs to better consider and study the scarcity, considering the multitude of disadvantageous effects that this mindset could have in a broad perspective. Moreover, literature has largely focused on the psychological and behavioral consequences of experiencing a real or perceived lack of resources (see Cannon et al., 2018 for a review), but it has largely neglected the antecedents of a scarcity mindset, or what causes this pervasive state of mind beyond a simple access to resources (Goldsmith et al., 2018). Thus, future research should attempt to fill these theoretical gaps by identifying the antecedents of a scarcity mindset, such as individual differences that may increase the likelihood of triggering such state of mind. This future line of research will thus advance our understanding of the psychology of resource scarcity in several ways. First of all, by helping identify why some individuals are more likely to feel as if they "do not have enough", which will then help reduce their likelihood of experiencing a scarcity mindset. Consequently, should help also to reduce the numerous detrimental effects such mindset can have on their wellbeing.

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Appendix 1

Manipulation. Below, I report the scarcity manipulation (adapted from Fischhoff et al., 2003 and Roux et al., 2015) as participants saw it on the screen. Studies from chapter two and studies 3,5, and 6 share the same manipulations, I report the manipulation below and refer to the manuscript for variations in how the material were described.

1. Money scarcity manipulation

MEMORY STUDY

Briefly describe three or four times when you felt like you <u>didn't have enough money</u> in the past or times when you usually feel <u>money is scarce.</u> They can be specific situations, prior instances, or anything else that first comes to mind:

1)
2)
3)
4)

Now please write 3-5 sentences elaborating on <u>two</u> of the things that you mentioned above. Please think about what you experienced. Why did you feel like you didn't have enough money? How much money were you lacking?

1.

2.

2. Time scarcity manipulation

MEMORY STUDY

Briefly describe three or four times when you felt like you <u>didn't have enough time</u> in the past or times when you usually feel <u>time is scarce</u>. They can be specific situations, prior instances, or anything else that first comes to mind:

1) [   ]
2) [   ]
3) [   ]
4) [   ]

Now please write 3-5 sentences elaborating on <u>two</u> of the things that you mentioned above.
Please think about what you experienced. Why did you feel like you didn't have enough time? How much time were you lacking?

1. [   ]

2. [   ]

3. Control condition

MEMORY STUDY

Briefly describe three or four things that you did in the past week. They can be activities, interactions you had with other people, or anything else that first comes to mind:

1) [   ]
2) [   ]
3) [   ]
4) [   ]

Now please write 3-5 sentences elaborating on <u>two</u> of the things that you mentioned above.
Please think about the feelings that you experienced. How did engaging in the activity make you feel? Why do you think that activity was particularly memorable?

1. [   ]

2. [   ]

Appendix 2

Scenarios. Below, I report the scenarios used in Study 3 and 4 (adapted from Becker et al., 1964). Scenarios 2 and 4, were used also in Study 4. Scenarios 1 and 2 refer to the category *Spend money to earn time*, while Scenarios 3 and 4 belong to the category *Spend time to gain money*.

1. Scenario: Moving study.

MOVING STUDY

Imagine that you are moving to a different location and that you have decided to hire a moving company. The best price that you have found for the service is **$500**, which includes packing and moving your possessions.

The moving company informs you that **you can obtain a discount if you help pack boxes**, as it will have to provide less personnel during that time, and that the discount will be proportionate to the amount of time that you are willing to help.

Packing all your possessions should take approximately **6 hours** in total and, if you decide to help for the entire time, your moving fee will be brought down to **$150** (to still cover for the cost of personnel and the moving truck).

For each option below, indicate whether you would prefer to spend time helping with packing to save some money or pay the full cost:

Help 30 min, pay $480	○ ○	$500
Help 1 hr, pay $450	○ ○	$500
Help 1 hr and 30 min, pay $420	○ ○	$500
Help 2 hrs, pay $390	○ ○	$500
Help 2 hrs and 30 min, pay $360	○ ○	$500
Help 3 hrs, pay $330	○ ○	$500
Help 3 hrs and 30 min, pay $300	○ ○	$500
Help 4 hrs, pay $270	○ ○	$500
Help 4 hrs and 30 min, pay $240	○ ○	$500
Help 5hrs, pay $210	○ ○	$500
Help 5 hrs and 30 min, pay $180	○ ○	$500
Help 6 hrs, pay $150	○ ○	$500

2. Trip Study (used also in Study 4).

TRIP STUDY

Imagine that you are at the airport on a Friday, on the way to a long weekend trip to Las Vegas. You are due to arrive in Las Vegas at **4 pm**. However, the attendant at the gate tells you that **your flight has been overbooked**.

The attendant kindly asks you **whether you would be willing to wait for a next available flight** in exchange for a **monetary compensation based on how long you wait**, or if you would prefer to **get on the flight that is about to leave**.

For each row, indicate whether you would prefer to wait in exchange for a monetary compensation or leave right away to arrive on time:

Wait 30 min for another flight, get $50, arrive at 4:30 pm	○ ○	Leave now and arrive at 4pm
Wait 1 hr for another flight, get $100, arrive at 5 pm	○ ○	Leave now and arrive at 4pm
Wait 1 hr 30 min for another flight, get $150, arrive at 5:30 pm	○ ○	Leave now and arrive at 4pm
Wait 2 hrs for another flight, get $200, arrive 6 pm	○ ○	Leave now and arrive at 4pm
Wait 2 hrs 30 min for another flight, get $250, arrive at 6:30 pm	○ ○	Leave now and arrive at 4pm
Wait 3 hrs for another flight, get $300, arrive at 7 pm	○ ○	Leave now and arrive at 4pm
Wait 3 hrs 30 min for another flight, get $350, arrive at 7:30 pm	○ ○	Leave now and arrive at 4pm
Wait 4 hrs for another flight, get $400, arrive at 8 pm	○ ○	Leave now and arrive at 4pm
Wait 4 hrs 30 min for another flight, get $450, arrive at 8:30 pm	○ ○	Leave now and arrive at 4pm
Wait 5 hrs for another flight, get $500, arrive at 9 pm	○ ○	Leave now and arrive at 4pm

3. Scenario: Transportation study.

TRANSPORTATION STUDY

Imagine you are having a very busy Friday night and you need a cab to go back home. You are in an area that is not well deserved by public transportation, so a taxi is your only way home.

Because of the high demand for the taxi service, there is a very limited number of cars available and the wait time for an available cab is around **75 minutes**.

You can either **pay a fee**, in addition to your cab fare, **to get access to a cab faster** or **wait until a cab becomes available free of charge**.

For each option below, indicate whether you would prefer to pay the fee to save time or wait for the next available cab free of charge:

$2 fee for a 60-min wait	○ ○	wait 75 min
$5 fee for a 55-min wait	○ ○	wait 75 min
$8 fee for a 50-min wait	○ ○	wait 75 min
$11 fee for 45- min wait	○ ○	wait 75 min
$14 fee for a 40-min wait	○ ○	wait 75 min
$17 fee for a 35-min wait	○ ○	wait 75 min
$20 fee for a 30-min wait	○ ○	wait 75 min
$23 fee for a 25-min wait	○ ○	wait 75 min
$26 fee for a 20-min wait	○ ○	wait 75 min
$29 fee for a 15-min wait	○ ○	wait 75 min
$32 fee for a 10-min wait	○ ○	wait 75 min
$35 fee for a 5-min wait	○ ○	wait 75 min

4. Scenario 2: Promotion study (used also in Study 4)**.**

PROMOTION STUDY

Imagine that, this Saturday at 12 pm, a local electronics stores is going to have a huge promotional event: The store will be giving away gift certificates of a value of **$65** to the first 500 customers, which can be used to purchase anything inside the store.

The event is expected to be very popular, so you would have to wait in line early in order to be able to receive one of the gift certificates.

Based on the amount of people who usually line up for these kinds of promotions, you believe that you would need to **wait in line at least 4 hours** in advance in order to be among the first 500 customers. Someone in the cue however offers you to **save your spot for a certain amount of time for a fee**.

For each option below, indicate whether you would prefer to pay the fee to save some time or wait in line:

Skip 15 min of waiting for $6	○ ○	wait 4+ hours
Skip 30 min of waiting for $18	○ ○	wait 4+ hours
Skip 1 hr of waiting for $24	○ ○	wait 4+ hours
Skip 1 hr 30 min of waiting for $30	○ ○	wait 4+ hours
Skip 2 hrs of waiting for $36	○ ○	wait 4+ hours
Skip 2 hrs 30 min of waiting for $42	○ ○	wait 4+ hours
Skip 3 hrs of waiting for $48	○ ○	wait 4+ hours
Skip 3 hrs 30 min of waiting for $54	○ ○	wait 4+ hours
Skip the whole wait for $60	○ ○	wait 4+ hours

Time Perception Scale (adapted from Wiepking & Breeze, 2012).

Thinking about your time availability, please answer each statement below by selecting the number that best reflects your degree of agreement or disagreement with that statement.
There are no right or wrong answers.

	Completely disagree						Completely agree
I often say 'I don't have the time', regardless whether I do or not.	O	O	O	O	O	O	O
I have less free time than my friends think.	O	O	O	O	O	O	O
Most of my friends have more free time than I do.	O	O	O	O	O	O	O
I worry about my available time most of the time.	O	O	O	O	O	O	O
I often have difficulty in making decisions about spending time regardless of the duration.	O	O	O	O	O	O	O
Even when I have the time, I often feel guilty about spending time on leisure activities (e.g., watching a movie, etc.).	O	O	O	O	O	O	O

Appendix 4

Manipulation. Below, I report the scarcity manipulation used in Study 4 (adapted from

Haisley, Mostafa & Loewenstein, 2008) as participants saw it on the screen.

1. **Money constraint condition**

Please indicate **how much money you get every week** (from a salary, allowance, scholarship, financial support, etc.) using the following slider scale (from $0 to $2,000 or more):

| 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 |

$ CAD

2. **Money no-constraint condition**

Please indicate **how much money you get every week** (from a salary, allowance, scholarship, financial support, etc.) using the following slider scale (from $0 to $100 or more):

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

$ CAD

3. **Time constraint condition**

Please indicate your **weekly amount of leisure time** (or free time) using the following slider scale (from 0 to 100 or more hours per week):

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

Hours of leisure time/week

4. Time no-constraint condition

Please indicate your **weekly amount of leisure time** (or free time) using the following slider scale (from 0 to 10 or more hours per week):

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Hours of leisure time/week

Appendix 5

Scenarios. Below, I report the scenarios used in Study 6 (adapted from Becker et al., 1964). Participants were randomly assigned to either one combination of scenarios (combination 1) or the other (combination 2).

1. Combination 1:

PROMOTION STUDY

Imagine that, this Saturday at 12 pm, a local electronics store is going to have a huge promotional event: The store will be giving away **gift certificates of a value of $200** to the first 50 customers, which can be used to purchase anything inside the store.

The event is expected to be very popular, so you would have to wait in line early in order to be able to receive one of the gift certificates.

How long would you be willing to wait in line in order to be able to receive one of the $200 gift certificates? Please only enter numerical values.

Hours: _____

Minutes: _____

TRIP STUDY

Imagine that you are at the airport on a Friday, on the way to a long weekend trip to Las Vegas. You are due to arrive in Las Vegas at **4 pm**. However, the attendant at the gate tells you that **your flight was overbooked.**

The attendant kindly asks you **whether you would be willing to wait for 3 hours for the next available flight in exchange for a voucher compensation** applicable to any future flight purchases.

How much would the voucher need to be worth (in $) for you to be willing to wait 3 hours until another flight is available? Please only enter numerical values.

$ _____

2. Combination 2:

PROMOTION STUDY

Imagine that, this Saturday at 12 pm, a local electronics store is going to have a huge promotional event: The store will be giving away **gift certificates** to the first 50 customers, which can be used to purchase anything inside the store.

The event is expected to be very popular, so you would have to **wait for 4 hours** in line in order to be able to receive one of the gift certificates.

How much would the gift certificate need to be worth (in $) for you to be willing to wait 4 hours in line? Please only enter numerical values.

$ [   ]

TRIP STUDY

Imagine that you are at the airport on a Friday, on the way to a long weekend trip to Las Vegas. You are due to arrive in Las Vegas at **4 pm**. However, the attendant at the gate tells you that **your flight was overbooked**.

The attendant kindly asks you **whether you would be willing to wait for the next available flight in exchange for a $300 voucher compensation** applicable to any future flight purchases.

How long would you be willing to wait for the next flight in exchange of a $300 voucher? Please only enter numerical values.

Hours: [   ]
Minutes: [   ]

Appendix 6

Distribution of pensions in Italy (ISTAT, 2017).

€/month	Number of retired people	% over total retired
Up to 249	1 870 410	
250 - 499	3 546 875	24%
500 – 749	6 672 060	
750 – 999	2 062 588	
1000 – 1249	1 803 125	53%
1250 – 1499	1 434 626	
1500 – 1749	1 391 623	
1750 – 1999	877671	
2000 - 2249	752 428	13%
2250 - 2499	587641	
> 2500	1 560 549	6%
Total retired	22 559 596	