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In medio stat filius.
The relationship between time preferences and fertility

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Abstract

Objective Time discounting preference (TDP) is a trait indicating to what extent individuals prefer immediate but lower benefits versus future but higher benefits. It can also be interpreted as the inclination to be more or less impatient. TDP has been found to influence different human decisions, including health behaviour and schooling investments. This study is the first that explores whether this trait represents a determinant of fertility.

Background Fertility decisions, like all life actions, imply a balancing of anticipated costs and benefits the expectations for which are formed under uncertainty. Fertility research has addressed a multitude of 'backward' correlates (socio-demographic or biological factors) of fertility decisions. Yet, the role of 'forward' factors, such as TDP, has never been explored.

Method Unique data from the panel component of the Survey of Household Income and Wealth carried out by the Bank of Italy every two years were used. We applied logistic regression models using a question included in the 2004, 2008, 2010 and 2012 waves to examine whether, net of backward factors, impatience affects first (N=760) and second (N=1284) parity progressions.

Results Findings indicate an inversed U-shape relationship between impatience and the probability of the transition to the first and the second child. For very patient and for very impatient individuals the probability of having a child is lower than for those with intermediate levels of impatience.

Conclusion The empirical findings point to the need to consider TDP in fertility research so as to gain a more complete understanding of fertility behaviour.

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Fertility decisions, like all life actions, imply a balancing of anticipated costs and benefits, the expectations for which are formed under uncertainty. Outcomes cannot be known with any precision (Beckert & Bronk, 2018). The socio-demographic literature has extensively analysed several micro-level determinants of the decision-making process influencing fertility outcomes (see Balbo, Billari, & Mills, 2013, for a review). These kind of micro-level determinants of fertility, however, represent the 'backward-looking' side of reproductive behavior (Johnson-Hanks, Bachrach, Morgan, & Kohler, 2011: 58). Classical determinants of fertility, such as social background or economic constraints, identify characteristics or (cumulative) experience of what has already happened over an individual's life course. Similar considerations can be applied to other established *explicanda* of fertility choices, such as the cultural heritage or the historical context that form a backdrop to the fertility decision-making process. What is missing in the socio-demographic literature is the consideration that fertility choices are also driven by 'forward-looking' factors that are strictly related to individual expectations.

Fertility decisions are oriented toward the future, given that the consequences of reproductive choices develop over time, both in the short and in the long term (Ajzen & Koblas, 2013). Individuals evaluate the future thinking of a potential birth. The future perspective of this latent event may depend on individuals' *time preferences.* They may influence how expectations form within this kind of forecasting process. Time preferences refer to the natural tendency of individuals to prefer the present over the future, and to the formation of expectations about the trade-off between costs and benefits occurring in different time periods (Berns, Laibson, & Loewenstein, 2007). Time discounting preferences (TDP) indicate the extent to which individuals prefer immediate utility over delayed utility: i.e. by how much delayed utility is "discounted" by the individual to gain an immediate benefit (Frederick, Loewenstein, & O'donoghue, 2002). TDP can also be thought of as the individual preference on how to solve the conflict between impatience and improvement over time. Impatience pushes individuals to "cash in" a given utility as soon as possible, even if waiting may imply a higher utility; preference for patience implies weighting the desire or expectation to improve utility in the future. In the following, we use impatience and time discounting preferences interchangeably: an

individual with a high discounting rate is referred to as being “highly impatient”, while an individual with a low discounting rate is referred to as being “highly patient”.

The present paper is the first that examines how time preferences influence fertility. TDP has become one of the most-studied constructs in behavioural sciences (Spivey, 2010), as it strongly influences a variety of human choices, such as educational attainment, labour market and health outcomes (e.g. Breen, van de Werfhorst, & Jaeger, 2014; Golsteyn, Gronqvist, & Lindahl, 2014). It might affect fertility choices too, we posit here, for at least two reasons. First, TDP should be key to explaining parenthood given that this is, by definition, a decision that implies intertemporal consequences – consequences occurring at different points in time. Individuals can form expectations about the costs and benefits of childbearing, but these are uncertain not only in their amount but also in their timing. In this sense people may expect benefits to overcome (or not) costs in the short or in the long term, according to what degree they are impatient. In other words, the cost-benefits calculation associated with childbearing could be influenced by the intertemporal trade-offs of individuals. Second, given the progressive diffusion of Post-Materialistic values in Western societies, individuals give more weight to the fulfilment of individual inclinations. In this scenario, individual predispositions, such as time preferences, should play a key-role in fertility decisions.

Using longitudinal data, we answer the research question of whether individual’s discounting preferences influence parity transitions. The analysis is based on large-scale data from SHIW (Survey of Household, Income and Wealth) collected by the Bank of Italy (www.bancaditalia.it/pubblicazioni/indagine-famiglie/index.html). The dataset reports information on individuals’ socio-demographic and family-related characteristics (including childbirth) of a representative sample of Italian households during the first two decades of the 2000s. Most importantly, it provides measures of general TDP in four panel waves that are assessed in survey questions related to a hypothetical lottery/inheritance. Italy is an interesting setting for this study given that fertility decisions are carefully planned by couples (Dalla Zuanna, De Rose, & Racioppi, 2005) – the rate of unplanned births in Italy is relatively low.

BACKGROUND. TIME PREFERENCES AND BIRTHS

In the last decades, the literature on fertility has extensively analysed several micro-, meso- and macro-level determinants influencing the decision-making process behind fertility timing and quantum choices. A large part of the literature has focused on the impact of the socio-economic circumstances of individuals, such as educational attainment (e.g. Skirbekk, 2008), income (Jones, Schoonbroodt, & Tertilt, 2011), employment status (e.g. Breen, 1997), economic constraints (e.g. Nau, Dwyer, & Hodson, 2015), and social background (e.g. Murphy & Wang, 2001). Also, demographic characteristics such as female and male partners' age (Billari & Tabellini, 2010) and the number of previous children (Dommermuth, Klobas, & Lappegård, 2015), are among the micro-level factors that have been found to affect fertility behaviour. In the last years, scholars in social demography, as well as in social psychology, have shown that personality traits influence fertility (Lundberg, 2009; Jokela, Alvergne, Pollet, & Lummaa, 2011; Jokela, 2012; Le Moglie, Mencarini, & Rapallini, 2015).

We argue that socio-economic circumstances, demographic characteristics and personality traits (among others) represent past conditions or, strictly speaking, backward factors for fertility (Francesconi, 2002). The missing element here is the role of the future perspective of individuals. The importance of adopting a forward-looking perspective in the analysis of the fertility decision-making process has been primarily emphasized within the socio-psychological framework of the Theory of Planned Behaviour (TPB). In this model, perceived constraints related to fertility decisions are operationalized in a hypothetical future situation (Schoen, Astone, Kim, Nathanson, & Fields, 1999; Ajzen & Klobas, 2013). In this sense, individuals evaluate the saliency of the costs/benefits of giving birth as a function of time relationship (Rachlin, 1989). As Ranyard, Crozier and Stevenson (1997, p. 165) stated "*time is an ever present and prominent dimension in all human decision making*". As in other cases where returns are delayed (e.g., educational choices), fertility decisions are also oriented towards the future, given that their consequences develop over time. As such, time

preferences should play a role in determining fertility decisions. In particular, decision-makers with a high time discounting rate tend to be more focused on the utility of the investment in the present and the immediate future relative to other individuals. People, meanwhile, with a low time discounting rate place more emphasis on their utility in the more distant future. More broadly, the term *time discounting preference* is used to "*encompass any reason for caring less about a future consequence, including factors that diminish the expected utility generated by a future consequence, such as uncertainty or changing tastes*" (Frederick et al., 2002: 352). TDP depicts differences in cognitive representations between near and future events and in time orientation. As suggested by numerous authors, individuals with a high rate of TDP are identified as impatient, impulsive and intuitive persons with less self-control (e.g., Peters & Büchel, 2011). On the contrary, individuals with low TDP are identified as being patient. All backward factors being equal, which group of decision-makers is more likely to have children?

THEORETICAL PERSPECTIVES: THE UTILITARIAN VALUE OF CHILDREN *VERSUS* THE IMMINENT VALUE OF CHILDREN

We argue that the sign of the relationship between impatience and fertility is far from being straightforward. On the one hand, having a child entails a utilitarian/instrumental value (Becker, 1974) – mainly accessible in the long run (e.g. children as an old age security). On the other hand, childbearing also has an imminent value (Friedman, Hechter, & Kanazawa, 1994) that immediately comes into play (e.g. children as marital stabilizers).

Under the standard expected utility framework, one might hypothesize that the higher the rate of time discounting the lower the parity progression probability. As already said, persons with high TDP are more likely to focus on *hic et nunc* (here and now) fulfilment and tend to avoid delayed gratification – their investment in the future is lower. In a Beckerian key, individuals with short time

horizons may perceive childbearing as a goal with high immediate material (e.g. money) and immaterial (e.g. spare time) costs (e.g. Nomaguchi & Milkie, 2004). Accordingly, the losses of having a child would be perceived by impatient individuals as outweighing the benefits. This attitude may weaken their intention to have a child, thus decreasing their parity progression. We might come to the same conclusion thinking about another (indirect) pattern that links impatience and childbearing. As argued by De Paola and Gioia (2015), impatient individuals, more set on immediate fulfilment, are less likely to invest time in a search for a well-matched partner, and may end up, as a result, with a worse match. The quality of the partnership will, in turn, negatively affect the attitude toward having a(nother) child – given the potential higher degree of instability in their partnership.

Moreover, a high level of impatience may induce potential parents to adopt risky forms of behaviour. Hazardous choices, such as smoking, drinking, gambling and cheating, are potential drivers of immediate pleasure. Very impatient individuals, guided by the *carpe diem* principle, are less likely to resist risky behaviour – given that they give 'value' to what happens in the present. As shown by Spivey (2010), individuals who undertake risky forms of behaviour may be perceived as inadequate parents by their partners.

Following the same reasoning, the fertility attitudes of patient individuals, prioritizing (higher) future utilitarian value (e.g. in terms of insurance utility and dialogical benefits), should be less conditional on concerns about the immediate costs of childbearing. Moreover, individuals with a low discounting rate (patient) would tend to make more effort to 'settle down', searching for a good job, a good income and a good partner (Wilson & Daly, 1997). Once these conditions are performed, they would feel that they are now free to achieve their fertility plans. In this sense, their low time discounting preferences contribute to them following a certain sequence of life-events that is more likely to hit on the right time for having a child. As such, they are expected to be more likely to have birth progressions.

Given these considerations, *a negative relationship between impatience and fertility transitions might be expected*.

However, embracing the core idea of offspring as an imminent value, one might question the view that more impatient individuals have a lower probability of having children compared to their more patient counterparts. The Value of Children (VoC) perspective suggests that, given that childbearing provides a significant increase in an individual's wellbeing immediately upon birth, then the obtainable benefits of parenthood in the short run are likely to outweigh the costs. When people decide to have a child, they anticipate a happy event that, in turn, increases life satisfaction (Mencarini, Vignoli, & Gottard, 2018). A rise in subjective well-being around childbirth, typically found in life satisfaction or happiness trajectories before and after the birth of a child, confirms a positive affective forecast (e.g., Balbo & Arpino, 2016; Myrskyla & Margolis, 2014) – even if afterwards subjective well-being is likely to fall. These immediate benefits are, in part, due to the fact that, having a child, decreases marital uncertainty through marital solidarity – other short period benefits include status attainment and stimulation (Nauck, 2007).

A different kind of reasoning that supports the expectation that more impatient individuals would be more likely to have children would be based on the relationship between time preferences and impulsivity. As documented by Golsteyn et al. (2014), a very high level of impatience is associated with more impulsivity that, in turn, is more likely to lead to teenage parenthood – a phenomenon that is more common in Anglo-Saxon countries than in Italy. A further argument goes in the same direction. Because extremely impatient individuals are less able to imagine the future, they might give more emphasis to the risk of declining fecundity – that goes hand in hand with overestimating the likelihood of future health problems (Camerer, Loewenstein, & Rabin 2004). This, in turn, may boost the fertility of very impatient individuals.

Decision-making research has analyzed the relationship between TDP and psychological characteristics. In particular, Borghans, Duckworth, Heckman, & Ter Weel (2008) have showed that

time preferences are linked to a high level of conscientiousness that, in turn, is associated with self-control and self-discipline. It follows that patient individuals constantly monitor themselves and regulate their behavior in line with their own goals and self-imposed standards. In other words, the ability to utilize regulatory resources to actively control emotion and behavior through time in order to forego potential immediate rewards is likely to be strongly related to patience. Thus, a strong ability to resist short-term rewards in favor of longer-term alternatives may make it less likely that someone has children. The persistent tendency to inhibit emotion in order to build a high-quality career both in the labor market and in the marriage-market could induce someone to procrastinate with childbearing for too long. Waiting too long lowers, of course, the chances of having a child (e.g. due to infecundity).

Given these considerations, *a positive relationship between impatience and fertility transitions might be expected*.

Because theoretical arguments sustain both directions of the relationship between impatience and fertility, more complex relationships (nonlinear, e.g. U-shaped or inversed U-shaped) should be expected. In other words, it may be that the likelihood of having a child is the highest/lowest for those that are extremely patient or extremely impatient. The mechanisms driving a possible positive relationship and those operating in the opposite direction may even compensate giving rise to an overall null relationship. Therefore, we will test whether there is any relationship between impatience and fertility and whether this relationship is linear or not.

Differentials by Parity, Age and Education

The relationship between TDP and fertility needs to be anchored in life-course research, conceptualizing fertility choices as a succession of transitions in one's life-course. Impatience may have a stronger effect, especially on the transition to first birth, which represents a turning point in

life, one that is increasingly exposed to external uncertainties, particularly those related to economic constraints (Kreyenfeld, Andersson, & Pailhé, 2012). Of course, the postponement of childbearing may affect completed fertility because of the limited time interval left for second or higher order births. Delaying the entry into motherhood may, in some cases, also lead to involuntary childlessness.

In addition, the association between time preferences and fertility outcomes might differ between different segments of the population. Some of the reasons why impatience might affect childbearing may be age-specific. The impact of impatience should be more dominant during younger ages. This, in any case, is the life course stage when individuals can decide to procrastinate over the decision to have a child without consequences for the chances of eventually having a baby – infertility and sterility are, in a sense, minor issues (Mills, Rindfuss, McDonald, & Te Velde, 2011). This argument is particularly relevant if one considers the female partner's age.

The educational resources of individuals are also likely to moderate the association between TDP and fertility. The impact of TDP is expected to be more relevant for those with lower levels of education. Being future oriented could be a more important trait for these individuals when predicting fertility outcomes. In fact, highly-educated individuals should be less influenced by the level of impatience because they have spent more years in the educational system – the time window for becoming a parent is overall smaller (compared to time window for those who did not go to university). One might, on similar grounds, consider that highly-educated individuals are likely to follow a more structured path in their educational and labour market career that, in turn, creates better conditions for starting a family, regardless of impatience levels. On the contrary, because highly-educated individuals are more influenced by the diffusion of post-modernist values (Lesthaeghe, 2010), one might expect that TDP, as an individual characteristic that influence attitudes, plays a more relevant role for this group.

The Italian Case of Low Fertility

Persistently low fertility levels and strong family ties have long characterized Italy (Dalla Zuanna & Micheli, 2006). After the baby boom in the mid-1960s, the total fertility rate (TFR) steadily declined to very low levels in the mid 1980s, reaching lowest-low fertility rates (less than 1.3 children per woman) in the period 1993–2003 (De Rose, Racioppi, & Zanatta, 2008). At the turn of the century, fertility started to increase again, and TFR peaked in 2010 at 1.46. Then, since 2010, Italian fertility has declined again and, since 2017, Italy has once more been in a lowest-low fertility regime, with a TFR of 1.3 (Istat, 2019). A glance at age-specific birth rates suggests that the recent fall in period fertility is essentially attributable to birth postponement (Caltabiano, Comolli, & Rosina, 2017). In this context, the level of an individual's impatience might prove a crucial interpretative lens, as the decision to postpone the first birth is likely to depend on whether women believe that they will still have time to have a child afterwards.

Italy offers an interesting case study for investigating the relationship between TDP and fertility because, there, reproductive decisions are carefully managed by couples. We give two examples to substantiate this consideration. First, rates of unintended pregnancies, including teen pregnancies, are extremely low. Second, the decline in Italian fertility from the 1970s to 2000 happened without the diffusion of modern contraception; it was, instead, the result of deliberate and carefully planned decisions using natural contraceptive methods (Dalla Zuanna et al, 2005).

At the micro level, between-social groups, fertility differentials in Italy have been increasingly examined with respect to rising external uncertainties and economic constraints (Vignoli, Rinesi, & Mussino, 2013; Vignoli, Tocchioni, & Mattei, 2019). Nonetheless, all these factors, by their very nature, are 'backwards looking'. Indicators and statistical models used in prior published research considered only what had already happened over the life course (Coppola & Di Laurea 2016). In this paper we analyse fertility transitions from a 'forward looking' perspective. We believe that uncovering the role played by time-discounting preferences in fertility behavior might bring new insights to the difficult, well-thought out decision to have a child in Italy.

METHOD

Data and Sample Selected

We used data from the Survey of Household Income and Wealth (SHIW) carried out by the Bank of Italy every two years since the mid 1960s. SHIW collects information on consumption, income and wealth, in addition to several household characteristics, for a representative sample of Italian households drawn in two stages from population registers. The sample used in the most recent waves comprises about 8,000 households (20,000 individuals). From the 1989 wave, a rotating panel component has been introduced. The share of panel households has been around 45-50% of the total since 1993. The SHIW provides very detailed information on the demographic and socio-economic characteristics of individuals that belong to sampled households. Moreover, the questionnaire includes questions that allow us to measure the time discounting preferences of the head of the household. To the best of our knowledge, SHIW is the only survey with a panel component that provides this information worldwide.

TDP are measured in the 2004, 2008, 2010 and 2012 waves. We considered all households who participated in at least one of these waves and use all data available for these households in the preceding and following waves covering the period 1995-2016. We considered married and cohabiting couples in a heterosexual partnership, and restrict the sample to couples in which the male partner is aged between 18 and 54 (we drop 42% of the initial sample) and in which the female partner is aged between 18 and 45 (we drop about 22% of the sample). In order to study parity transitions we dropped couples who were only in a single wave of observation (about 46% of the sample). This is due to the fact that the panel component of SHIW is rotatory.

Empirical Strategy

We tested whether TDP was associated with fertility outcomes distinguishing: 1) the likelihood of having the first child; and 2) the likelihood of having the second child.

The question on time discounting preferences provided by SHIW data was included in the 2004, 2008, 2010 and 2012 questionnaires. It presents, to the head of the household, a hypothetical situation where s/he has to decide how much money to give up in order to receive a certain amount of money in the present, instead of after one year. Questions of these type have been previously widely used to determine the impatience of individuals in a survey (Frederick et al., 2002) and have been used for, among other topics, trust (Albanese, de Blasio, & Sestito, 2017) and divorce (De Paola & Gioia, 2017). Unlike other surveys, the SHIW does not assume that the head of the household is a man. It defines head of the household as the person that is in charge of economic decisions there. About 30% of households in our sample had a woman as household head.

After the description of the hypothetical situation, the respondent is given a series of questions about the percentage s/he would be willing to give up. More precisely, household heads are asked the following question:

Q. “Imagine receiving an unexpected inheritance (or lottery) equal to the amount of income that your family earns in a year. Now, imagine that the inheritance is only available after one year. Would you be willing to sacrifice 10% of that amount to have immediate access to the remaining 90%? *yes: go to question (Qa) *no: go to question (Qb)”;

Qa. “Would you sacrifice 20%? *yes *no;

Qb. “Would you sacrifice 5%? *yes *no: go to question (Qc)”;

Qc. “Would you sacrifice 2%? *yes *no”.

The maximum percentage of sacrificed inheritance represents a measure of TDP (note: 0 is given if the respondent is not willing to sacrifice any money to anticipate the benefit). The corresponding indicator operationalizes time discounting preferences as the rate at which the head of the household discounts future utility. The considered rates are slightly inconsistent across the waves (see Online Appendix 1 for the exact rates used in the different waves). In order to harmonize the answers to the TDP questions across the years, we constructed five thresholds, 0%, 2%, 5%, 10%, and 20%. We transformed these values into discount rates (Samuelson, 1937), thus dividing the

percentage given up in order to obtain the money immediately by one minus that percentage – following this formula, the discount rate of 20% is 0.25 given that [0.2/(1-0.2)]=0.25. Computing the discount rate, we generated our explanatory variable that represented a continuous measure (that can assume values between 0 to .25) of the degree to which respondents preferred bigger economic reward in the future but smaller in the present (in this case the variable takes lower values) or preferred smaller reward in the future but a higher reward in the present (in this case the variable takes on higher values). Giving our intention to interact this variable with others in order to test moderating effect, we centered it on the sample mean – thus its mean is zero. The missing values were less than 7%; they are homogenously distributed across our sample.

We found that, as expected, this measure was relatively stable over time (see Online Appendix 2 for further details on this assessment). As a consequence, we treated this variable as time constant within our observation period. In cases where more than one answer was given, we computed the measure of impatience taking the average value of the answers given across the waves.

We considered models with only the linear term of our explanatory variable (the discount rate) and models including also the squared term, in order to test for potential nonlinear associations between impatience and fertility outcomes.

Control variables included standard variables in fertility studies (e.g. Hill & Johnson, 2004): the female partner's age (and its square), the male partner's age, the gender of the household head (0 = *male*, 1 = *female)*. We also include both partners' level of education. We used the International Standard Classification of Education (ISCED), distinguishing three categories: lower secondary education or less ("low"; *ISCED 0, 1 and 2*); upper secondary education or postsecondary non-tertiary education ("medium"; *ISCED 3 and 4*); and tertiary education ("high"; *ISCED 5 and 6*). The educational variables collected by the Bank of Italy are not coded following the ISCED codes. Applying ISCED to SHIW data, the corresponding levels were less than ninth grade, between ninth and thirteenth grade, and fourteenth grade or higher (four-year college degree or more for the pre-Bologna reform and three-year college degree or more afterwards). Other observable characteristics

that we controlled for in our model were the following: the equalized family income and social origins in term of the educational level of the head of the household's father categorized into three levels: 1 ((“low”; *ISCED 0, 1 and 2*), 2 ((“medium”; *ISCED 3 and 4*) and 3 (high”; *ISCED 5 and 6*); note that about 3.5% of the respondents did not report the father's education. We also added a control for the head of the household's occupational status at the moment of the interview. The variable took value 1 if s/he was self-employed or an employer and otherwise takes value 0.

Another two variables that captured the household's economic conditions were included in the model as controls. The first was self-reported credit rejection. The survey reported whether the family did not ask for credit for fear of being rejected. The exact question addressed to the household head was the following: 1) “During the previous year did you or another member of your household consider the possibility of applying to a bank or a financial company for a loan or a mortgage but then changed your mind thinking that the application would be rejected?”. Households with perceived credit constraints were those who respond “yes” to this question. In this case the variable credit rejection took on value 1, and 0 otherwise. The second variable was a more explicit indicator of liquidity constraints given that the survey asks whether a credit request was rejected: 2) [In the case the household applied to a bank or a financial company for a loan or a mortgage] “Was the application granted in full, in part or rejected?” Households with objective liquidity constraints were those who respond “in part” or “rejected” to this question. Thus, the variable took on value 1 in this case, otherwise 0.

Additionally, in the model for the second outcome (the dependent variable here is *having or not the second child*) we controlled for the age of the first child (losing about 7% of the sample). Finally, we controlled for time period (years fixed-effects) and for the region of residence of the respondent (regions fixed-effects). All the control variables were lagged, i.e. measured in the wave preceding the measurement of the outcome. Our final samples for the transition to the first child and to the second child were respectively N=760 and N=1284.

For the first outcome (*having/not the first child*), the categorical variable took value 1 (17.59%) in case of the transition to the first child during the observation period, value 0 if not (82.41%). For the second outcome (*having or not the second child*), the dummy variable took value 1 in case of transition to the second child during the observation period (15.25%), and value 0 otherwise (84.75%).

Facing the classical trade-off between the tractability and flexibility of model specification, we analysed the probability for each fertility outcome using logistic regression models, that are extremely tractable in terms of model specification (Greene, 2003). We clustered the standard errors around the household unit.

To examine the moderating role of age and education, we run models interacting, in turn, female age groups and female education with our TDP measure. We considered two age groups (based on female partner's age): 18-31 and 32-45. As for education, we considered three groups based on the educational attainment of the female partner: "low", "medium" and "high" (see above).

Descriptive Statistics

The first row of Table 1 summarizes the explanatory variable for each sample. The mean is always zero given that we have centred the variable within each sample. In the rest of Table 1, we report summary statistics for the other independent variables.

Table 1. *Descriptive Statistics*

	Transition to 1st child N=760			*Transition to 2nd child N=1284*		
Variables	*M*	*SD*	Range	*M*	*SD*	Range
Time discounting rate (impatience) (TDP)	0	6.05	-5.4 – 19.61	0	6.21	-6.18 - 18.81
Age of female partner	33.18	5.28	19.00 – 43.00	35.66	5.28	18.00 - 45.00
Age of male partner	36.16	5.95	18.00 – 52.00	39.03	5.83	21.00 – 52.00
Equivalized income	22095	15733	0 – 259724	17559	10324	0 – 127555
Female partner's education						
Low	33.73		0 – 2	45.68		0 – 2
Medium	43.57		0 – 2	42.00		0 – 2
High	22.70		0 – 2	12.32		0 – 2
Male partner's education						
Low	41.47		0 – 2	51.87		0 – 2
Medium	4.29		0 – 2	38.04		0 – 2
High	18.24		0 – 2	1.09		0 – 2
Sex of the respondent (male) [a]	70.87		0 – 1	71.04		0 – 1
Credit rejected [b]	98.43		0 – 1	98.13		0 – 1
Liquidity constrains [c]	98.03		0 – 1	97.62		0 – 1
Self-employed [d]	88.45		0 – 1	88.40		0 – 1
Education of the hh's father						
Low	43.18		0 – 2	55.91		0 – 2
Medium	52.49		0 – 2	39.70		0 – 2
High	4.33		0 – 2	4.39		0 – 2
Region	Appendix3			Appendix3		
Year	Appendix3			Appendix3		

[a] Sex of the respondent: 0 = *male*, 1 = *female*. [b] Credit rejected: 0 = *no*, 1 = *yes*. [c] Liquidity constrains: 0 = *no*, 1 = *yes.* [d] Self-employed: 0 = *no*, 1 = *yes. Standard deviation*s are *reported for numerical variables only. 'hh' means head of the household.*

Note. Descriptive Statistics for Region and Year are reported in the Online Appendix 3.

FINDINGS

In Table 2 and 3 we present results from the logistic regression models. The reported estimates represent the log-odds, standard errors and the odds ratios of each regressor on the probability to have

the first (Table 2) or the second (Table 3) child during the observation period. We consider four alternative specifications of the model for the first and the second outcomes.

We start with Model 1. We include here the variable impatience and its square and we do control for the socio-demographic backward variable (male partner's age; male partner's education; sex of the respondent; year fixed effects; and regional fixed effects). In Model 1 (Table 2 and Table 3), the coefficient of the squared term of the TDP is negative and statistically significant for all outcomes (at the 1% level for the first birth and at 10% for the second birth), pointing to a quadratic relationship between impatience and fertility. In Model 2 (Table 2 and Table 3) we also control for credit rejection and liquidity constraints, equivalized income, self-employed status and the education of the head of the household's father.

We find that for all specifications and for all three outcomes the coefficient of the squared term of the TDP remains negative and statistically significant, and that the size of the estimates does not vary substantially. All in all, our findings show an inversed u-shaped association between impatience and progressions probability. Similar results are obtained performing a stepwise regression procedure (estimates available upon request) and also when the outcome variable considered is the transition to an additional child (estimates available upon request)

Table 2. *Summary of Estimates from Logistic Regressions Analysis for Variables Predicting the Transition to the First Child (n=760)*

	(M1)			(M2)			(M3)			(M4)		
	β	SE β	OR	β	SE β	OR	β	SE β	OR	β	SE β	OR
TDP	.078***	.026	1.08	.075***	.03	1.08	.105**	.046	1.11	.152***	.050	1.16
							-.016***	.005	0.98	-.016***	.004	0 .98
TDP squared	-.008***	.002	.99	-.009***	.00	.99						
Age woman	1.556***	.294	4.70	1.571***	.29	4.81				1.605***	.289	4.98
Age woman squared	-.022***	.004	0.97	-.022***	.00	.97				-.022***	.004	0 .97
Woman education. Ref primary												
Secondary education	.148	.235	1.15	.267	.254	1.31	.246	.235	1.28	.033	.282	1.03
Tertiary education	.117	.293	1.12	.311	.321	1.36	.429	.307	1.53	-.154	.368	0 .86
Age category: Ref 18-31												
Older than 31							.596*	.311	1.81			
Older than 31* TDP							-.057	.058	0.94			
Older than 31* TDP squared							.009*	.006	1.01			
Woman Secondary education* TDP										-.094	.065	0.91
Woman Tertiary education* TDP										-.142*	.073	0.87
Woman Secondary education* TDP squared										.007	.005	1.01
Woman Tertiary education* TDP squared										.015***	.005	1.02
Constant	-24.971			-25.251			-.982			-25.721		
χ^2	104.12			126.32			107.59			126.69		
df	37			43			44			47		
% transition to 1st child	17.59			17.59			17.59			17.59		

Note. Controls in M1, M2, M3, M4 are male partner's age, male partner's education, sex of the respondent, year fixed effects and regional fixed effects. In Model M2, M3, M4, controls are also credit rejection and liquidity constraints, equivalized income, self-employed status and father's education of the head of the household. OR=Odds Ratio. SE = Robust standard error. * p<.1, ** p<.05, *** p<.01.

Table 3. *Summary of Estimates from Logistic Regressions Analysis for Variables Predicting the Transition to the Second Child (n=1284)*

	(M1)			(M2)			(M3)			(M4)		
	β	SE β	OR	β	SE β	OR	β	SE β	OR	β	SE β	OR
TDP	.04*	.020	1.04	.04**	.02	1.04	.056*	.033	1.06	.078**	.037	1.08
							-.003	.003	.99	-.004	.003	0 .99
TDP squared	-.00*	.000	1.00	-.00*	.00	0.99						
Age woman	.99***	.240	2.68	.98***	.24	2.68				1.043***	.244	2.83
Age woman squared	-.02***	.00	0.98	-.02***	.00	0.98				-.018***	.004	0 .98
Woman education. Ref primary												
Secondary education	.04*	.02	1.23	.04**	.02	1.21	.220	.197	1.24	.031	.244	1.35
Tertiary education	-.00*	.00	2.40	-.00*	.00	2.44	.882***	.282	2.41	.801**	.343	2.23
04												
Age category: Ref 18-31												
Older than 31							-317	.287	.72			
Older than 31* TDP							-.025	.044	.97			
Older than 31* TDP squared							.003	.004	.98			
Woman Secondary education* TDP										-.023	.049	.98
Woman Tertiary education* TDP										-.125**	.057	0.88
Woman Secondary education* TDP squared										-.002	.004	.99
Woman Tertiary education* TDP squared										.004	.005	1.00
Constant		-14.95			-15.24			-15.36			-16.17	
χ^2		174.09			182.96			163.24			185.47	
Df		39			45			46			49	
% transition to 2st child		15.25			15.25			15.25			15.25	

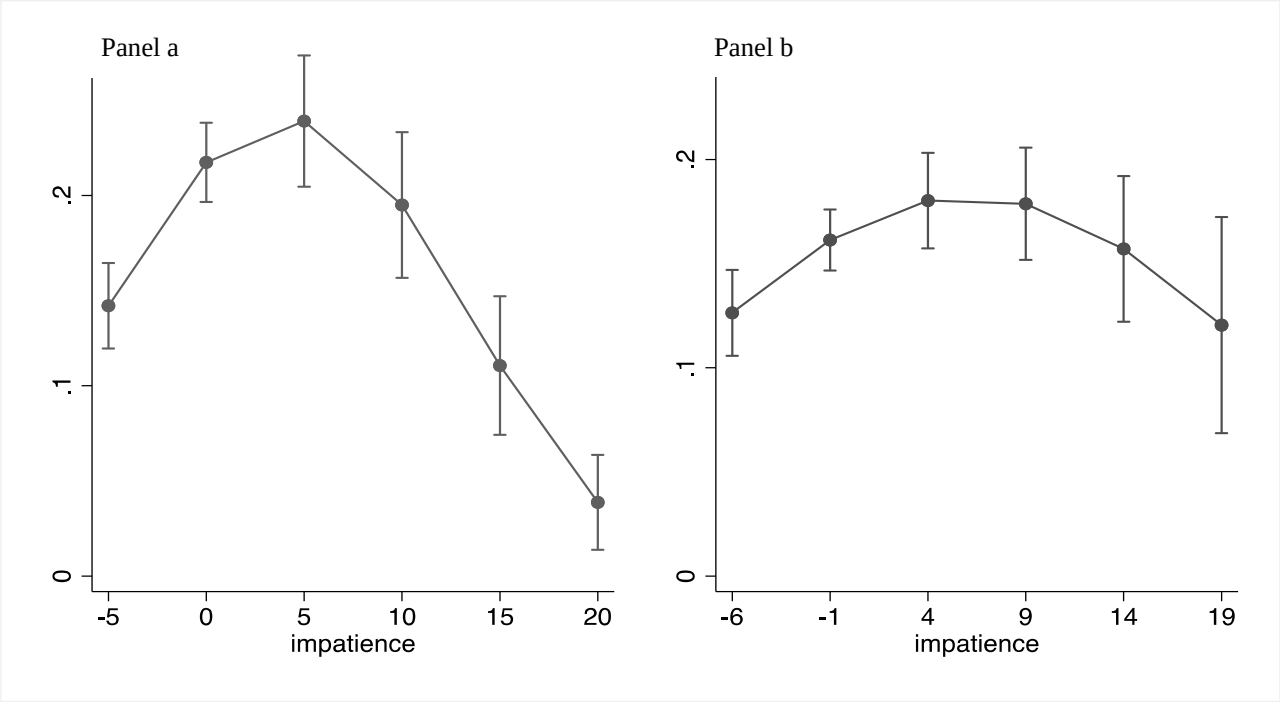
Note. Controls in M1, M2, M3, M4 are male partner's age, male partner's education, sex of the respondent, year fixed effects and regional fixed effects. In Model M2, M3, M4, controls are also credit rejection and liquidity constraints, equivalized income, self-employed status and father's education of the head of the household. OR=Odds Ratio. SE = Robust standard error.

* p<.1, ** p<.05, *** p<.01.

In order to ease the interpretation of the estimates presented previously (Model 2 of Table 2 and Table 3), we plot them in terms of predicted probabilities (Figure 1 Panel a and Panel b). The 95% confidence intervals for pair-wise comparisons are also reported. These intervals are centred on the predictions and have lengths equal to 2 × 1.39 × standard errors. This is necessary in order to have an average level of 5% for Type I error in pair-wise comparisons of a group of means in pair-wise comparisons (Goldstein & Healy, 1995). Figure 1, Panel a illustrates that time preferences are not linearly associated with the likelihood of the transition to the first child. The relationship follows a clear, well-defined inversed U-shape. In fact, Figure 1, Panel a, shows that an increase in impatience from its minimum value to its average is associated with an increase in the likelihood of having a first child from about 14% to about 24%; the change in the level of impatience from the average value to the maximum corresponds to a decrease of about 20 percentage points in the likelihood of having the first child.

A similar inverted U-shape association is observed for the second birth (Figure 1 panel b). However, in this case the relationship is less salient. Moving from the minimum to the mean level of impatience we observe an increase of about 5 percentage points. Going, instead, from the mean to the maximum level of impatience the predicted probability of having a second child sees a decrease of about 6 percentage points.

FIGURE 1. PREDICTED PROBABILITIES (Y AXIS) OF THE TRANSITION TO THE FIRST AND SECOND CHILD ACCORDING TO THE LEVEL OF IMPATIENCE.



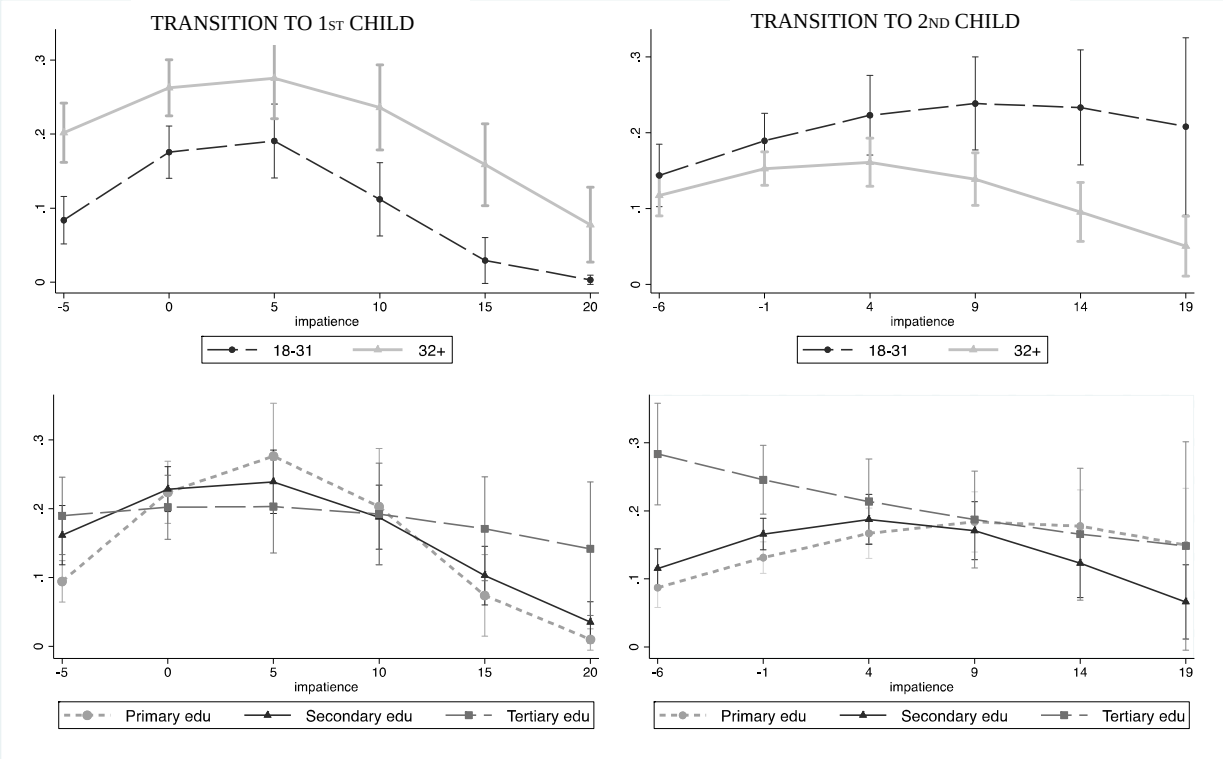
Note: C.I. 95% for pair-wise comparisons. Predicted probabilities calculated from Model 2 Table 2 and Model 2 Table 3.

A very low or very high degree of impatience seems to depress parity progression. This is true especially in the case of the first transition, and, to a lesser extent, also for the transition to the second birth. Individuals that are strongly focussed on future gratifications or, on the contrary, excessively discount future utilities, are less likely to become parents; and if they do become parents, they are, to some extent, less likely to progress to having a second child.

We test whether the impact of TDP is moderated by age and education in models M3 and M4 (Tables 2 and Table 3), which include interactions between impatience and respectively age and education. Results are displayed, graphically, in Figure 2. The two graphs, at the top of Figures 2, show that in the case of the transition to the first birth, the shape of the association for young women is more delineated than for their older counterparts, which is flatter. Given that younger women have a longer reproductive life ahead of them, their preferences seem to exert a stronger effect. In the case of the transition to the second child, however, we do not observe clear divergent paths.

The two graphs at the bottom of Figure 2 show the moderating role of education. In couples with low educated woman, the estimates show a clear inverse U-shaped. For the low educated group, the predicted probability of having a first child varies from a level of 10% to about 26% moving from the lowest to average values of impatience. After this peak the trend reverses and becomes negative, reaching a very low rate for the maximum value of impatience. In the case of the other educational groups the trend is not so well-defined, especially for the transition to the second child.

FIGURE 2. PREDICTED PROBABILITIES (Y AXIS) OF THE TRANSITION TO THE FIRST AND TO SECOND CHILD ACCORDING TO THE LEVEL OF IMPATIENCE BY AGE GROUPS (FIRST ROW) AND BY EDUCATIONAL GROUPS (SECOND ROW).



Note: C.I. 95% for pair-wise comparisons. Predicted probabilities calculated from Model 3 and 4 Table 2 and Model 3 and 4 Table 3.

CONCLUSION AND DISCUSSION

The article has introduced theoretical arguments about the role of time discounting preferences for fertility and has tested this relationship, distinguishing by parity and considering the moderating role of the female partner's age and education. Personal orientations are at the core of fertility decisions (Aassve, Mencarini, & Sironi 2015), and have become more and more important over time (Jokela, 2012). We believe that individual preferences not only background factors, such as cultural heritage or historical context, play a major role in fertility decisions. We particularly argue that expectations and future prospects (what we call "forward looking") play a crucial role in defining fertility careers. In particular, we have argued that a psychological trait that drives preferences about the future, time discounting preferences, influences fertility outcomes.

We used unique data from a nationally representative survey from Italy, the Survey of Household Income and Wealth (SHIW). By estimating logistic regression models, we found that there is an inverse U-shape relationship between the degree of TDP and childbearing. In particular, individuals with a low rate of discounting (very patient) and those with a high rate of discounting (very impatient) have a considerably lower probability of having a first and second child, as compared to individuals with average rates. The association is particularly strong for the probability of having a first child.

Our findings suggest that 'in medio stat filius'. Patient individuals may advocate childbearing as a sort of *utilitarian investment* to make when their life is well structured. However, their preference for future and higher benefits, and the consequent preference for procrastination (Borghans et al., 2008), may obstruct the accomplishment of fertility desires. Impatient individuals may assess childbirth as an *imminent value*. However, very impatient individuals, may also prefer to search for self-realization, and are more likely to engage in risky behavior. They will perhaps, as a result, be perceived by others (particularly their partners) as being not up to the task of raising children (Spivey, 2010).

Our analyses also demonstrate that the (nonlinear) association between TDP and fertility is particularly evident for couples composed by a young and low educated female partner. These results are consistent with the idea that the greater availability of time for reproduction that younger women have ahead may facilitate the expression of certain inclinations for discounting rates. The stronger effect of TDP for couples with low educated women is consistent, too, with an explanation based on a future window of reproductive opportunity. Given that, in the Italian context, it is uncommon to have a child while studying, the time window for becoming a parent is smaller for higher educated individuals. It may also be that highly-educated patient individuals have already postponed childbearing so as to reach their educational and career goals. Conditional on having reached these goals, the effect of impatience on childbearing appears to be small. Previous speculations may indicate that the effect of TDP on childbearing comes out mostly as a postponement effect, but postponing fertility choices may also result, in Italy, in a lower number of children at the end of the fecund life span (Ongaro, 2002).

Our analyses are not without limitations. First, though we used rich, panel data, including a measure of TDP which is unusual in surveys typically employed for fertility research, our data did not allow us to directly test mechanisms behind the relationship found between TDP and fertility. Hopefully, this study will stimulate the inclusion of TDP in longitudinal dataset permitting a better understanding of the effects of this important personal trait. Second, the TDP measure was available only in few waves and because of the rotating nature of the panel data we used, the overall number of observations *per* couple was limited. Thus, it was not possible to use more dynamic statistical models. However, psychological and economic studies on personality have found personality to be stable during adulthood; this was also suggested by our data. Third, information about the duration of the relationship is not available in our data. The control for respondents' age profile should limit the impact of the failure to include information about relationship duration, however. Finally, we do not distinguish between the ways in which TDP influences fertility indirectly through union formation

and directly within unions. A simultaneous consideration of patterns of union formation and parenthood in relation to TDP would be an interesting topic for future research.

Despite the limitations outlined here, this article offers a new perspective on the determinants of fertility. We offered theoretical arguments justifying the important role of forward looking factors in fertility decisions. In a context in which (bounded) rational calculations of opportunities and constraints concerning fertility decisions are carefully managed, like Italy, forward-looking factors may become important frameworks for directing individual action. Our analyses show that time preferences represent a crucial individuals' predisposition that affect fertility behavior, which is an intertemporal decision taken with uncertainty about future costs and benefits and about other future events. Our study demonstrates the importance of considering time discounting preferences as a powerful marker of an individual's heterogeneity in approaching fertility decisions.

Regardless of backward factors, in this article we have pointed out that a propensity for looking forward identified by time discounting preferences, play a crucial role in predicting fertility behavior. For Italy, where individuals carefully plan their reproductive decisions, forward factors seem to play a crucial role in the transition to the first child. We believe that not only time discounting preferences, but also subjective interpretation regarding the future as well as the self-representation of forthcoming circumstances, may be key to understanding fertility behavior. Further research is needed to make conclusive statements about the impact of forward factors on fertility choices.

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Appendix 1

We report here the questions of the SHIW questionnaires 2004, 2008, 2010, 2012 on which our measure of time discounting preference is based.

Questionnaire 2004

Imagine you were told you had won on the lottery the equivalent of your household's net annual income. The sum will be paid to you in a year's time. However, if you give up part of the sum you can have the rest immediately.

SCONT1...5

E09.a To get the money right away would you give up 5 per cent of this sum?
- Yes ...1 ➔ Quest. E09.b - No ...2 ➔ Quest. E09.d

E09.b …Or 10 per cent? - Yes …1 ➔ Quest. E09.c - No …2

E09.c...Or 20 per cent? - Yes ...1 - No …2

E09.d ..Or 3 per cent? - Yes … 1 - No … 2 ➔ Quest. E09.e

E09.e …Or 2 per cent? - Yes …1 - No, I'd wait a year to collect the whole amount …2

As explained in the manuscript, the rates used in the different waves slightly differ and we had to harmonize them. In the case of wave 2004, we aggregated the 3% and 2% discounting rates. Thus, respondents that answer yes to the question E09.d were assimilated to those than answer yes to E09.e.

Questionnaire 2008

R2.14. You have won the lottery and will receive a sum equal to your household's net yearly revenue. You will receive the money in a year's time. However, if you give up part of the sum you can collect the rest of your win immediately. SCONTO1...4

R2.14a. To obtain the money immediately would you give up 20 per cent of your win?
- Yes ...1 - No ...2 ➔ *Question R2.14b*

R2.14b. What about 10 per cent? - Yes ...1 - No ...2 ➔ *Question R2.14c*

R2.14c. And 5 per cent? - Yes …1 - No …2 ➔ *Question R2.14d*

R2.14d. Just 2 per cent? - Yes ...1 - No …2

In this case, there is no need to aggregate answers.

Questionnaire 2010

You have won the lottery and will receive a sum equal to your household's net yearly revenue. You will receive the money in a year's time. However, if you give up part of the sum you can collect the rest of your win immediately. SCONTO21...24

C33a. To obtain the money immediately would you give up 20 per cent of your win?

- Yes …1 - No ...2 *Question C33b*

C33b. What about 10 per cent? - Yes ...1 - No ...2 *Question C33c*

C33c. And 5 per cent? - Yes ...1 - No ...2 *Question C33d*

C33d. And 2 per cent? - Yes ...1 - No ... 2

In this case, there is no need to aggregate answers.

Questionnaire 2012

Imagine, instead, that you would receive this inheritance only after a year. Would you give up 10 per cent of it in order to have the remaining 90 per cent right away? SCONTO1...7

- Yes ...1 ➔ Question E19a - No ...2 ➔ Question E19b

E19a. What about 20 per cent? - Yes ... 1 ➔Question E19c - No ...2➔ Question E19d

E19b. What about 4 per cent? - Yes ... 1 ➔ Question E19e - No ... 2➔ Question E19f

E19c. What about 30 per cent? - Yes ... 1 - No ... 2

E19d. What about 15 per cent? - Yes ... 1 - No ... 2

E19e. What about 7 per cent? - Yes ... 1 - No ...2

E19f. What about 2 per cent? - Yes ... 1 - No ... 2

In this case, in order to harmonize these answers with those of the other waves, we assign the value of 5% to the answers to the questions E19b and E19e.

Appendix 2.

Sensitivity analysis for the stability over time within individuals of time discounting preferences.

Considering the sample of individuals that answer more than once to the question regarding their time discounting preferences, we observe that about 70% did not change consistently their response. In fact, the maximum difference between their answers in the discount rate is about 5%. Only 5% of the respondents changed consistently their answer (with a difference of about 25%). As a robustness check we excluded from the analyses these individuals and results did not change. We also constructed a dummy variable that takes value 0 if the respondent answers 0%, 2% or 5%, while it takes value 1 if the respondent answers 10% or 20%. About 75% of the respondents answer the same (0 or 1) across waves. The intraclass correlation coefficient excluding those respondents that changed consistently their answer (N=142) was about .70, meaning that the between variation explains about 70% of the variance (and only 30% is due to the within-individual variation).

Appendix 3. Descriptive statistics of the variables region and year, %

	Transition to the first child	Transition to the second child	Transition to an additional child
Region			
Piedmont	5.12	8.57	5.96
Val d'Aosta	1.44	1.37	0.75
Lombardy	9.19	10.45	9.49
Trentino - Alto Adige	4.20	2.45	2.80
Veneto	9.71	8.93	8.80
Friuli – Venezia Giulia	5.38	2.38	3.77
Liguria	5.25	3.24	3.53
Emilia – Romagna	13.91	10.16	8.90
Tuscany	7.74	6.05	6.71
Umbria	3.94	7.71	5.63
Marche	4.59	4.11	4.05
Lazio	4.07	5.84	4.59
Abruzzo	2.10	1.80	2.00
Molise	0.26	1.01	0.94
Campania	3.15	4.32	7.16
Puglia	4.99	5.19	6.47
Basilicata	3.02	0.79	1.81
Calabria	2.10	3.10	3.01
Sicily	6.82	8.29	10.15
Sardinia	3.02	4.25	3.48
Year			
1995	4.86	3.48	3.58
1998	6.56	7.43	6.80
2000	8.01	9.44	9.67
2002	12.20	13.93	13.68
2004	12.86	14.16	14.01
2006	14.57	12.54	13.00
2008	14.44	14.32	13.12
2010	12.34	11.38	11.69
2012	9.84	8.82	9.77
2014	4.33	4.49	4.69