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ORIGINAL RESEARCH

The Role of Salience and Memory in Fertility Decisions: Experimental Evidence

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Abstract

Public policies use communication campaigns to affect individual behavior. We analyze how providing women with information on the beneficial effects of using formal childcare may affect their realized fertility. We argue that cues in the messages are particularly salient for mothers and women with fertility intensions, since they activate these women's past memories. Hence, cues induce these women to create mental representations of future actions, such as realized fertility. We exploit a randomized survey experiment run in 2011, which provides information on the positive effects that attending daycare may have on the children' future cognitive development. Using a follow-up survey run six-year later we show that the treatment increases realized fertility among mothers and women with declared fertility intentions, for whom the communication was more salient. Yet, the treatment did not affect the individual knowledge nor recall of the information provided in the message. Our results carry important policy implications: persuading individuals is difficult, but communication can be effective if salient.

Keywords Realized fertility · Information · Randomized control trial

Introduction

Public policies often rely on information provision and education – particularly in family planning and public health. Mass media and targeted messages are largely employed to raise families' awareness about fertility choices and promote the use of contraceptive (Dupas, 2011), to encourage smoking cessation programs (Free et al., 2011) and to improve health behavior (Fjeldsoe et al., 2009). These policies are

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typically regarded as useful and cost effective (Bongaarts, 1994; Cleland et al., 2006; Wakefield et al., 2010), although they may occasionally backfire. During the current COVID-19 outbreak, in several countries, restrictive measures, such as isolation and quarantine, were accompanied by educational announcements to induce people to follow safe behaviors and to get vaccinated (Galasso et al., 2023). Can informational and educational contents be used as public policies in countries with low fertility to increase childbirths?

This is an important question, since several western countries have been experiencing very low fertility rates for decades. Yet, unrealized fertility occurs frequently in most societies (Casterline, 2017). Indeed, while realized fertility is well below replacement level, desired fertility remains around replacement level, even in the lowest low fertility countries (Kohler et al., 2002; Casterline & Han, 2017). The gap between intended and actual childlessness is particularly relevant in Southern European countries (Beaujouan & Berghammer, 2019). What can be done to bring realized fertility to the desired levels?

According to the theory of planned behavior (Ajzen, 1991), fertility intensions depend on three main elements: attitudes toward having a child, perceived norms and perceived behavioral control. The existence of enablers and constraints accounts for the difference between realized and desired fertility. Several factors have been identified to account for the existing fertility gap (Bongaarts, 2001; Vitali et al., 2009; Ajzen & Klobas, 2013). Individuals may find themselves unable to reach their desired family size due to lack of a partner, union disruptions, or health problems. They may decide to postpone childbearing – for instance due to job insecurity or career choices – thereby reducing their chance to reach their desired fertility. Or they may voluntarily decide to revise downward their fertility intentions, due to competing preferences, such as conflicting career aspirations (Bloom & Trussell, 1984; Barber, 2001; Quesnel-Vallée & Morgan, 2003; Sobotka, 2004; Keizer et al., 2008; Hayford, 2009; Morgan & Rackin, 2010; Gemmill, 2019). Barriers to realized fertility include childcare costs (Mörk et al., 2013). Hence, a policy often advocated to enable realized fertility is the increase in the supply of formal early childcare, or daycare services, and reduce their cost. By helping to balance maternity and working life (OECD, 2017), more accessible, cheaper and better formal early childcare services could induce women to anticipate their first maternity and to have more children.

We consider the effect of a communication that provides women with information about the beneficial effects on children's socialization and educational attainments that follow from using formal early childcare. Recent evidence (Lavy & Nussbaum, 2023) shows that the birth of a gifted child increases the probability of an additional child, particularly among highly educated parents. Communication emphasizing excellent social and educational attainments may activate a similar process and increase the probability of having a child. We suggest that this communication may have long term effects on realized fertility, particularly for already mothers and for women with fertility intensions. By making salient the social and educational attainments of children, the communication activates positive memories for women, who have already formed memories about small children either because they are already mothers, or because have the intention of becoming mothers. The positive image of successful children creates an emotional valence from the retrieval of a positive

memory about children (Szpunar et al., 2012), which may help projecting future fertility scenarios. In particular, if the stimulus – the clue in the message – is strongly related to the individual's intention, it may induce a "self-defining future projection" and a correlated action (Jeunehomme & D'Argembeau, 2021). In other words, the clues are more easily captured if they correspond to the woman's own ideal. This conceptual framework thus suggests that this communication fosters the perceived benefits of reproduction by acting on the unconscious brain, which responds to cues and creates mental representations of future actions. These effects are more likely to operate if clues are particularly salient, hence for women who already are mothers or have fertility intentions.

In the framework of the theory of planned behavior (Ajzen, 1991), this communication has no effect on perceived norms and perceived behavioral control. However, it may reinforce the attitudes toward having a child. In particular, the communication may be able to active a memory recall process that strengthens the initial, positive attitudes towards having children. This argument is consistent with individuals having persistent attitudes, possibly determined early in their life (Guzzo et al., 2019). In fact, the message in the communication does not oppose, but rather reinforces these positive attitudes towards having a child. Hence, by strengthening the intensity of these existing attitudes, the message may manage to successfully induce individuals to implement their planned behavior.

The point of departure of our analysis is a randomized survey experiment run in Italy in 2011 (Galasso et al., 2017), which provided information on the positive effects that attending daycare may have on the children' future cognitive development (Felfe & Lalive, 2010; Havnes & Mogstad, 2011; Brilli et al., 2016; Abner et al., 2013). As a lowest low fertility country with a large gap between intended and realized fertility (Bongaarts, 2001; Kohler et al., 2002), Italy is a well-suited environment to study realized fertility (Beaujouan & Berghammer, 2019). Moreover, childcare availability and affordability are often debated as possible causes of the low fertility rate, due to the prevalence of informal over formal childcare. In Italy, informal childcare arrangements are used for 32% of the children younger than 2 years old, against an average of 24% in OECD countries. Instead, enrolment rate in early childhood education and care services is equal to 26.4% -- with large geographical variations – against an average of 36% among OECD countries. In the public debate, child care provision is recognized as a crucial factor in fertility decisions.

The sample consisted of 1500 women, aged 18 to 40, who were randomly divided in two treatment and a control group. In the two treatment groups, information on the social and educational attainments of children attending daycare was released with an online survey, either in a video showing children joyfully playing at a daycare facility or in text messages. Six years later, we ran a follow-up survey to assess the impact of the treatment on realized fertility. We were able to reach 333 women, of whom 221 were treated. In this follow-up analysis, we combine the two original treatments into one treatment due to sample size. Crucially, the treated and control groups were ex-post balanced on the observable characteristics of the reached individuals, thereby ensuring the internal validity of our study. In this follow-up survey, we can measure realized fertility, since we have retrospective information on the children born between the two surveys. Hence, we are able to analyze whether the

treatments, consisting of providing information about the benefits of using childcare facilities, had a long-term effect on the realized fertility. This analysis is in line with a recent literature suggesting that information provision may indeed have long-term effects, at least for some groups of individuals. For instance, Pons (2018) shows that door-to-door canvassing in France, which provided information on François Hollande's electoral program, increased Hollande's vote share in the contemporaneous French presidential election and also in later elections, suggesting a lasting persuasion effect. Galasso et al. (2023) show that altruistic messages provided in December 2020 about the role of COVID-19 vaccination in protecting other individuals, population health and the economy positively affected vaccination uptake in the next six months, but only in countries experiencing high COVID-19 mortality (Austria, France, Italy, Sweden, the UK and the USA), where health risks may have been more salient, while no effects occurred in countries where mortality was low (Australia, Germany and New Zealand).

The Conceptual Framework

We examine how people react to communication campaigns that convey information and educational messages. In particular, we consider the effect on realized fertility and use of childcare facilities of a communication that provides women with information about the beneficial effects that formal childcare has on children's socialization and educational attainments. Novel information could help individuals, especially at younger age, updating their views. If the newly acquired information induces a substantial adjustment in people previous knowledge on a subject – for instance, on the use of contraceptives – individuals may choose to modify their previous behavior – and to use contraceptives. In this case, communication campaigns would be highly effective in reaching their policy target. However, attitudes and behavior may remain stable over time, even after people receive new information (Kiley & Vaisey, 2020). In fact, individuals may decide to not use information, even when it is freely available. Indeed, people may actively avoid being informed, if they expect to dislike the content of the information. This may happen when information challenges choices already made by the individual, which are not reversible. Or when the novel information may induce behaviors that clash with individual values or culture (Golman et al., 2017).

In this paper, we suggest that communication campaigns may be effective even when individuals do not pay much attention to the information and educational content they convey, due to the role of salience and memory in communication messages. Salience allows specific cues in the message to attract the individual attention. Whether these cues are indeed salient to a receiver of the message depends on the specific features of the cues and on the characteristics of the receiver (Bordalo et al., 2012, 2020). In our empirical analysis, a message providing information on the educational attainments of children, who attend daycare, has cues on children. These cues will thus be more salient to mothers, or women intending to become mother, than to women, who have no children, nor intend to have them. Studies in psychology suggest that cues in the message are able to recall similar items from past memories

(Tulving & Thomson, 1973; Kahana, 2012). In our empirical analysis, cues about children may retrieve stored memories of children both in mothers, who have personal memories about their own children, and in women, who intend to become mother and have thus constructed and stored memories about motherhood and children. These cues have emotional valence (Szpunar et al., 2012), since they are provided by showing positive events featuring persons (mostly, children) in a familiar and plausible environment, such as a day-care facility (McLelland et al., 2015; van Mulukom et al., 2016; Jeunehomme & D'Argembeau, 2017). These cues of children achieving excellent educational attainments will then to be associated with positive memories about children behavior. These effects are particularly strong when combined with individual intentions, as in the case of women, who intend to become mothers (Szpunar et al., 2012). These past memories, stimulated by the cues that are included in the information content or in the visual stimulus, may induce changes in future behavior through future thinking, since past experiences can be used to imagine novel future scenarios (Addis et al., 2008; Schacter & Addis, 2007a, b; Schacter et al., 2008; Szpunar, 2010; Seligman et al., 2013). Elements of current and past experiences are thus combined to imagine and simulate new situations that might occur in the future. The salient cues concealed in current communication messages contribute to creating the mental construct to simulate future scenarios and take decisions. Cues of successful children embed in the message retrieve positive memories about children behavior particularly in mothers (and in women intending to become mothers) and allow them to project novel and positive future scenarios. Thus, they become more inclined to realize their intended fertility and to have children. This conceptual framework may thus account for what may seem an overreaction to a modest piece of information about the benefits of daycare. When applied to fertility decisions, our theoretical framework is in line with the theory of planned behavior (Ajzen, 1991) in focusing on the role of fertility intentions, since these fertility intentions make daycare salient for women. At the same time, our framework highlights the role of the unconscious brain in responding to cues, in developing mental representations of complete images and in associating the images with meanings (Johnson-Hanks et al. 2011). In particular, traditionally the schema for children's daycare is closely connected to motherhood (Bachrach and Morgan, 2013).

According to this conceptual framework, we can formulate the following two hypotheses:

H1 Communication message about children attainments increases fertility among individuals for whom children are salient and memories about children can be retrieved.

H2 Among these individuals, communication message needs not increasing their knowledge about the information provided.

Experimental Design

In 2011, a survey experiment was performed on the importance of formal daycare for women's fertility decisions. The sample consists of 1503 Italian women aged between 20 and 40 years, with individual characteristics broadly in line with a representative sample of Italian women. If compared to the Italian part of the 2008 European Survey on Income and Living Conditions (Eurostat, 2008), the 2011 sample has an average age of 31.7 years (vs. 31.1), a share of graduate of 38.9% (vs. 24.9), a proportion of employed women of 61.5% (vs. 56.5%), a share of women in a relation of 67% (vs. 53.4%) and a share of women with children younger than four years old of 26.3% (vs. 20.2%).

All women answered to an online survey and were randomly assigned to three groups. The online survey was conducted in November 2011 by a survey company (CE&CO), which exploited an existing panel of 20,000 people with internet access from home, who had previously agreed to participate to online surveys on social issues and marketing. Among these, 3,300 women aged 20–40 were randomly selected and invited by e-mail to answer a survey on childcare. Among the 2,066 women, who agreed to fill the questionnaire, 221 persons did not finish the interview, while 342 were automatically dropped by the survey company, as the required sample size for each group of different age classes had been reached.

One treatment group was exposed to text messages stating the benefits of day-care attendance. The other treatment group watched a 60 s video-message, featuring six months-to-three years old children doing activities (playing, painting, dancing and having lunch) at a day-care center, while a background voice read the same messages on the benefits of day-care attendance shown to the first group (the video is available upon request, but could not be made freely available on-line for privacy issues). The control group received no information.

More specifically, the information provided to the treatment groups were the following:

Information I: A study conducted on ten years old Germans shows that children who attended formal child care are more independent, socialize more with other children, and use a more appropriate language, when compared to children who stayed at home (Felfe & Lalive, 2010);

Information II: A research on thirty years old Norwegians shows that those who attended formal child care have a higher probability of going to college, earn more, and have a lower probability to be on welfare (Havnes & Mogstad, 2011);

Information III: Also in Italy, thanks to data collected by the National Institute for the Evaluation of the Educational System, a positive effect of attending formal childcare emerges. In second grade, children who attended formal childcare have better results in Italian tests than others (Brilli et al., 2016.)

These messages convey clear, direct information on the positive role played by formal childcare on the children's future social and educational attainments.

A recall survey was run by the same survey company (CE&CO) in 2017, with the aim of measuring the long-term effect of the treatment on realized outcomes. Out of the 1503 women surveyed in 2011, 333 responded also to this second survey. Non-responding women either had already dropped from the company sample or were

reached but refused to participate. This smaller sample of women had individual characteristics in line with a representative sample of Italian women. If compared to the Italian part of the 2008 European Survey on Income and Living Conditions (Eurostat, 2008), women in this subsample have an average age of 31.9 years (vs. 31.1), the share of graduate is 42% (vs. 24.9), of employed women is of 61.6% (vs. 56.5%), of women in a relation of 55.8% (vs. 53.4%) and the share of women with children younger than four years old is 21.3% (vs. 20.2%).

Methods

The 2011 survey collected information on the socio-economic status of the respondents. More specifically, we have data on their age, place of birth and of residence, marital status (married, co-resident partner, not co-resident partner, single), number of children, educational attainment (primary, secondary, tertiary, graduate), occupational status (employed, unemployed, not in the labor force), family (monthly) income in six brackets (less than 1000 euro, between 1000 and 2000 euro, between 2000 and 3000 euro, between 3000 and 4000 euro, between 4000 and 5000 euro, more than 5000 euro, no response), home ownership (yes or no), geographical distance from parents and from in-laws in five brackets (less than 1 km, between 1 and 5 km, between 5 and 25 km, more than 25 km, no living parents or in-laws) and whether they read the newspaper and/or watch news (regularly, often, sometimes, never).

Immediately after the treatment, women were asked questions regarding their intention to have a child in the following three years, to use formal childcare (and to pay for it) and to arrange (informal) childcare within the family. On impact, the treatment had a positive effect on the intention to use formal childcare, but only among highly educated women. No treatment effect emerged on fertility intentions (Galasso et al., 2017).

In the 2017 recall survey, respondents reported their 2017 individual socio-economic characteristics and demographics, including the day of birth of each child and whether each child attended formal childcare. Moreover, in order to test whether respondents recalled the information conveyed with the 2011 treatment, we asked three questions on the effects of attending daycare, which exactly correspond to the content of the three messages provided in the 2011 survey.

We combine the information of the two surveys for the 333 women, who responded both in 2011 and in 2017. Our main outcome of interest is the fertility realized after the treatment, which we reconstruct using the children birth dates from the 2017 survey. Since the first survey took place in November 2011, we only consider children born after August 2012, and we include women who were pregnant at the time of the 2017 survey. In this time period, there were 76 new births. We measure the average treatment on fertility, and, following hypothesis 1, we test for a positive treatment effect on fertility, among women for whom children are salient, such as mothers and women with fertility intentions. Due to sample size, in our analysis, we combine the text and video treatment into one overall treatment.

We use answers to the 2017 survey to construct the other outcome of interest: formal childcare attendance for newly born. We also consider the answers to three questions in the 2017 survey, in which respondents are asked whether they believe that children, who attended formal childcare, (i) socialize more than others; (ii) have better grades in primary school; and (iii) are more likely to complete college. The possible responses were (a) better with daycare; (b) the same; (c) worst with daycare; (d) I do not know. For each of the three questions, we create a dummy variable that takes value one if the answer is (a) "better with daycare" and zero otherwise. These represented the three positive messages about daycare provided in the 2011 treatment. We use answers to these questions to test our hypothesis 2 on the individuals' knowledge of the information provided.

For our analysis, we construct several variables, which we use both to validate our randomization with balance tests and as controls in our regressions. For the 2011 survey, we construct variables for Treatment (1 if text or audio treatment, 0 if control), children (number of children) in 2011, intended fertility in the next three years (1 if yes, 0 no), Low education (1 if not graduate, 0 otherwise), age 20–29 (1 if 20–29, 0 otherwise), in a relation (1 if in a relation, 0 otherwise), occupational status (1 if Not employed, 0 otherwise), availability of Family Help from parents or in-laws (1 if either one or both live within 5 km, 0 otherwise), home ownership (1 if yes, 0 otherwise), informed (1, if either read the newspaper or/and watch news at least regularly, 0 otherwise) and geographical location (south, center and north). For the 2017 survey, we construct variables for Realized Fertility (number of children born between the two survey), use of Formal Childcare (1 if Yes, 0 otherwise), knowledge (1 if yes, 0 otherwise) of the three messages on Socialization, Primary school attainments and University attainments and an overall measure of knowledge summing up the answers to the three questions.

Table 1 provides summary statistics for all these 2011 variables and for the outcome variables from the 2017 survey: realized fertility, use of formal childcare, knowledge (yes or no) of the three messages on socialization, school attainments and university attainments and an overall measure of knowledge summing up the answers to the three questions. Table 2 reports the balance test between the treatment (video or text message) and control group, in which the 333 respondents to the 2017 survey were initially divided. Since the randomization was performed in 2011 on the full sample, this test is crucial to assess whether potentially different attrition rates have created ex-post unbalanced groups. The results in Table 2 are reassuring. All covariates are balanced between treated and control group, with the exception of the intended fertility, which is larger in the control group. This stacks the cards against finding results on realized fertility, since women in the treatment group have lower fertility intentions. In our empirical evidence, we thus show also results controlling for fertility intentions.

To estimate the average treatment effect, we use OLS estimates of the following linear equation:

$$y_i = \alpha + \beta T_i + \gamma X_i + \epsilon_i \tag{1}$$

Table 1 Descriptive statistics

	2011 Survey				
Variable	Obs	Mean	Std. Dev.	Min	Max
Treatment	333	0.664	0.473	0	1
Children	325	0.609	0.830	0	5
With intended fertility	333	0.655	0.476	0	1
Low Education	333	0.580	0.494	0	1
Age 20–29	333	0.318	0.467	0	1
In a relation	333	0.559	0.497	0	1
Not employed	333	0.384	0.487	0	1
Family Help	333	0.453	0.717	0	2
Homeowner	325	0.797	0.403	0	1
Informed	333	0.925	0.264	0	1
North	333	0.444	0.498	0	1
Center	333	0.144	0.352	0	1
South	333	0.411	0.493	0	1
	2017 Survey				
Variable	Obs	Mean	Std. Dev.	Min	Max
Realized Fertility	333	0.294	0.547	0	4
Formal Childcare	76	0.526	0.503	0	1
Socialization (knowledge)	300	0.637	0.482	0	1
Primary School (knowledge)	333	0.265	0.442	0	1
University (knowledge)	279	0.207	0.406	0	1
Overall (knowledge)	247	1.073	1.060	0	3

Note: For the 2011 survey, we construct variables for Treatment (1 if text or audio treatment, 0 if control), children (number of children) in 2011, intended fertility in the next three years (1 if yes, 0 no), Low education (1 if not graduate, 0 otherwise), age 20–29 (1 if 20–29, 0 otherwise), in a relation (1 if in a relation, 0 otherwise), occupational status (1 if Not employed, 0 otherwise), availability of Family Help from parents or in-laws (1 if either one or both live within 5 km, 0 otherwise), home ownership (1 if yes, 0 otherwise), informed (1, if either read the newspaper or/and watch news at least regularly, 0 otherwise) and geographical location (south, center and north). For the 2017 survey, we construct variables for Realized Fertility (number of children born between the two survey), use of Formal Childcare (1 if Yes, 0 otherwise), knowledge (1 if yes, 0 otherwise) of the three messages on Socialization, Primary school attainments and University attainments and an overall measure of knowledge summing up the answers to the three questions

where y_i is an outcome of interest (use of formal childcare and realized fertility) or the knowledge of the information messages provided in 2011, T_i is the dummy variable that indicates exposure to any treatments in 2011; X_i is a vector of personal characteristics in 2011 whose measure was previously described (previous fertility, fertility intentions, education, age, marital, occupational status, availability of family help, home ownership, informational status and geographical location); and ε is a random error, which follows a normal distribution. We are interested in estimating the parameter β. We also run equivalent logit regressions. The results of the logit specification are in line with the evidence provided in Tables 3, 4 and 5 and are available upon request.

To assess the relevance of the treatment specifically for mothers and women who intend to have children, we run the following regression:

Table 2 Balance tests on 2011 survey variables

Variable	*Control*	*Treated*	*Difference*
With intended fertility	0.723	0.612	0.103***
Children	0.518	0.657	-0.139
Low Education	0.580	0.579	0.001
Informed	0.937	0.919	0.019
Age 20–29	0.366	0.294	0.072
In a relation	0.571	0.552	0.019
Not employed	0.339	0.407	-0.068
Family Help	0.527	0.416	0.110
Homeowner	0.821	0.784	0.037
North	0.482	0.425	0.057
Center	0.125	0.154	-0.029
South	0.393	0.421	-0.028

Note: we constructed variables for Intended fertility in the next three years (1 if yes, 0 no), children (number of children) in 2011, Low education (1 if not graduate, 0 otherwise), informed (1, if either read the newspaper or/and watch news at least regularly, 0 otherwise), age 20–29 (1 if 20–29, 0 otherwise), in a relation (1 if in a relation, 0 otherwise), occupational status (1 if Not employed, 0 otherwise), availability of Family Help from parents or in-laws (1 if either one or both live within 5 km, 0 otherwise), home ownership (1 if yes, 0 otherwise) and geographical location (south, center and north)

$$y_i = \alpha + \beta T_i + \gamma X_i + \rho T_i * X\prime_i + \epsilon_i \tag{2}$$

where $X\prime_i$ represent the elements in the vector of control variables, which are interacted with the treatment – more specifically, the number of children a woman already has or/and whether a woman intends to have children in the following three years. In testing our hypotheses, we will be interested in estimating the coefficient(s) of the interaction term(s), ρ.

Results

Table 3 shows the results of estimating Eq. 2 on our two outcomes of interest, realized fertility and use of daycare, with and without individual controls. The average treatment effect on realized fertility is positive but not significant without controls (column 1), and positive and only marginally significant when individual controls are included (column 2). The magnitude of this effect is sizable: 0.109 additional children for treated woman, against an average realized fertility of 0.294 for the entire sample. Among the control variables, fertility intentions are strongly significant. No average treatment effect emerges instead on the use of formal childcare. However, since only 76 children were born in our sample, the number of observations is limited and we may lack statistical power to detect any effect. These results provide weak evidence of an effect of our messages on fertility.

To test our hypothesis 1 on the role of salience and memory for already mothers and for women with fertility intentions – we estimate Eq. 2 with realized fertility as outcome variable. Results are provided in Table 4. In column 1, we test the differential treatment effect on already mothers, by adding an interaction term between the

Table 3 Main results: average treatment effect

VARIABLES	Realized Fertility	Realized Fertility	Formal Childcare	Formal Childcare
Treatment	0.053	0.109*	0.007	0.013
	(0.061)	(0.061)	(0.126)	(0.148)
Children		-0.028		-0.089
		(0.064)		(0.076)
Fertility intentions		0.361***		0.269
		(0.058)		(0.217)
Low Education		-0.056		-0.022
		(0.060)		(0.113)
Age 20–29		0.091		-0.270*
		(0.080)		(0.143)
In a relation		0.190*		0.175
		(0.112)		(0.188)
Not employed		-0.059		-0.074
		(0.074)		(0.148)
Close Family Help		-0.028		-0.023
		(0.048)		(0.094)
Homeowner		0.102		-0.272*
		(0.068)		(0.137)
North		-0.041		0.230
		(0.071)		(0.152)
Center		-0.041		0.060
		(0.079)		(0.164)
Informed		-0.088		0.071
		(0.091)		(0.236)
Constant	0.259***	-0.038	0.522***	0.381
	(0.047)	(0.195)	(0.106)	(0.407)
Observations	333	325	76	76
R-squared	0.002	0.139	0.000	0.203

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: Treatment (1 if text or audio treatment, 0 if control), Intended fertility in the next three years (1 if yes, 0 no), children (number of children) in 2011, Low education (1 if not graduate, 0 otherwise), informed (1, if either read the newspaper or/and watch news at least regularly, 0 otherwise), age 20–29 (1 if 20–29, 0 otherwise), in a relation (1 if in a relation, 0 otherwise), occupational status (1 if Not employed, 0 otherwise), availability of Family Help from parents or in-laws (1 if either one or both live within 5 km, 0 otherwise), home ownership (1 if yes, 0 otherwise) and geographical location (south, center and north). For the 2017 survey outcome variables: Realized Fertility (number of children born between the two survey), use of Formal Childcare (1 if Yes, 0 otherwise)

treatment dummy and the number of children a woman already has. In column 2, the interaction term is between the treatment dummy and a dummy variable indicating the woman intention, expressed in 2011, to have children in the next three years. In column 3, both interaction terms are included. In all specifications, the interaction terms are positive and statistically significant, indicating that already mothers and women who intended to have a(nother) child were induced by the treatment to increase their fertility. The treatments are particularly effective on women with fertility intentions. For those women, as opposed to those with no fertility intensions, the treatments increase the realized fertility of 0.191 children (against an average realized fertility among all women of 0.294). The treatments are also more effective on mothers, as opposed to non-mothers, since they increase their realized fertility of 0.151 children for every existing child (with the average number of existing children in 2011 being 0.61). Hence, the fertility effects of the treatments are mostly concentrated on these two groups of women – mothers and women with fertility intentions. For these two groups, the magnitude of the effect is relevant.

Table 4 Results by fertility intentions and education

	Realized Fertility		
VARIABLES	(1) Mothers	(2) Women with Fertility Intentions	(3) Both
Treatment	0.027	-0.023	-0.120
	(0.080)	(0.056)	(0.075)
Children	-0.145**	-0.024	-0.147**
	(0.062)	(0.063)	(0.060)
Children*Treatment	0.151**		0.158**
	(0.074)		(0.062)
Fertility Intention	0.362***	0.229***	0.220***
	(0.057)	(0.067)	(0.077)
Fertility Intention* Treatment		0.191**	0.206**
		(0.093)	(0.093)
Low Education	-0.049	-0.063	-0.056
	(0.059)	(0.059)	(0.059)
Age 20–29	-0.049	0.092	0.092
	(0.059)	(0.080)	(0.079)
In a relation	0.194*	0.181	0.184*
	(0.112)	(0.111)	(0.111)
Not employed	-0.052	-0.066	-0.060
	(0.074)	(0.074)	(0.074)
Family Help	-0.014	-0.026	-0.012
	(0.049)	(0.047)	(0.048)
Homeowner	0.106	0.107	0.112
	(0.068)	(0.068)	(0.068)
North	-0.046	-0.039	-0.044
	(0.070)	(0.071)	(0.070)
Center	-0.045	-0.040	-0.044
	(0.080)	(0.079)	(0.079)
Informed	-0.075	-0.093	-0.079
	(0.093)	(0.093)	(0.095)
Constant	-0.006	0.064	0.106
	(0.197)	(0.184)	(0.186)
Observations	325	325	325
R-squared	0.148	0.145	0.155

Robust standard errors in parentheses

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

Note: Treatment (1 if text or audio treatment, 0 if control), Intended fertility in the next three years (1 if yes, 0 no), children (number of children) in 2011, Low education (1 if not graduate, 0 otherwise), informed (1, if either read the newspaper or/and watch news at least regularly, 0 otherwise), age 20–29 (1 if 20–29, 0 otherwise), in a relation (1 if in a relation, 0 otherwise), occupational status (1 if Not employed, 0 otherwise), availability of Family Help from parents or in-laws (1 if either one or both live within 5 km, 0 otherwise), home ownership (1 if yes, 0 otherwise) and geographical location (south, center and north). For the 2017 survey outcome variables: Realized Fertility (number of children born between the two survey)

To assess a possible role of the information content in persuading these two groups of women (already mothers and women who intent to become mother) to have a(nother) child, we estimate the regression at Eq. 2 on the treatment, on both interaction terms and on the other control variables, with the answers to our three questions on information recall as dependent variable. The results are reported in Table 5, where column 1 reports the effect on the knowledge of the information on socialization, column 2 on school attainments, column 3 on university attainments and column 4 displays the overall knowledge effect. The interaction terms between the treatment dummy and the number of children a woman already has or between

Table 5 Knowledge of the message in the treatment

VARIABLES	(1) Socialization	(2) Primary School	(3) University	(4) Overall
Treatment	-0.190*	0.036	0.009	-0.079
	(0.104)	(0.106)	(0.101)	(0.240)
Children	-0.118	0.001	0.049	-0.041
	(0.074)	(0.063)	(0.052)	(0.136)
Children*Treatment	0.091	0.047	-0.005	0.119
	(0.077)	(0.068)	(0.062)	(0.153)
Fertility Intention	-0.123	0.084	-0.063	-0.195
	(0.102)	(0.093)	(0.090)	(0.217)
Fertility Intention* Treatment	0.219*	-0.001	0.111	0.342
	(0.122)	(0.113)	(0.113)	(0.274)
Low Education	-0.081	-0.145**	-0.174***	-0.422***
	(0.056)	(0.056)	(0.056)	(0.142)
Age 20–29	0.049	-0.026	-0.032	0.014
	(0.069)	(0.071)	(0.074)	(0.176)
In a relation	-0.185**	-0.170**	-0.079	-0.490**
	(0.082)	(0.076)	(0.074)	(0.195)
Not employed	-0.017	0.100	0.005	0.146
	(0.070)	(0.063)	(0.063)	(0.172)
Family/Help	0.052	0.064	-0.020	0.064
	(0.048)	(0.042)	(0.037)	(0.105)
Homeowner	0.060	-0.081	-0.098	-0.148
	(0.070)	(0.073)	(0.070)	(0.179)
North	0.003	0.028	-0.076	-0.058
	(0.068)	(0.058)	(0.059)	(0.157)
Center	0.034	0.110	-0.024	0.148
	(0.089)	(0.086)	(0.083)	(0.235)
Informed	-0.005	0.186**	0.129*	0.489**
	(0.133)	(0.082)	(0.074)	(0.203)
Constant	0.856***	0.151	0.323**	1.187***
	(0.180)	(0.148)	(0.137)	(0.328)
Observations	300	279	251	247
R-squared	0.084	0.079	0.088	0.121

Robust standard errors in parentheses

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

Note: Treatment (1 if text or audio treatment, 0 if control), Intended fertility in the next three years (1 if yes, 0 no), children (number of children) in 2011, Low education (1 if not graduate, 0 otherwise), informed (1, if either read the newspaper or/and watch news at least regularly, 0 otherwise), age 20–29 (1 if 20–29, 0 otherwise), in a relation (1 if in a relation, 0 otherwise), occupational status (1 if Not employed, 0 otherwise), availability of Family Help from parents or in-laws (1 if either one or both live within 5 km, 0 otherwise), home ownership (1 if yes, 0 otherwise) and geographical location (south, center and north). For the 2017 survey outcome variables: knowledge (1 if yes, 0 otherwise) of the three messages on Socialization, Primary school attainments and University attainments and an overall measure of knowledge summing up the answers to the three questions

the treatment dummy and the dummy variable for fertility intentions are never significant, except for fertility intention in column 1 (at 10% level). This suggests that knowledge of the information provided in the communication message was not crucial to induce already mothers and women who intend to become mother to increase their realized fertility.

Taken together, the results in Tables 4 and 5 provide supporting evidence to our conceptual framework. The exposure to a communication message about children attainments increased fertility among these women, for whom children were indeed salient. However, this communication message did not improve their knowledge (or at least their recollection) of the information conveyed. For these women, salience was likely to induce memory of children. This could have started a process of retrieval of positive memories about children, which remained lingering and persisted over time. This reconstruction of a positive narrative about children social and educational attainments may induce the magnification of a simple communication message (a short video or a text) and lead to what may seem an overreaction, as past memories, stimulated by current cues, promote future thinking and induce changes in future behavior.

Discussion

Information provision and educational campaigns are widely used – and largely appreciated – public policies in family planning and public health. In this paper, we study the long-term effects on realized fertility in a lowest low fertility country – Italy, of information treatments about the positive effects of childcare. We exploit a randomized survey experiment run in Italy in 2011, which provides information on the positive effects that attending daycare may have on the children' future cognitive development. Using a follow-up survey run six years later, we analyze the impact of these treatments on realized fertility. Our empirical analysis shows a large effect of the treatment on the realized fertility of women who had fertility intension already in 2011 or who were already mother. However, these two groups of women do not appear to have better knowledge or recollection of the three information messages provided with the treatments in 2011.

These results are consistent with our conceptual framework that links salient features in the communication message to individual behavior through the working of memory. Images of children joyfully playing in childcare facilities are particularly salient for mothers and for women with fertility intensions. For these women, who have personal memories of their own children or may have already created memories about small children in developing their fertility intensions, cues in a message may bring back vivid memories. These memories may then constitute the base of future thinking. In fact, vivid past experiences are known to be key to construct mental simulations of future events and decisions. The effectiveness of a communication campaign may thus rely on this chain of event involving salience and memory, which may help explaining individual overreaction to seemingly small stimuli, but only for those women who found the stimuli to be salient. This chain of event is consistent also with several features of the

empirical results. In the 2011 survey, the message on the benefits of childcare was not sufficient to increase the immediate fertility intensions among women. The treatments, consisting of a single exposure to three statements on the positive effects of childcare attendance, were likely to be too limited to convince women with no prior fertility intensions. However, the same treatments may have been strong enough to have long-term effects on realized fertility for those women, who already had developed fertility intensions. For these groups of women, the cues in the treatment may have been sufficiently salient to bring back existing memories and activate future fertility behavior. Interestingly, even among women with prior fertility intensions, women who saw the communication message in 2011 did not have a better knowledge or recall of the information provided in the message than women who were not exposed to the message. This suggests that, rather than positive information about childcare effectiveness, salient cues in the message might have been responsible for increasing fertility.

Two important policy implications emerge from this study. Using unsolicited information to modify individual behavior may prove difficult. Yet, communication messages may work for some individuals, if they are able to induce retrieval of past memories and to activate future thinking. These effects may materialize even in the long-term (Pons, 2018; Galasso et al., 2023). Communicating a positive narrative about children behavior was salient for some individuals (mothers and women who intend to have children) and may have encouraged them to realize their fertility intentions.

Of course, this study has limitations. The sample size of the second survey was somewhat limited (333 observations). A large attrition rate between the two surveys run six years apart is to be expected. But possible selection issues may emerge. Based on observable individual characteristics, compliers, who participated to both surveys, and drop-outs, who were not reached for the second survey (or refused to answered), are not statistically different in most crucial individual characteristics, such as, intentions to have children, education, age, family help, working status and home ownership. Some differences however emerge. There are more individuals with no children, not in a relation and living in the South among the compliers than among the dropouts. Despite these differences, it is reassuring that the characteristics more prevalent among the compliers (not being in a relation, not having children, and living in the South) are not positively correlated with the probability of having children. Hence, according to these observable characteristics, the individuals surveyed twice are not more likely to have children.

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Data Availability Data and codes are available upon request.

Declarations

Open Practices Statement The study relies on a previous experiment by Galasso, Profeta, Pronzato and Billari "Information and Women's Intentions: Experimental Evidence About Child Care." European Journal of Population 33, no. 1 (2017): 109–128. I use available data from that survey experiment and run a recall survey. Formal approval from the Ethical Committee was not needed for the 2017 survey under the existing Bocconi rules. A copy of the 2017 questionnaire is available. The survey company that ran the online survey in 2017 was Ce&co (www.ce-co.it).

Conflict of Interest I have no conflict of interest.

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