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When the message hurts: The unintended impacts of nudges on saving

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ABSTRACT

We implement a field experiment in Romania to elucidate how informational nudges and goal setting impact saving. We find no evidence that text message reminders, either in the form of a general reminder or information about the saving goals of peers, encourage saving. Further, both types of messages discourage saving for participants who set a goal, particularly among high goal setters. We posit that informational nudges unintentionally increase the salience of unrealistic goals and engender boomerang effects that discourage high goal setters from saving. Among participants who received no messages, those who set goals save more, suggesting a tradeoff between commitment devices and informational nudges in this context.

1. Introduction

Promoting savings behavior is a key concern among policy makers and commercial institutions alike. On a macro level, savings stimulates economic growth (Jayaratne and Strahan, 1996; Black and Strahan, 2002; Levine, 2005) and reduces income inequality (Beck et al., 2007). On a micro level, savings is critical for poverty alleviation, risk smoothing, and economic welfare more generally (Burgess and Pande, 2005; Honohan, 2004; Allen et al., 2016).

Yet, across the world, many people under-save. Interventions aiming to incentivize saving behavior often rely on nudges, like messaging, and commitment devices, such as goal setting, to encourage savings. Evaluations of these interventions, however, show mixed results.[1] Recent experiments in low-income settings have shown a positive impact of messaging and goals on saving, where messaging takes different forms, from general reminders about one's goal to peer information (Karlan et al., 2016; Kast et al., 2018; Rodriguez and Saavedra, 2019). In high-income settings the results are more mixed and suggest that nudges may sometimes discourage saving (Beshears et al., 2015; Grinstein-Weiss et al., 2017; Raue et al., 2020; Dur et al., 2021). Nudges can be powerful interventions, but occasionally they may fail to achieve their objectives, and in some cases even backfire. Understanding the potential

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[1] See Steinert et al. (2018) and Duvendack and Mader (2020) for recent surveys.

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heterogeneity of these effects, and in particular, how nudges interact with other incentives, is thus key to the successful design of interventions aiming to promote saving (Beshears and Kosowsky, 2020).

We design a randomized intervention to elucidate how informational nudges, including general reminders and peer information, interact with goal setting to impact saving behavior. General reminders are thought to increase saving by addressing limited attention and promoting salience.[2] While there are several theoretical reasons why peer information should also encourage saving, from belief updating to social benchmarking,[3] in some settings peer information has been shown to discourage saving (Beshears et al., 2015). Moreover, while goal setting theoretically helps to overcome self-control problems, and is a standard feature in most interventions aiming to promote saving, goal setting can sometimes interact with nudges in discouraging ways. For example, if peer information leads to a "boomerang effect" (Clee and Wicklund, 1980), such as oppositional reactions or negative belief updating, messaging may reduce saving among people whose goals are inconsistent with their peers.[4] General reminders may also unintentionally decrease saving among those who set unrealistic goals by increasing the salience of said goals.[5]

Our randomized intervention specifically tests whether distinct types of messaging – general reminders versus peer information – have a differential impact on saving, and further, whether these messages interact with goal setting in heterogeneous ways. We implement our experiment among a random sample of 500 farmers in Romania, which is classified by the World Bank as an upper-middle income country, with a per capita GDP of $12,400 USD in 2018 at the time of our experiment. Saving in Romania is among the lowest in Europe and Central Asia, where just 14 percent of adults save in a formal account. We focus explicitly on farmers, as they represent almost a quarter of the labor force and a significant portion of the unbanked in Romania, suggesting that the potential gains from promoting saving are large among this group.

At the beginning of the experiment, each participant was presented with an offer to save in a home deposit box and informed that after three months, the research team would revisit to observe the total accumulated savings and pay interest on the balance. At baseline, all participants were asked whether they would like to set a saving goal and if so, how much they wished to save over the following months. In addition, participants were randomized into one of three groups. In the first group, participants received a general text message reminder to save approximately half-way through the study period. In a second group, participants received the general reminder and were also informed of the average saving goals of their peers. In a third, control group, participants received no text messages.

We find that on average, 17 percent of participants saved in the experimental home deposit box, accumulating 488 Lei ($122 USD) over the three-month period.[6] We verify that engagement with the experimental home deposit box is unrelated to the participant's (mis)trust in strangers or to possible hoarding behavior prior to follow-up. Moreover, we find no evidence of substitution into other formal savings accounts during the experimental period. Thus, relative to low baseline financial engagement, in which 27 percent of participants reported owning a formal savings account with an average balance of 700 Lei ($175 USD), and 20 percent saved in cash at home, engagement with the experimental home deposit box is qualitatively meaningful.

We then estimate the impact of messaging on saving behavior, conditional on having access to a saving device. First, we examine the effect of receiving any message – reminder or peer – on the propensity to save and find no significant difference between treatment and control. We then estimate the separate effect of reminders versus peer information and find that while both types of messaging appear to reduce the propensity to save, the difference is neither statistically significantly different from the control group nor between the two treatment groups.

Next, we examine heterogeneity by whether the participant set a saving goal. While the option to set a goal was given to all participants, the decision to set a goal was elicited prior to random treatment assignment, allowing for causal inference of the heterogeneous treatment effect. In addition, the proportion of those setting a goal (30 percent of the sample) is statistically equivalent across treatment and control, and is balanced across a host of observable baseline characteristics. In the control group with no messaging, goal setting is associated with a 15 percentage point increase in the likelihood of saving in the home deposit box and a 125 percent increase in the amount saved. However, in the treatment group, any messaging – reminder or peer – reduced the propensity to save for goal setters by 21 percentage points. When we disaggregate the treatment into reminder versus peer, we find that both types of messaging reduce the propensity to save for goal setters equally, but that peer reminders appear to reduce the total amount saved. Tests for selection on observables (Oster, 2019) suggest that the results are not driven by potentially confounding unobservable factors. Further, when we examine the effect of messaging on those who did not set a goal, we find that while the coefficients are positive, they are qualitatively small and statistically insignificant, suggesting that on its own, messaging is unlikely to impact saving.

We then attempt to elucidate why messaging negatively interacts with goal setting in our sample by comparing those who set high goals (i.e., above the mean saving goal of their peers) with those who set low or no goals. Here we find that for people who set high goals, messaging reduces the propensity to save by 23 percentage points. Furthermore, general reminders and peer information

[2] Karlan et al. (2016) develop a theoretical model where limited attention to exceptional expenses generates undersaving, which is mitigated by reminders. Akerlof (1991) emphasizes the role of salience rather than costly self-control as a driver of procrastination. Bordalo et al. (2013) develop a model of salience as a driver of consumer choice.

[3] See Schultz et al. (2007) for a discussion of peer information in psychology. See Breza and Chandrasekhar (2019) for a discussion of peer information in financial decision-making.

[4] See Beshears et al. (2015) for oppositional reactions in savings; see Schultz et al. (2007) for negative belief updating in the context of energy consumption.

[5] See Harding and Hsiaw (2014) in the context of energy conservation; see Hsiaw (2013) for the underlying theory of unrealistic goal setting and self-control.

[6] Unconditional on saving. At the time of the experiment, 1 Lei was approximately $0.25 USD.

have a statistically equivalent impact on reducing the propensity to save among high goal setters, though peer messaging appears to reduce the total amount saved.

We posit that messaging negatively interacts with high goal setting for two reasons. First, for the group that received peer information, high-goal setters appear to update their beliefs downward, closer to that of their peers, exhibiting behavior that is consistent with a boomerang effect (Clee and Wicklund, 1980), such as negative belief updating (Schultz et al., 2007). Second, for the group that received general reminders, we argue that the reminder to save increased the salience of unrealistic saving goals among high goal setters. Hsiaw (2013) shows theoretically how unrealistic goals can discourage agents from exercising self-control, while Harding and Hsiaw (2014) show in the context of energy conservation that unrealistic goal setters were less able to conserve energy consumption. Our findings are consistent with this phenomenon, suggesting that increasing the salience of unrealistic goals can also disincentivize financial savings.

Our findings relate to several literatures. First, we contribute to the work on messaging and financial behavior.[7] Specifically in regard to savings, Karlan et al. (2016) test the impact of messages that highlight saving goals versus financial incentives and find that both types increase saving. Messages that are framed in terms of a new beginning have also been shown to increase retirement savings (Beshears et al., 2021). Messages that include peer information, however, are not always effective. While several studies have documented peer effects in financial decision-making,[8] recent field experiments on peer messaging show that information about peer behavior (Raue et al., 2020) and peer pressure (Kast et al., 2018) may increase saving in some settings and discourage saving in others (Beshears et al., 2015). Furthermore, even when messaging promotes saving, it remains unclear whether peer messaging is more effective than general reminders to save.

Our experimental design teases out the relative importance of general reminders versus peer information and finds that, at least in our setting, there is no differential impact between the two approaches on the propensity to save on average, but that both types of messages negatively interact with goal setting to discourage saving. Our study is one of the first to examine this heterogeneity, suggesting an important trade-off between goal setting and informational nudges in upper-middle income settings. This finding relates directly to the literature on goal setting, where a rich theoretical literature establishes the role of goals in managing self-control problems,[9] and in particular, how unrealistic goals can lead to sub-optimal choices (Hsiaw, 2013). Our findings are consistent with empirical work on goal setting and energy conservation, which shows that consumers who choose realistic goals to reduce energy consumption save substantially more (Harding and Hsiaw, 2014).

We further contribute to the consumer psychology literature on boomerang effects (Clee and Wicklund, 1980; Ringold, 2002), where the provision of information about the behavior of one's peers can lead to unintended consequences in the treatment group. Our results relate most closely to boomerang effects observed by Beshears et al. (2015), who find that providing peer information reduces 401(k) participation in the US. The specific boomerang effect documented there is an oppositional reaction, in which participants shift their behavior away from their peers upon realizing that their peers were saving more. In our setting, the observed boomerang effect is more consistent with negative belief updating, in which participants shift their behavior downward, toward their peers, upon learning that their own behavior is less common than previously believed.[10]

Finally, most of the research on savings interventions comes from high income countries, like the US, or low-income settings in Africa, Southeast Asia, or Latin America. We know far less about the nuances of interventions in upper-middle income countries, such as Romania. Yet, some of the largest potential gains from promoting savings stand to be made in these places, where saving behavior is low, but incomes are relatively high. Per capita income in Romania is among the highest in Eastern Europe and Central Asia, but saving is among the lowest.[11] On average, 58 percent of adults have a bank account and the share of adults formally saving is 14 percent — the lowest share in the European Union,[12], while in our own data, informal savings is also low, with 39% of respondents saving informally, including cash at home, livestock, and grain inventory. Thus, the scope for successful savings interventions in this setting is large.

The rest of this article proceeds as follows. Section 2 details the setting and design of our field experiment. Section 3 presents the summary statistics. Section 4 details the empirical results. Section 5 concludes.

2. Experimental design

We conducted our experiment over five months, from November 2017 to March 2018, among a random sample of farmers living in Suceava county, a rural county in northeast Romania. We focus specifically on farmers for several reasons. First, agriculture is one of the primary sectors in the Romanian economy, with over 23 percent of the labor force employed in agricultural activities — the highest in all of Europe (Eurostat, 2017). In December 2017, monthly average net earnings in agriculture (1844 Lei = $461 USD)

[7] See, e.g., Karlan and Zinman (2014) and Cadena and Schoar (2011) who test the impact of reminders on loan repayment.

[8] See for example Duflo and Saez (2003) on 401(k) participation in the US and Lieber and Skimmyhorn (2018) on charitable giving in the US.

[9] See, among others, Koch and Nafziger (2011); Suvorov and van de Ven (2008); Loewenstein (2007), Locke and Latham (2002), Heath et al. (1999), Latham and Locke (1991), Bandura (1989), Kahneman and Tversky (1979).

[10] Boomerang effects are common in other contexts, too. See, for example, Schultz et al. (2007) in regard to energy consumption, Bhargava and Manoli (2015) in regard to the Earned Income Tax Credit in the US, Fellner et al. (2013) on tax compliance, Ashraf et al. (2014) on the student performance in community health worker training, Bursztyn et al. (2020) on preferences for female labor supply, and Robinson et al. (2021) in the context of awards to motivate student attendance.

[11] According to the World Bank, in 2017 globally about 1.7 billion adults remain unbanked and there were 116 million unbanked adults in Europe and Central Asia. The majority live in Romania, the Russian Federation, Turkey, Uzbekistan, and Ukraine.

[12] IMF Global Findex database, 2017.

were around 30 percent lower than average net salaries in Romania (2629 Lei = $657 USD) according to the Romanian National Institute for Statistics. Second, farmers represent a significant portion of the unbanked in Romania; in our sample, only 27 percent of farmers had a formal savings account at baseline, compared to 58 percent of all Romanians in the national average, and of those who had an account, only 20 percent made deposits on a regular basis.

This is likely due to the fact that farmers are often paid in cash and at irregular intervals. The irregular nature of agricultural income, in combination with a poorly developed banking sector,[13] especially in rural areas, make it difficult for farmers to interface with automatic banking services that have been shown to incentivize savings in high-income contexts (Madrian and Shea, 2001; Taler and Benartzi, 2004; Grinstein-Weiss et al., 2017; Roll et al., 2020), necessitating a different approach to savings promotion in this setting.

Nonetheless, in spite of the lower relative incomes and financial engagement of our sample demographic, a large literature shows that people in low-income settings can and do save (see Karlan and Zinman (2014) for a review). Moreover, while farmers are on the lower end of the income distribution in Romania, their average incomes are well above the upper-middle income poverty line of $5.50 per day (USD 2011).[14] Thus, there are potential unrealized gains from promoting savings among this demographic.

To construct our experimental sample, we implemented a stratified random sampling from a list, provided by the Agency of Payments and Intervention for Agriculture (APIA), of all farmers in Suceava county receiving support from the European Agricultural Guarantee Fund.[15] We first selected a random sample of localities (called comuna) to ensure balance across particular geographic and historical factors. We restricted selection to comuna that are within 15 km of the historical border between the former Habsburg and Ottoman empires, given recent evidence suggesting that institutional legacies impact savings in this region (Walker, 2020; Grosjean, 2011). From a total of 41 comuna that met our geographic criteria, we randomly selected 27 for the experiment: 9 comuna in former Habsburg regions, 9 comuna in former Ottoman regions, and 9 comuna split by the historical border. Within each comuna, we then randomly selected 20 farmers to invite to the experiment, for a total target of 540 participants.[16]

Our experimental design consisted of several components. We first administered a baseline survey to each of the selected participants privately in their homes to collect information on basic demographic characteristics, risk and time preferences, engagement with various financial services, farm attributes, and trust in financial institutions. Time preferences were measured using a multiple price list (MPL), which asked the participant to decide whether they would prefer to receive a lower sum of cash in a near period or a larger amount in a later period. We use these questions to measure the extent to which the participant demonstrates hyperbolic discounting (or present bias).[17] We elicited risk preferences using the method developed by Eckel and Grossman (2008). This method is a simple way of measuring risk preferences and has been widely used in the literature, especially in populations where participants have lower math abilities (Charness et al., 2013).

We construct several measures of socio-economic status, which should correspond to the propensity to save. Farm area is a proxy for land wealth. In addition, we count the total pieces of farm equipment owned, including: tractor, trailer, hand plow, truck, cultivator, chemical applicator, mechanical seeder, thresher, tractor plow, and bale press. We also construct an index of consumer durables ownership, where participants are assigned one point for each of the following items they own: refrigerator, freezer, automatic washing machine, audio equipment, computer, cell phone, television, bicycle, motorcycle, moped, and car. Finally, we ask the respondent to report the type of saving methods they use, as well as total value of all formal and informal savings at baseline.

At the end of the survey, all participants were presented with an offer to save in our experimental home deposit box and given a small box to deposit their savings into over the study period. The enumerator informed the participant that our team would return in five months to conduct a follow-up interview and pay one percent interest on the total savings accumulated in their experimental home deposit box. To incentivize saving in the deposit box, we specifically chose an interest rate that was slightly higher than the average bank interest rate at the time of the study, but not so high so as to set unrealistic incentives.[18] At the time the savings boxes were administered, but prior to treatment, participants were also asked whether they would like to set a saving goal for their experimental home deposit box, and if so, how much they wished to save.

We designed the experimental home deposit box as a savings box to be kept at home for several reasons. First, given the rural nature of our experimental setting, simply offering participants the option to open an account with an existing bank is not feasible. 70 percent of participants do not have a bank in their village and would have to travel on average more than five km to the nearest village to access a physical bank. Given that only 58 percent of these participants own a car, and in the absence of accessible public transportation, the transaction costs involved with traveling to a physical bank are not trivial. Moreover, previous studies suggest that indirect transaction costs, such as travel time and distance to the nearest bank, are a significant barrier to saving.[19] Second, while access to banks is balanced across treatment and control, financial under-development presents a logistical barrier to saving

[13] Financial intermediation (measured as the ratio of total private sector credit to GDP) was 25.6% of GDP in 2018, roughly three times below the EU average.

[14] According to the Romanian National Institute for Statistics, monthly net earnings for farmers in 2017 was $461 USD, which is roughly $15 USD per day or $13.77 in 2011 USD.

[15] APIA operates under the Ministry of Agriculture and Rural Development based on Law 1/2004 and since January 2007 has been administering support measures financed by the European Agricultural Guarantee Fund (EAGF) (http://www.apia.org.ro/).

[16] Comuna correspond to the NUTS5 administrative level in Romania and have an average population of 3388 inhabitants (Romanian National Institute for Statistics). There are 114 total comuna in our sample county.

[17] See, e.g., Frederick et al. (2002) Cohen et al. (2020) for a review of literature on time discounting and preferences. See Ashraf et al. (2006b); Tanaka et al. (2010); Bauer et al. (2012); Dupas and Robinson (2013); Giné et al. (2018) for applications to savings.

[18] According to National Bank of Romania (www.bnr.ro/Statistics-report-1124.aspx) the average interest rates for Lei denominated deposits in November 2017 was 0.92%, suggesting that our experimental home savings bank was slightly more profitable than saving in a formal bank.

[19] See, e.g., Goodstein and Rhine (2017) in the US and Dupas et al. (2018) in sub-Saharan Africa.

that we overcome by bringing the experimental bank directly to participants, ensuring that the transaction costs of saving are equal for all subjects. Third, many banks have account opening fees and minimum deposit requirements, which have been shown to inhibit financial engagement in other contexts (Dupas and Robinson, 2013).

Home savings boxes have been used in other settings, such as the Philippines (Karlan et al., 2016) and Kenya (Dupas and Robinson, 2013) to test interventions designed to promote saving among the under banked. In our sample, saving at home is not uncommon. Of the 40 percent of participants who report saving informally (i.e., outside of a bank), 52 percent save cash at home. Other common methods include illiquid agricultural assets, such as animals (57 percent) and grain inventory (37 percent). In this context, the home deposit box is consistent with the preferences of its potential customers, while at the same time providing aspects of formal savings, such as interest, liquidity, and observability of balances. It is also consistent with the work on deposit collectors in many low-income country settings, in which financial institutions send agents to collect deposits in places with limited access to physical branches (e.g., Ashraf et al. (2006a)).

Nonetheless, one may be concerned that the design of the savings boxes may over or understate incentives to save. For instance, participants may decide to put all of their cash in the box on the day that the survey team arrives or pool cash from friends and family members to reap the interest rather than save on a regular basis. While we cannot directly observe this behavior, we did ask respondents during the follow-up survey how frequently they deposited in the experimental home deposit box, as well as the average amount deposited. Conditional on saving, 94 percent of respondents reported saving on a weekly (44 percent) or monthly basis (50 percent), while the average deposit amount was between 100 and 500 Lei. This is consistent with the savings amounts counted by enumerators, where the median total savings was 1100 Lei conditional on saving. This amount is in line with average incomes of farmers (around 23,000 Lei annual), particularly considering that our study was conducted right after the harvest when incomes are highest.

Alternatively, one may think that the home savings incentives were insufficient for farmers who may accumulate wealth by investing in their farms rather than saving. During our study period, however, estimates from the European Union indicate that the return on assets for Romanian farmers was negative, suggesting that saving is a superior investment to farm assets.[20] Moreover, given the risky nature of agriculture and the absence of formalized insurance markets for farming in Romania, saving is a primary method for risk-smoothing among our sample.

One may further wonder whether participants' (mis)trust in the research team could impact engagement with the experimental home deposit box. If participants did not believe that the enumerators would return to pay interest on the balance, this would diminish incentives to save. In the survey, we asked participants to report how much they trusted people they met for the first time: (i) completely, (ii) somewhat, (iii) not very much, and (iv) not at all. We create a dummy variable equal to one if the participant reported (i) or (ii), and zero otherwise, and correlate this measure of trust with saving in the experimental home deposit box (Appendix Table A.1). There is no correlation between trust in strangers and engagement with the experimental home deposit box.

To capture the impact of messaging on savings, we randomized participants, within each comuna, into one of three groups. Participants in the control group received only the savings box. In a second group, participants received the savings box and were also sent one text message after eight weeks to remind them to save. We call this the reminder treatment. The reminder message stated: "Thank you for participating in this research. This is a friendly reminder to save. We will be visiting you sometime in March to pay your accumulated interest".

In a third group, participants received the box and text message reminder, but in addition to being reminded to save, they also received information about the average saving goal of all participants in the study. We call this the peer treatment. The peer message stated: "Thank you for participating in this research. This is a friendly reminder to save. On average, participants in this study want to save 900 Lei. We will be visiting you sometime in March to pay your accumulated interest".[21]

At the time the savings boxes were administered, participants were given no information regarding the messaging treatments.

We hired a local survey company to administer the baseline and follow-up surveys, conduct the time and risk elicitation tasks, send the text message reminders, and count and pay interest on the savings at the end of the experimental period. Baseline surveys were administered in late November and early December 2017, just after the harvest and at a time when farmers had been recently paid for their crop yields and had ample income available for saving. Follow-up surveys and interest payments were completed in March 2018.

3. Summary statistics

Of the 540 randomly selected farmers who were invited to the experiment, 503 participated in the baseline survey and were given savings boxes. Of the 503 baseline participants, 412 completed the follow-up and presented their experimental home deposit boxes for interest payments. Appendix Table A.2 conducts a series of t-tests to compare the baseline characteristics of participants who completed the follow-up with those who did not. The exercise reveals that attrition was balanced on almost every dimension, with the exception that people who had a formal savings account at baseline and who reported a higher total balance in that account were less likely to complete the follow-up. Importantly, however, attrition does not vary by treatment assignment, nor across goal setting, suggesting that the internal validity of our experiment is not threatened.

[20] Source: https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/farming/documents/agricultural-capital-land-value_en.pdf.

[21] 92 percent of participants own a mobile phone and there is no systematic difference between treatment and control with regard to mobile phone ownership. In the event the participant did not own a mobile phone, they were asked to provide a proxy who could be contacted for the follow-up. For participants in the treatment group, the proxy would have received the reminder text messages.

Table 1
Balance of baseline covariates by treatment and control.

	Treatment		Control		Difference
	N	Mean	N	Mean	*P*-value
Age	330	51.27	167	53.00	0.157
Female	334	0.21	169	0.23	0.587
Post-secondary school	334	0.39	169	0.36	0.582
Household size	333	3.96	169	3.78	0.273
Children in household	333	0.68	169	0.78	0.284
Adults in household	333	2.74	169	2.55	0.163
Work off farm	326	0.31	168	0.27	0.408
Farm size (Ha)	334	11.53	167	12.08	0.766
Farm equip	334	2.39	169	2.14	0.376
Durables	334	6.59	169	6.56	0.875
σ risk choice	334	2.71	168	2.72	0.990
Discount rate	334	94.94	169	95.11	0.365
Present bias	334	0.06	169	0.05	0.764
Set goal	334	0.31	169	0.27	0.441
High goal	334	0.26	169	0.24	0.612
Saves in cash	334	0.19	169	0.20	0.676
Formal savings account	332	0.25	169	0.30	0.217
Formal savings (Lei)	328	169.28	168	214.14	0.199
Informal savings (Lei)	321	282.40	164	269.36	0.741
No bank in village	334	0.69	169	0.70	0.774

Durables is the total number of consumer durables that the participant owns from the following list: refrigerator, freezer, automatic washing machine, audio equipment, computer, cell phone, television, bicycle, motorcycle, moped, and car. *Farm equip* is the total pieces of farm equipment owned.

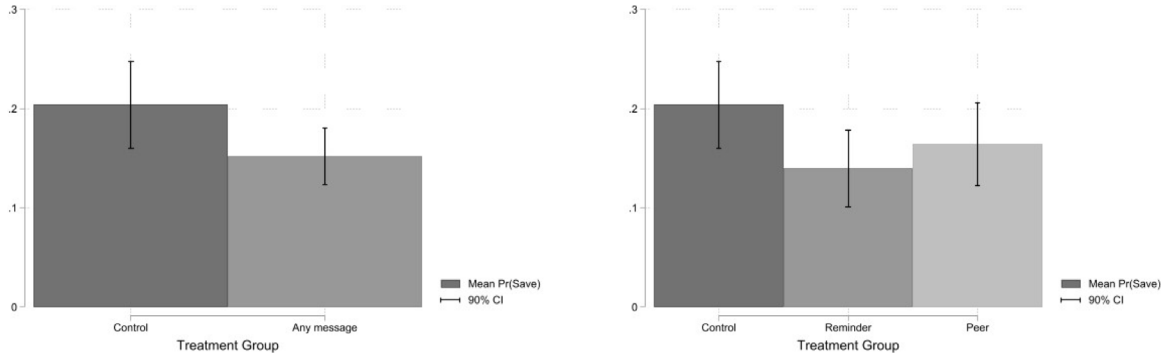
Nonetheless, one may be concerned about possible implications for external validity if the final sample is less likely to engage with formal savings, and perhaps less financially literate. First, we note that, while statistically significant, the qualitative differences in owning a savings account and total amount of formal savings between attritors and non-attritors is small (0.157 and 0.134 standard deviations, respectively). Second, we note that there is no difference in engagement with formal credit between attritors and non-attritors, nor are there differences in the amount of trust in financial institutions between the two groups, suggesting that financial literacy is not likely to be different across groups. Finally, we conduct an exercise in Appendix Table A.3 to elucidate whether those who owned a formal account are more or less likely to engage with the experimental home deposit box. The results provide weak evidence that participants who owned a formal savings account at baseline were more likely to save in the home deposit box, but that there is no significant interaction with our messaging treatment (if anything, the coefficients on the interaction are negative, which is consistent with our main finding that messaging demotivates savings). However, given the higher attrition rate among account owners, who we assume did not save in the home deposit box, the net effect is likely zero, as columns (5)–(10) suggest. Finally, in a separate exercise in Section 4.3 we explore whether formal account owners substitute their savings away from the home deposit box and into formal savings over the study period and find no evidence of such substitution (Appendix Table A.6). We nonetheless control for baseline account ownership in our robustness specifications to address the fact that formal account owners may be inherently different than those without formal accounts at baseline.

Next, we verify that the randomization in the follow-up sample is balanced across important baseline characteristics that could impact saving behavior. Here, we group the reminder and peer treatment into one category and compare them to the control group that received no reminders using simple t-tests. The exercise in Table 1 reveals that treatment is balanced across a host of baseline characteristics, including age, gender, household composition, education, farm size, ownership of consumer durables, time and risk preferences, baseline savings, and financial access. In Appendix Table A.4, we separate the treatment groups into reminder and peer and find that baseline covariates are balanced over the disaggregated treatment groups, as well.

Of the farmers who completed the follow-up, 17 percent saved in the experimental home deposit box, and accumulated 488 Lei ($122 USD) on average (unconditional) over the three-month period. While the take-up rate may seem low at first glance, it is notable that at baseline, 27 percent of the sample reports saving in a formal account. Of those who had a formal account, the average account balance at the time of the baseline survey was 700 Lei ($175 USD). Hence, relative to these baseline figures, the level of engagement with the experimental home deposit box is qualitatively meaningful.

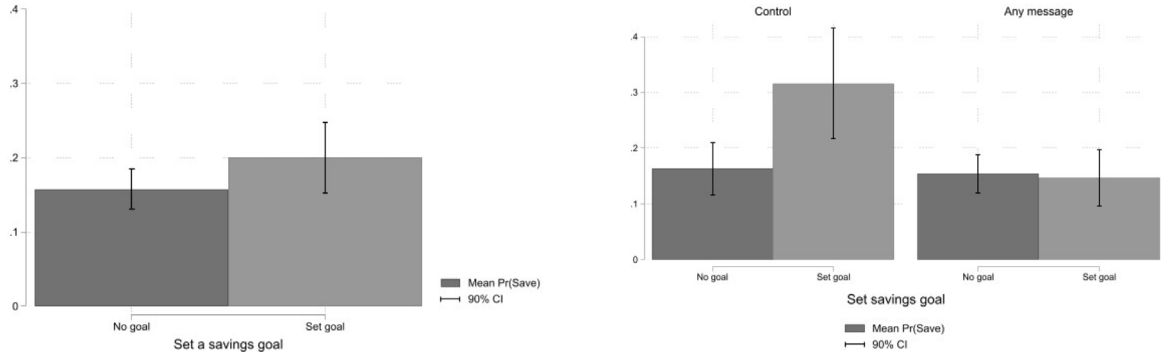
Our aim is to understand how different forms of messaging impact savings and whether these messages interact with goal setting in ways that may help or hinder savings. We begin by plotting the average savings across the treatment and control groups to visually examine differences in means. Panel (a) of Fig. 1 plots the mean likelihood that the participant saved in the experimental bank account, separated by control and treatment group. Panel (b) disaggregates treatment into the separate reminder and peer groups. In both panels, the treatment group has a lower likelihood of saving than the control group, but the difference does not appear to be statistically significant at the 90% confidence interval (CI).

Next, we examine average savings across participants who set a saving goal and those who did not, and whether goal setting interacts with the treatment in heterogeneous ways. In panel (a) of Fig. 2, we see that participants who set a goal have a higher likelihood of saving in the experimental home deposit box, but this difference is not statistically significant at the 90% CI. In panel



(a) Any reminder (b) Specific reminders

Fig. 1. Experimental savings and reminders.



(a) Any saving goal (b) Saving goal, by treatment

Fig. 2. Experimental savings, goals, and reminders.

(b), we examine heterogeneity by random treatment assignment and find that in the control group of participants who received no messages, those who set a goal saved significantly more than those who did not set a goal. However, for participants who received any kind of message (reminder or peer), those who set a goal were no more likely to save than those who did not. In fact, the figure suggests that messaging actually reduced the propensity to save among participants who set a goal.

4. Results

4.1. Messaging

We first estimate the average treatment effect of messaging on saving behavior with the following equation:

$$Y_i = \alpha + \beta_1 T_i + \mu_c + \varepsilon_c \tag{1}$$

where T_i is treatment status. We include comuna fixed effects, μ_c, to control for unobservable geographic and institutional factors, and cluster standard errors at the comuna level, ε_c. Given that treatment was randomized within comuna, this empirical strategy identifies within-comuna variation in the treatment effect, independent of observable and unobservable comuna-level confounds that could impact individual saving behavior.

We estimate the impact of messaging on the probability of saving, as well as total amount saved in the experimental home deposit box at the time of the follow-up, including zero savings. We take the inverse hyperbolic sine of the account balance to address skew in the data and interpret effect sizes in terms of percent changes.[22] We estimate the effect of any messaging treatment, as well as the separate impact of the reminder versus peer treatment to elucidate which treatment is potentially more important.

[22] The inverse hyperbolic sine approximates the natural log function, but is defined at zero. Given that some participants saved nothing, we prefer to use the inverse hyperbolic sine rather than add a trivially small number to 0 and then take the natural log.

Table 2
The impact of messages on saving behavior.

	(1)	(2)	(3)	(4)
	Pr(Save)		IHS(Amount saved)	
Any message	−0.039		−0.281	
	(0.050)		(0.364)	
Reminder		−0.050		−0.335
		(0.054)		(0.384)
Peer		−0.028		−0.231
		(0.055)		(0.419)
Mean savings (control):	0.20	0.20	442	442
Observations	412	412	412	412
R^2	0.109	0.110	0.117	0.117

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. All estimates include *comuna* fixed effects and cluster standard errors at the *comuna* level in parenthesis.

The results in Table 2 suggest that there is no average treatment effect of messaging on saving. The coefficients are negative, but statistically insignificant at the 90% confidence interval.

4.2. Goal setting

Next we examine whether there is a heterogeneous treatment effect of messaging across goal setting. For participant i living in comuna c, we examine the impact of the messaging treatment, T_i, and setting a goal, G_i, on saving in the experimental home deposit box, Y_i. We again include comuna fixed effects, μ_c, and cluster standard errors at the comuna level. For robustness, in some specifications we also control for individual level characteristics, X_i, including: age, female, post-secondary education, risk tolerance, consumer durables index, works off-farm, and whether the participant had a formal savings account at baseline. Our estimating equation is the following:

$$Y_i = \alpha + \beta_1 T_i + \beta_2 G_i + \beta_3 G_i * T_i + \beta_4 X_i + \mu_c + \varepsilon_c \quad (2)$$

Since goals were elicited prior to treatment, and are orthogonal to the treatment, we can recover causal estimates of the heterogeneous treatment effects. Moreover, note from Table 1 that setting a saving goal is balanced across treatment and control groups, while Appendix Table A.5 shows that goal setting is balanced across a host of observable covariates, with a few notable exceptions.[23] We find that those who set goals are more likely to work off-farm, have a smaller farm size, and are more likely to own a formal savings account prior to the experiment. These correlations may bias our interpretation of the pure effect of goal setting, for instance, if people who already own a savings account respond to the intervention by saving in their existing account, rather than in the home deposit box. To elucidate the extent to which this is a concern, we collected information at endline on whether participants made deposits into other accounts during the study period. During this time, 9% of participants made a deposit into a formal savings account. Appendix Table A.6 shows that this behavior is uncorrelated with treatment assignment and goal setting. Moreover, column (7) suggests that, if anything, participants who owned a formal savings account at baseline and received any message (reminder or peer), are *less* likely to deposit into their formal accounts during the study period.

Nonetheless, to address concerns about the potential endogeneity of previous account ownership and the impact of goal setting on savings, we present results in our main tables both with and without the controls that are unbalanced across goal setting. If these covariates are endogenous to goal setting, we would expect the inclusion of these controls to significantly alter the coefficients on goal setting.

While we do our best to control for relevant observables, one may be concerned about possible selection on unobservables. To understand whether this is a concern, we conduct an exercise to elucidate the extent to which the results are driven by selection on unobservables (Oster, 2019) and report delta coefficients (δ) at the bottom of the table. At the core of the test is a conjecture about the covariance between the omitted variable and the treatment variable — in our case, the interaction between the randomized treatment and the decision to set a goal. One commonly made assumption is that the covariance between the omitted and treatment variable is equivalent to that between the observables and the treatment variable. This is known as the proportional selection assumption and implies a coefficient of proportionality (δ) equal to 1. We calculate the coefficient of proportionality that would overturn our results and present it in the bottom row of our main table.[24] Intuitively, a higher absolute value δ coefficient implies that the results are unlikely to be driven by selection on unobservables, where a value of $|\delta| \geq 2$ is a rule-of-thumb threshold (Oster, 2019).

[23] The results present a series of regressions that regress an observable covariate on whether the participant set a goal, controlling for comuna fixed effects and clustering standard errors at the comuna level. We use this approach to understand balance, as opposed to, for example, a series of t-tests, firstly because goal setting was not randomized, and secondly because the specification mimics our main estimating equations for goal setting, which include comuna fixed effects and cluster standard errors at the comuna level.

[24] Based on Oster (2019) recommendation, we assume an Rmax that is the lesser of 1.3 times the R-squared achieved by the full regression specification and 1. The Rmax is an estimate of the R-squared that would be achieved in the case where we were able to include all the key unobservables.

Table 3
The impact of messages and saving goals.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Pr(Save in home deposit box)					IHS(Amount saved in home deposit box)				
Set goal	0.013	0.154**	0.154**	0.150*	0.147*	0.231	1.252**	1.249**	1.212*	1.178*
	(0.047)	(0.071)	(0.072)	(0.076)	(0.077)	(0.379)	(0.602)	(0.607)	(0.633)	(0.651)
Any message		0.023					0.161			
		(0.051)					(0.404)			
Set goal × Any message		−0.210***					−1.517**			
		(0.073)					(0.651)			
Reminder			0.010	0.027	0.020			0.062	0.160	0.098
			(0.058)	(0.059)	(0.060)			(0.447)	(0.452)	(0.461)
Peer			0.037	0.057	0.051			0.254	0.360	0.309
			(0.056)	(0.053)	(0.054)			(0.449)	(0.443)	(0.448)
Set goal ×Reminder			−0.207*	−0.215**	−0.193*			−1.388	−1.444	−1.265
			(0.103)	(0.104)	(0.104)			(0.900)	(0.903)	(0.898)
Set goal ×Peer			−0.214***	−0.227***	−0.223***			−1.637**	−1.717**	−1.689**
			(0.073)	(0.072)	(0.069)			(0.642)	(0.628)	(0.624)
Formal savings account				0.090*	0.095*				0.503	0.518
				(0.047)	(0.051)				(0.396)	(0.411)
Work off farm				−0.001	−0.032				0.115	−0.138
				(0.055)	(0.059)				(0.447)	(0.472)
IHS(Farm size Ha)				−0.004	−0.019				0.014	−0.107
				(0.014)	(0.019)				(0.112)	(0.145)
Additional controls:	No	No	No	No	Yes	No	No	No	No	Yes
Mean savings (control):	0.20	0.20	0.20	0.20	0.20	442	442	442	442	442
Observations	412	412	412	400	395	412	412	412	400	395
R^2	0.107	0.123	0.124	0.134	0.148	0.116	0.129	0.130	0.136	0.153
δ Goal					20.224					5.461
δ Goal × Reminder					−7.260					−4.345
δ Goal × Peer					−2.587					−2.414

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. All estimates include *comuna* fixed effects and cluster standard errors at the *comuna* level in parenthesis. Additional controls include: age, female, post-secondary education, standard deviation of risk game choice, and index of consumer durables. The coefficients δ are calculated using the *psacalc* function in Stata assuming an R-max = $1.3 * R^2$ and represent the proportional degree of selection on unobservables needed to overturn the estimated effects.

We present the results in Table 3. In column (1) we investigate whether goal setting is correlated with saving in the home deposit box. While the coefficient is positive, it is statistically insignificant. In column (2) we investigate whether the messaging treatment had a heterogeneous effect on the likelihood of saving for people who set a saving goal versus those who did not. The results confirm the picture in Fig. 2 that messaging reduces the propensity to save among goal setters. The coefficient on *Set goal* suggests that goal setting is associated with a 15 percentage points increase in the likelihood of saving in the home deposit box. However, the coefficient on the interaction between setting a goal and treatment suggests that messaging completely reverses this relationship, decreasing the probability of saving by 21 percentage points for those who set a goal.

In columns (3)–(5) we disaggregate the treatment into whether the participant received the simple reminder or peer information. Here, we find that both messages decrease the likelihood of saving for people who set goals. We cannot reject the null hypothesis that the coefficients on *Reminder x Goal* and *Peer x Goal* are statistically equivalent, suggesting that both types of messaging reduce the likelihood of saving among goal setters by approximately 20 percentage points.[25] Notice that when we include controls that are correlated with goal setting in column (4), the coefficient on goal setting is almost identical to the specification without controls. Moreover, in column (5) the absolute value of the δ coefficients for goal, as well as for both interaction effects, are sufficiently large, suggesting that the results are not likely to be driven by selection on unobservables.

In columns (6)–(10) we replicate the estimation using the inverse hyperbolic sine of total savings and obtain similar results. Here, however, we find that the peer reminders, in particular, reduced the total amount of savings for people who set saving goals. The coefficient suggests that peer messaging closed the savings gap between goal and non-goal setters by 160 percent. Intuitively, this means that in the control group, goal setters saved more than non-goal setters, while in the peer message group, goal setters saved less than non-goal setters. Again, when we include controls that are correlated with goal setting in column (9) the coefficient

[25] Given the size of our sample, at 0.8 power and a significance level of 10%, the minimum detectable effect is 14.5 percentage points for the treatment *x* saving goal interaction. In the specifications that disaggregate the treatment, the minimum detectable effect is 18.9 percentage points for the reminder *x* saving goal interaction and 19.7 percentage points for the peer *x* saving goal, suggesting that these empirical specifications are sufficiently powered.

Table 4
Impact of messages by size of saving goal.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Pr(Save in home deposit box)					IHS(Amount saved in home deposit box)				
High goal	0.009	0.166**	0.166**	0.152*	0.144*	0.211	1.374*	1.376*	1.261*	1.184*
	(0.043)	(0.079)	(0.080)	(0.080)	(0.078)	(0.336)	(0.671)	(0.679)	(0.676)	(0.668)
Any message		0.019					0.140			
		(0.047)					(0.370)			
High goal ×Any message		−0.229**					−1.705**			
		(0.085)					(0.737)			
Reminder			0.012	0.028	0.024			0.096	0.195	0.156
			(0.054)	(0.055)	(0.055)			(0.417)	(0.427)	(0.426)
Peer			0.027	0.047	0.041			0.186	0.297	0.244
			(0.052)	(0.049)	(0.051)			(0.416)	(0.410)	(0.416)
High goal ×Reminder			−0.252**	−0.247**	−0.232*			−1.777	−1.753	−1.618
			(0.121)	(0.119)	(0.117)			(1.067)	(1.045)	(1.030)
High goal ×Peer			−0.213**	−0.217**	−0.210**			−1.659**	−1.686**	−1.632**
			(0.083)	(0.081)	(0.079)			(0.719)	(0.700)	(0.690)
Formal savings account				0.088*	0.088*				0.495	0.476
				(0.047)	(0.050)				(0.385)	(0.401)
Work off farm				0.006	−0.018				0.152	−0.047
				(0.054)	(0.057)				(0.435)	(0.467)
Post-secondary school				−0.011	−0.007				−0.012	0.019
				(0.041)	(0.042)				(0.335)	(0.336)
Additional controls:	No	No	No	No	Yes	No	No	No	No	Yes
Mean savings (control):	0.20	0.20	0.20	0.20	0.20	442	442	442	442	442
Observations	412	412	412	402	397	412	412	412	402	397
R^2	0.107	0.124	0.125	0.135	0.146	0.116	0.131	0.131	0.137	0.152
δ Goal					4.859					3.062
δ Goal × Reminder					−5.503					−3.681
δ Goal × Peer					−1.990					−1.864

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. High savings goal equal to 1 if the participant's savings goal exceeded the mean savings goal in the sample (900 Lei). All estimates include *comuna* fixed effects and cluster standard errors at the *comuna* level in parenthesis. Additional controls include: age, female, standard deviation of risk game choice, and index of consumer durables. The coefficients δ are calculated using the *psacalc* function in Stata assuming an R-max = $1.3 * R^2$ and represent the proportional degree of selection on unobservables needed to overturn the estimated effects.

on goal setting is almost identical to the specification without controls in column (8). In addition, in column (10) the absolute value of the δ coefficients for goal, as well as for both interaction effects, are sufficiently large, suggesting that the results are not likely to be driven by selection on unobservables.

Note that in the specifications that interact goal setting with treatment, the coefficient on treatment represents the effect of messaging for those who did not set a goal. Here, we find that while the coefficient is positive, it is insignificant for any message, as well as for each of the reminder and peer messages. This result has important implications for interventions that both encourage goal setting and utilize messaging, in that there appears to be a trade-off between the two strategies. While encouraging customers to set goals can promote savings, nudging customers to save can reverse these gains, particularly when these nudges include peer information. In the absence of goal setting, nudges may not deter the will to save, but they also may not increase it. Thus, encouraging goal setting alone may be the more effective way to promote saving in this environment.

4.3. Mechanisms

Next, we aim to understand why reminders reduced savings for goal-setters. We create a dummy variable equal to one if the saving goal set by the participant was above the mean saving goal of the sample and zero if below, where participants who set no goal are assigned a value of zero. Appendix Table A.7, shows that high goal setting is relatively balanced across a host of baseline characteristics, with a few exceptions. High goal setters are marginally more likely to have post-secondary education, work off farm, and own a formal savings account. In our main specifications, we therefore present results with no controls, and then controlling for these unbalanced covariates, to elucidate the extent to which these correlations may bias our interpretation of the impact of high goal setting on savings.

We re-estimate Eq. (2) and present the results in Table 4. In column (1), we find that on average high goal setting is uncorrelated with the propensity to save. In column (2) we interact treatment with whether the participant set a high goal and find that in the control group that received no messages, high goals are associated with 16.6 percentage point higher likelihood of saving than low

Table 5
Impact of messaging by size of goal (Goal Setters, only).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Pr(Save in home deposit box)					IHS(Amount saved in home deposit box)				
High goal	0.023	0.334**	0.367***	0.368**	0.324**	0.292	2.886**	3.124**	3.136**	2.741**
	(0.097)	(0.125)	(0.127)	(0.135)	(0.125)	(0.806)	(1.189)	(1.202)	(1.245)	(1.022)
Any message		0.220					1.976			
		(0.138)					(1.301)			
High goal × Any message		−0.424**					−3.540**			
		(0.168)					(1.464)			
Reminder			0.383*	0.473**	0.528**			3.265*	4.030**	4.382**
			(0.203)	(0.211)	(0.248)			(1.749)	(1.813)	(2.064)
Peer			0.096	0.300**	0.366*			0.988	2.737*	3.182*
			(0.097)	(0.142)	(0.196)			(0.990)	(1.351)	(1.725)
High goal × Reminder			−0.631**	−0.714**	−0.737**			−5.059**	−5.750**	−5.863**
			(0.265)	(0.275)	(0.303)			(2.214)	(2.303)	(2.496)
High goal × Peer			−0.270*	−0.458**	−0.556**			−2.396*	−4.009**	−4.702**
			(0.147)	(0.188)	(0.233)			(1.315)	(1.631)	(2.013)
Formal savings account				0.233*	0.260*				2.046*	2.255*
				(0.118)	(0.128)				(1.089)	(1.149)
Work off farm				0.137	0.082				1.154	0.695
				(0.092)	(0.107)				(0.757)	(0.903)
Post-secondary school				0.073	0.063				0.559	0.498
				(0.083)	(0.079)				(0.689)	(0.627)
Additional controls:	No	No	No	No	Yes	No	No	No	No	Yes
Observations	120	120	120	117	116	120	120	120	117	116

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. Sample restricted to participants who set a goal. All estimates include *comuna* fixed effects and cluster standard errors at the *comuna* level in parenthesis. Additional controls include: age, female, post-secondary education, standard deviation of risk game choice, and index of consumer durables.

or no goals. However, for high goal setters in the treatment group, messaging appears to reduce the likelihood of saving by 23 percentage points. In columns (3)–(5) we disaggregate the treatment into reminder vs. peer and find that both messages reduced the likelihood of saving for high goal setters by roughly 20 to 25 percentage points.[26] Again, the coefficients on high goal setting are robust to the inclusion of controls. In addition, the absolute value of the δ coefficients for high goal, as well as for both interaction effects are sufficiently large, suggesting that the results are not likely to be driven by selection on unobservables. Further, we cannot reject null hypothesis that the *Reminder x High goal* and *Peer x High goal* coefficients are equal, suggesting that both types of messaging demotivate high goal setters from saving.

We replicate this analysis in columns (6)–(10) using the inverse hyperbolic sine of the total savings balance and obtain similar results. In these specifications, only the coefficient on *Peer x High goal* is statistically significant at conventional levels of inference. We also find in column (8) that again the absolute value of the δ coefficients for high goal, as well as both interaction effects, are sufficiently large, suggesting that the results are not likely to be driven by selection on unobservables.

As a robustness exercise, in Table 5, we replicate the previous estimation, restricting the sample to only participants who set a goal. Again, we find that high goal setters save less when they receive any form of messaging, but now there is weak evidence that messaging increases the propensity to save for reasonable goal setters.

The finding that messaging demotivates high goal setters from saving is consistent with results found in other contexts. In the US, Beshears et al. (2015) randomly provided employees with information about the 401(k) savings behavior of their peers and found that it reduced the likelihood of enrolling in a 401(k) plan. In particular, they find that employees with a zero percent contribution rate at baseline are less likely to save when they see that a higher fraction of their peers are participating in the plan, suggesting a type of "boomerang effect" known as an oppositional reaction. Our results suggest a boomerang effect, but one that is more consistent with negative belief updating (see for example the literature on energy consumption (Schultz et al., 2007) or norms about female labor supply (Bursztyn et al., 2020)). When participants learn that their saving goal is higher than their peers' goals, they adjust their behavior downward, closer to that of their peers.

What is interesting in our context, however, is that both general reminders and peer information reduce on the propensity to save, suggesting that while negative belief updating is occurring, it is also possible that simply reminding high goal setters to save

[26] Given the size of our sample, at 0.8 power and a significance level of 10%, the minimum detectable effect is 15.7 percentage points for the treatment *x* high goal interaction. In the specifications that disaggregate the treatment, the minimum detectable effect is 20.2 percentage points for the reminder *x* high goal interaction and 19.4 percentage points for the peer *x* high goal, suggesting that these empirical specifications are sufficiently powered.

can be de-motivating. This could be due to the fact that their goals are unrealistic. Appendix Fig. A.1 shows the distribution of saving goals for those who set goals, which suggests that indeed some of the stated goals were probably unrealistic. Appendix Fig. A.2, however, shows that the size of goal is positively correlated with the participant's savings capacity, suggesting that while some are unrealistic, the stated goals are not purely noise.[27] On average, high goal setters expected to save 5000 Lei ($1250 USD) over the three-month period. This would require a deposit of over 1600 Lei ($400 USD) each month, which is around seven percent of the average annual income of a farmer in Romania. Even in the presence of a windfall, perhaps after the harvest when our study takes place, 5000 Lei represents 22.6 percent of the average annual income for farmers, suggesting that while not entirely irrational, some of the high saving goals were unrealistic.

Hsiaw (2013) shows theoretically that goals must be sufficiently realistic for reference-dependent agents to counteract impatience; when unrealistic goals are set, the incentive to wait longer to obtain the higher net payoff is weaker, leading agents with unrealistic goals to stop too early. In our case, the pure reminder to save most likely increased the salience of unrealistic goals, thereby reducing the likelihood of saving among unrealistic goal setters. In Appendix Table A.8, we consider alternate definitions of unrealistic goals, including whether the stated saving goal was above the comuna average or greater than the participant's existing savings at baseline, and find again that messaging hinders savings for high goal setters.

4.4. Alternative reasons for low savings

Together, the evidence suggests that messages demotivate goal setters from saving. However, there are other possible reasons that we may observe a negative correlation in our setting. First, because goal setters are more likely to own a formal savings account at baseline (Appendix Table A.5), it is possible that these participants are *a priori* more likely to save, such that when they receive a reminder to save, they save in their formal accounts instead of the experimental home deposit box. This phenomenon could possibly explain the negative interaction between goal setting and messaging that we observe in our findings.

To elucidate whether there is substitution between the home deposit box and formal savings accounts, we first examine whether treatment assignment and goal setting are correlated with saving in a formal account during the study period. Note that 9% of participants saved in a formal account during the study period, suggesting that formal savings is low in this setting, as well. Appendix Table A.6 shows that both in the full sample and among participants who owned a formal savings account at baseline, treatment assignment and goal setting are uncorrelated with saving in a formal account during the study period. Moreover, when we interact the messaging treatment with goal setting in the sample of account owners at baseline, we find that if anything, the interaction is negative. This suggests that for people who owned accounts at baseline and who set a goal, the reminder to save also reduces savings in their formal account. These results are entirely consistent with our findings for the experimental home deposit box and further suggest that messaging reduces the propensity to save among goal setters.

Next, we examine the possibility that savings might be low due to pent-up demand. If pent-up demand is driving the low savings, we may expect that people who previously took loans, and are thus generally cash-constrained, may save less at a time when they receive a windfall, such as after the harvest when our study takes place. To elucidate this possibility, we asked participants whether they previously took a loan in 2016. We find that 11.9% requested a loan from a bank and 28.2% requested a loan from a person in 2016. These loans were most likely to be used for living expenses (32.6% of bank loans and 43.9% of personal loans), supplies for crop farming (63.3% of bank loans and 56.1% of personal loans), and supplies for animals (26.8% of bank loans and 30.3% of personal loans). We then explore whether requesting a loan is correlated with treatment assignment or goal setting, which it is not (Appendix Table A.9). Next, we correlate saving in the experimental home deposit box with having requested a loan in 2016 and find that if anything, people who requested personal loans are more likely to save. Requesting a bank loan is negatively correlated with saving in the home deposit box, but these estimates are very noisy and statistically insignificant.

5. Conclusion

We design a randomized intervention in an upper-middle income setting to elucidate how informational nudges impact saving and whether these nudges interact with commitment devices in unintended ways. We focus specifically on messaging and goal setting, two standard features of savings interventions in other contexts, and find that while there is no average effect of messaging on saving, messaging discourages saving among participants who set goals. This effect is driven by participants who set unrealistically high goals, suggesting that messaging unintentionally increases the salience of unrealistic goals and causes high goal setters to adjust their behavior downward in a pattern that is consistent with negative belief updating. Although goal setting is positively correlated with saving, this is only true in the absence of messaging.

While informational nudges have been found to increase saving in some contexts (e.g., see Karlan et al. (2016) in the Philippines, Kast et al. (2018) in Chile, and Rodriguez and Saavedra (2019) in Colombia), our results suggest that messaging may sometimes backfire. These findings are consistent with results found in other contexts, such as the US, where information may have no effect on savings behavior (Dur et al., 2021) and may even unintentionally reduce saving behavior through oppositional reactions (Beshears et al., 2015). There is less evidence in the literature, however, about how these nudges interact with other features of intervention design, which is an emerging area of research. In come cases, nudges can be complements to other

[27] We proxy for savings capacity with two different variables: (i) the total value of savings at baseline, and (ii) the size of the respondent's farm, both which should be positive correlated with income and wealth.

Table A.1
Trust in strangers and saving in the experimental home deposit box.

	(1)	(2)	(3)	(4)
	Pr(Save)		IHS(Amount saved)	
Trust people you meet for the first time	0.024	0.016	0.010	−0.045
	(0.044)	(0.045)	(0.343)	(0.336)
Additional controls:	No	Yes	No	Yes
Observations	412	405	412	405

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. All estimates include *comuna* fixed effects and cluster standard errors at the *comuna* level in parenthesis. Additional controls include: age, female, post-secondary education, standard deviation of risk game choice, index of consumer durables, works off-farm, and whether the respondent currently has a savings account.

interventions (e.g., in the context of financial aid applications and college enrollment (Bettinger et al., 2012)), and in others they can be substitutes (e.g., in the context of automatic enrollment and employer matching of employer-sponsored retirement plans (Beshears and Kosowsky, 2020)). Nonetheless, there remains a dearth of research that directly tests the interaction of nudges with other features of interventions. Understanding these interactions is crucial to facilitate the optimal design of interventions in achieving their objectives (Beshears and Kosowsky, 2020).

Our findings begin to fill this gap by showing that, at least in our context, messaging interacts with goal setting – another common feature of saving interventions – in a harmful way, reducing the saving behavior of goal setters. In the peer messaging group, this behavior is consistent with the theory of negative belief updating (Clee and Wicklund, 1980; Schultz et al., 2007), in which high goal setters reduce their savings, closer to that of their peers, when informed of their peers' lower goals. In the general message group, high goal setters reduce their savings when receiving a simple reminder to save. This is consistent with work on goal setting, in which increasing the salience of one's unrealistic goal may reduce the incentive to wait for higher long-run payoffs (Hsiaw, 2013; Harding and Hsiaw, 2014). While the literature on unrealistic goals has mainly focused on energy conservation behavior, our work sheds new light on its relevance to financial savings, as well.

Our findings may inform future interventions in similar contexts, where access to formal financial institutions is low, but the economic capacity to save is relatively high. Our intervention specifically implemented a home deposit box, with financial incentives to save, to circumvent institutional barriers to saving in Romania. While home deposit boxes have been used in low-income settings (e.g., Kenya (Dupas and Robinson, 2013), and the Philippines (Karlan et al., 2016)), we are unaware of their use in middle-income settings. Our findings suggest that people in such settings are willing to use financially-incentivized home-saving devices, at least in an experimental context. Commercially, home deposit boxes, combined with deposit collection services, have been used by financial institutions in other settings both to mobilize savings and screen clients for future lending services (Ashraf et al., 2006a). Our findings suggest that financial institutions in middle-income settings may consider introducing similar instruments to expand savings.

In doing so, however, our results also suggest that efforts to promote saving should think carefully about the design of additional incentives to save. While simple commitment devices like goal setting may encourage saving, these goals ought to be realistic. Further, and more importantly, reminding goal setting customers to save or providing them with information about the saving goals of their peers may fully reverse the gains of goal setting, suggesting a tradeoff between informational nudges and commitment devices in this context.

Nonetheless, given the informal nature of our intervention, our findings cannot speak to how a similar intervention in a formal financial setting may unfold. Future research in this space may consider examining the interaction between goal setting and messaging both in the context of formal financial products, and across different economic settings.

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Appendix. Additional figures and tables

See Figs. A.1 and A.2 and Tables A.1–A.9.

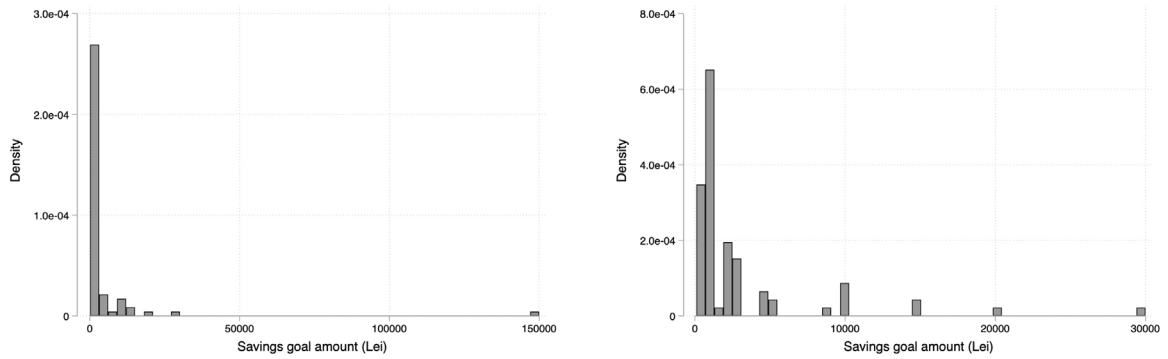

Fig. A.1. Distribution of saving goals.

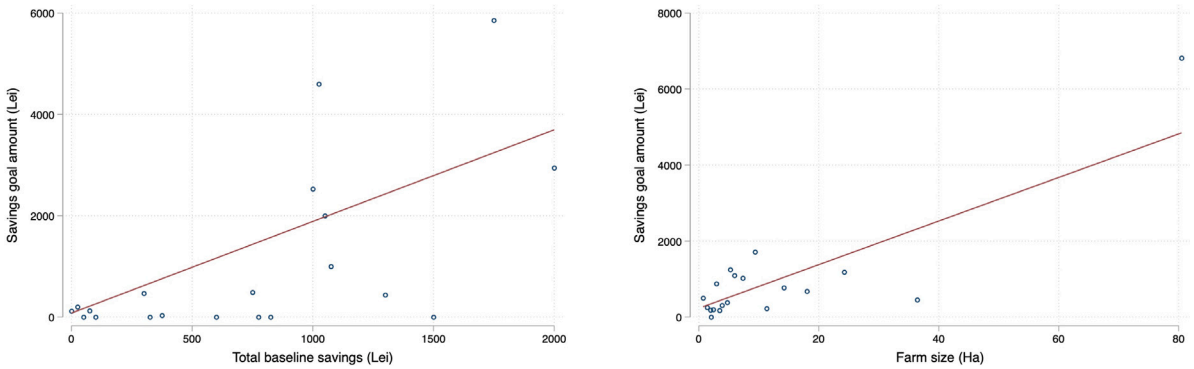

Fig. A.2. Saving goal amount and baseline saving capacity.

Table A.2
Balance of covariates by attrition between baseline and follow-up.

	No follow-up		Follow-up		Difference
	N	Mean	N	Mean	*P*-value
Control	91	0.30	412	0.34	0.382
Reminder	91	0.34	412	0.33	0.847
Peer	91	0.36	412	0.33	0.494
Age	91	51.56	406	51.92	0.812
Female	91	0.25	412	0.21	0.357
Post-secondary school	91	0.40	412	0.37	0.698
Household size	91	3.84	411	3.91	0.697
Children in household	91	0.58	411	0.74	0.193
Adults in household	91	2.76	411	2.66	0.542
Work off farm	91	0.29	403	0.30	0.785
IHS(Farm size Ha)	91	2.33	410	2.50	0.158
Farm equip	91	2.40	412	2.29	0.750
Durables	91	6.70	412	6.56	0.536
σ risk choice	90	2.72	412	2.71	0.997
Discount rate	91	94.85	412	95.03	0.402
Present bias	91	0.03	412	0.06	0.265
Set goal	91	0.31	412	0.29	0.756
Saves in cash	91	0.21	412	0.19	0.631

(*continued on next page*)

Table A.2 (*continued*).

Formal savings account	91	0.35	410	0.25	0.045
Formal savings (Lei)	91	243.96	405	171.11	0.088
Informal savings (Lei)	89	237.64	396	287.06	0.305
Bank loan (2016)	91	0.16	412	0.12	0.235
Trust Financial	90	0.34	410	0.28	0.210
No bank in village	91	0.70	412	0.69	0.864

Table A.3
Baseline savings and saving in the experimental home deposit box.

DV: Pr(Save)	Excluding attritors				Including attritors			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Savings account	0.092*	0.101*	0.096	0.112	0.051	0.055	0.062	0.075
	(0.048)	(0.050)	(0.083)	(0.076)	(0.045)	(0.047)	(0.084)	(0.079)
Any message			−0.029	−0.013			−0.028	−0.014
			(0.057)	(0.053)			(0.052)	(0.047)
Savings account ×Any message			−0.010	−0.036			−0.019	−0.041
			(0.106)	(0.100)			(0.100)	(0.091)
Additional controls:	No	Yes	No	Yes	No	Yes	No	Yes

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. All estimates include comuna fixed effects and cluster standard errors at the comuna level in parenthesis. Additional controls include: age, female, post-secondary education, standard deviation of risk game choice, present bias, index of consumer durables, and whether the participant works off-farm. Columns (5)-(10) assume that all attritors did not save in the home deposit box.

Table A.4
Balance of covariates by treatment group.

	Age (1)	Female (2)	Educ (3)	HH Size (4)	Off farm (5)	Farm size (6)	Farm equip (7)	Durables (8)	Risk (9)	Discount (10)	Present (11)	Cash (12)	Save (13)	No bank (14)
Reminder	−1.439	−0.017	0.050	0.125	0.026	−0.024	0.152	0.117	−0.119	−0.094	0.013	−0.018	−0.049	−0.022
	(2.092)	(0.043)	(0.058)	(0.224)	(0.064)	(0.128)	(0.325)	(0.287)	(0.222)	(0.174)	(0.032)	(0.035)	(0.042)	(0.035)
Peer	−1.780	−0.007	0.042	0.261	0.091*	0.030	0.264	0.236	−0.018	−0.127	0.000	−0.016	−0.049	−0.005
	(1.290)	(0.037)	(0.048)	(0.250)	(0.051)	(0.110)	(0.323)	(0.230)	(0.288)	(0.132)	(0.026)	(0.033)	(0.045)	(0.022)
Observations	497	503	503	502	494	501	503	503	502	503	503	503	501	503

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. Standard errors clustered at the comuna level in parenthesis. Excluded group is the control group.

Table A.5
Balance of covariates for setting a saving goal.

	Age (1)	Female (2)	Educ (3)	HH Size (4)	Off farm (5)	Farm size (6)	Farm equip (7)	Durables (8)	Risk (9)	Discount (10)	Present (11)	Cash (12)	Save (13)	No bank (14)
Set goal	0.555	0.032	0.075	−0.294	0.174**	−0.218*	−0.228	0.084	−0.094	0.158	0.035	0.087	0.137**	−0.039
	(1.782)	(0.044)	(0.047)	(0.176)	(0.070)	(0.111)	(0.345)	(0.197)	(0.276)	(0.255)	(0.029)	(0.051)	(0.056)	(0.038)
Observations	497	503	503	502	494	501	503	503	502	503	503	503	501	503

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. Standard errors clustered at the comuna level in parenthesis.

Table A.6
Saving in a formal account during study period.

	Pr(Save in formal savings account during study) (1)	(2)	(3)	(4)	(5)	(6)	(7)
Any message	0.002			0.053			0.149*
	(0.029)			(0.086)			(0.085)
Set goal		−0.011			−0.007		0.126
		(0.033)			(0.068)		(0.104)
High goal			−0.009			−0.034	
			(0.033)			(0.074)	
Any message × Set goal							−0.225
							(0.142)
Sample:	Full	Full	Full	Account	Account	Account	Account
Observations	412	412	412	100	100	100	100

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. All estimates include comuna fixed effects and cluster standard errors at the comuna level in parenthesis. Columns (4)-(7) restrict the sample to participants who owned a formal savings account at baseline.

Table A.7
Balance of covariates for setting a high saving goal.

	Age (1)	Female (2)	Educ (3)	HH Size (4)	Off farm (5)	Farm size (6)	Farm equip (7)	Durables (8)	Risk (9)	Discount (10)	Present (11)	Cash (12)	Save (13)	No bank (14)
High goal	−1.424	−0.005	0.096*	−0.135	0.192***	−0.064	0.007	0.283	−0.037	0.193	0.024	0.060	0.157***	−0.032
	(1.725)	(0.048)	(0.048)	(0.174)	(0.067)	(0.109)	(0.377)	(0.249)	(0.291)	(0.286)	(0.032)	(0.056)	(0.052)	(0.034)
Observations	497	503	503	502	494	501	503	503	502	503	503	503	501	503

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. Standard errors clustered at the comuna level in parenthesis.

Table A.8
Impact of messaging by alternate definitions of unrealistic goals.

	(1)	(2)	(3)	(4)	(5)	(6)
	Pr(Save in home deposit box)			IHS(Amount in home deposit box)		
Panel A: Goal higher than comuna savings goal						
High goal (Comuna goal)=1	0.232***	0.232**	0.217**	1.870**	1.867**	1.714**
	(0.083)	(0.084)	(0.088)	(0.706)	(0.711)	(0.748)
Any message	0.025			0.174		
	(0.047)			(0.375)		
High goal (Comuna goal) = 1 × Any message	−0.284***			−2.095**		
	(0.090)			(0.805)		
Reminder		0.015	0.028		0.102	0.155
		(0.054)	(0.055)		(0.415)	(0.425)
Peer		0.035	0.049		0.240	0.294
		(0.053)	(0.052)		(0.421)	(0.430)
High goal (Comuna goal) = 1 × Reminder		−0.288**	−0.267**		−2.021*	−1.814*
		(0.119)	(0.118)		(1.045)	(1.032)
High goal (Comuna goal) = 1 × Peer		−0.280***	−0.275***		−2.163***	−2.096**
		(0.086)	(0.087)		(0.772)	(0.785)
Panel B: Goal higher than mean baseline savings						
High goal (Baseline savings)=1	0.138*	0.138*	0.125*	1.140*	1.137*	1.023*
	(0.071)	(0.072)	(0.069)	(0.607)	(0.613)	(0.590)
Any message	0.013			0.090		
	(0.048)			(0.385)		
High goal (Baseline savings) = 1 × Any message	−0.189**			−1.371*		
	(0.082)			(0.719)		
Reminder		0.001	0.013		−0.002	0.053
		(0.056)	(0.058)		(0.430)	(0.443)
Peer		0.026	0.040		0.176	0.232
		(0.054)	(0.053)		(0.429)	(0.432)
High goal (Baseline savings) = 1 × Reminder		−0.189	−0.170		−1.252	−1.096
		(0.116)	(0.111)		(1.004)	(0.960)
High goal (Baseline savings) = 1 × Peer		−0.192**	−0.191**		−1.480**	−1.465**
		(0.076)	(0.070)		(0.663)	(0.617)
Additional controls:	No	No	Yes	No	No	Yes
Observations	412	412	397	412	412	397

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. All estimates include *comuna* fixed effects and cluster standard errors at the *comuna* level in parenthesis. Additional controls include: age, female, post-secondary education, standard deviation of risk game choice, index of consumer durables, works off-farm, and whether the respondent currently has a savings account.

Table A.9
Previous experience with bank or personal loans.

	Bank loan		Personal Loan		Pr(Save)		IHS(Save)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reminder	0.052		−0.049					
	(0.039)		(0.061)					

(*continued on next page*)

Table A.9 (*continued*).

Peer	0.037		−0.011					
	(0.033)		(0.050)					
Set goal		−0.043		−0.017				
		(0.049)		(0.065)				
Bank loan (2016)					−0.027		−0.216	
					(0.072)		(0.584)	
Personal loan (2016)						0.074*		0.502
						(0.041)		(0.351)
Observations	412	412	404	404	412	404	412	404

* p < 0.10, ** p <0.05, *** p < 0.01. OLS estimates. All estimates include comuna fixed effects and cluster standard errors at the comuna level in parenthesis.

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