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Female entrepreneurs targeting women: Strategic redirection under scientific decision-making

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ABSTRACT

This paper explores whether and to what extent a scientific approach to decision-making can be a useful tool for helping entrepreneurs overcome limitations in the commercial exploitation of their idea particularly when these limitations stem from their status as users of the product or service. Using data from a variety of sources, including three randomized control trials and LinkedIn data, and focusing on female entrepreneurs who develop a value proposition targeting female consumers as a case of user entrepreneurs, this paper shows that exposure to a training that encourages entrepreneurs to develop theoretical maps about their business proposition and validate them with evidence prompts more radical pivots on their initial ideas compared to entrepreneurs with a value proposition that does not target women explicitly. In turn, treated female entrepreneurs with a female-targeted value proposition who pivot radically show better performance in launching and sustaining their ventures compared to those who have not pivoted.

Keywords: Women entrepreneurs, female value proposition, scientific decision making, user entrepreneurs, knowledge domains

JEL Codes: J16, M13

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1. INTRODUCTION

Extensive organizational literature highlights how organizations and individuals typically operate within established knowledge domains, often resisting exploration of unfamiliar areas (Levinthal and March 1981, 1993, March 1991). This tendency stems from a positive feedback loop, wherein individuals focus on what they already know and avoid broader exploration to obtain immediate advantages (Cyert and March 1963, Levitt and March 1988, March and Simon 1958). One context in which this dynamic unfolds is user entrepreneurship, where individuals draw on their experience as users to identify unmet needs and develop products or services targeted at customers similar to themselves (Agarwal and Shah 2014, Bapna and Ganco 2023, Shah and Tripsas 2007). The user entrepreneur's advantage lies in their deep understanding of the need domain, which gives them an edge in identifying innovative solutions. Indeed, being a user has been key to the commercial success of companies such as Dropbox and Kickstarter (Thompson 2014).

However, this advantage can be offset by other significant challenges specific to user entrepreneurs. One such challenge is that user entrepreneurs often remain within familiar boundaries when developing their value proposition and may lack the business experience needed to accurately assess the commercial potential of their idea (Bapna and Ganco 2023, Cohen et al. 2019, Shah and Tripsas 2007). This tendency might result in incorrect assumptions about the target audience or, more generally, in overlooking the optimal integration of their innovative idea into a solid value proposition (Agarwal and Shah 2014, Bapna and Ganco 2023, Lee et al. 2019, Thompson 2014). An example is Oculus VR, a gaming-focused virtual reality headset created by a user entrepreneur and initially tailored for hardcore gamers. Ultimately, Oculus's success stemmed from a different market segment than initially intended: Facebook acquired it, seeing potential in engaging non-gamers for social networking and messaging, thus shifting its focus from high-end gaming to mainstream consumers (Thompson 2014). As with Oculus, while user entrepreneurs can identify promising ideas, their deep user knowledge can also constrain them from fully exploring broader commercial potential (Agarwal and Shah 2014). This example suggests that user entrepreneurs might limit their market space even when their innovations have broader applications (Bapna and Ganco 2023).

In this paper, we explore this issue by focusing on a specific group of user entrepreneurs:

female entrepreneurs who develop novel value propositions tailored to the needs of women. We examine the extent to which a more “scientific” approach to making business-related decisions (Camuffo et al. 2024, Felin and Zenger 2017, Novelli and Spina 2024, Zellweger and Zenger 2022, 2023) can lead to a radical pivot—i.e., a change in a firm’s strategy that reorients its strategic direction (Kirtley and O’Mahony 2023, p. 199; see also Gans et al. 2019, Pillai et al. 2020) and, in turn, improves its performance. Therefore, we ask: Does exposure to a scientific approach influence the strategic direction of female entrepreneurs with female-targeted value propositions, and if so, does it result in positive performance?

A scientific approach to decision-making resembles the learning process followed by scientists when they explore a phenomenon: the business idea is theoretically conceptualized, then logically decomposed into distinct hypotheses or predictions, which are tested and evaluated based on rigorously collected information. The guiding intuition we follow in our investigation is that such a theory and evidence-based approach to decision-making can lead user entrepreneurs—when appropriate—to see the limitations of their initial search and redirect their search to more promising areas, potentially identifying choices that could improve the commercial value of their idea (Felin, Kauffman et al. 2020; Laureiro-Martínez 2014, Laureiro-Martínez and Brusoni 2018).

In this investigation, we follow a question-driven approach (Graebner et al. 2022), which is particularly relevant in cases where prior research on a topic is limited. Prior research on a scientific approach to decision-making has suggested its effectiveness in addressing decision-making biases, which should make it a pathway to superior performance in many circumstances (Agarwal et al. 2023, Camuffo et al. 2024, Novelli and Spina 2024). Yet, there is still a limited theoretical understanding of the conditions under which this effect unfolds, and the empirical evidence on this dimension remains scant. To generate novel insights about the effectiveness of a scientific approach in informing strategic changes, especially when the assessment of the original idea might have been biased or constrained, we begin with our conceptual question and answer it by developing insights from a series of empirical analyses that explore different dimensions of the phenomenon. Each additional analysis is meant to bring us closer to interpreting the phenomenon through abduction (King et al. 2021, Lipton 2017, Pillai et al. 2020). We combine data from multiple sources—three randomized control

trials (RCTs) involving 172 Italy- and UK-based female entrepreneurs and LinkedIn data—and multiple methods: field experiments, secondary data analysis, and qualitative evidence. These data and methods provide an extraordinary opportunity to assess how an entrepreneur's decision-making approach influences choices that might have been driven by user-related considerations.

Our results offer relevant insights that directly address our research question. First, we show that female entrepreneurs with a female-targeted value proposition are more likely to engage in a radical pivot after exposure to a treatment that taught them to use a scientific approach to make business decisions. We show that the difference in the probability of radical pivoting between entrepreneurs in the treated and control groups after the treatment is higher for female entrepreneurs with a female-targeted value proposition than for those without a female-targeted value proposition.

We provide evidence consistent with the idea that the treatment is particularly effective for entrepreneurs who were likely constrained within the domain of their user knowledge and experience in their search for innovative solutions. Specifically, we show that our results replicate among other types of user entrepreneurs, i.e., ethnic entrepreneurs who develop value propositions targeting ethnic consumers. We also show that this effect is especially pronounced for entrepreneurs with limited prior business acumen as proxied by managerial experience. These findings support the notion that teaching entrepreneurs to adopt a more 'scientific' decision-making approach helps them escape the narrow knowledge corridor often associated with user entrepreneurship.

Finally, we explore the performance implications of the radical pivots that we observe. We show that treated female entrepreneurs with a female-targeted value proposition experience positive performance after pivoting across various dimensions. They are less likely to terminate their projects, more likely to translate their idea into an actual venture, and that venture is more likely to remain active in the medium term. These performance implications align with the insight that the radical pivot stimulated by the treatment supports the commercial exploitation of their ideas.

Our paper contributes to three main areas of research. First, it adds to the recent stream on the performance implications of a scientific approach to decision-making (Agarwal et al. 2023, Camuffo et al. 2024, Coali et al. 2024, Novelli and Spina 2024, Zellweger and Zenger 2023). Our results show that a scientific approach to decision-making is effective in changing behavior and improving

performance in a context where entrepreneurs are more likely to be constrained in the commercial exploitation of ideas by their narrow approach to the problem (i.e., using their knowledge as users).

Second, this paper adds to the literature on user entrepreneurs (Bapna and Ganco 2023, Shah and Tripsas 2007) and on its performance implications (Agarwal and Shah 2014, Shah et al. 2012). It presents evidence suggesting that a relatively brief intervention, which teaches entrepreneurs to develop cognitive maps of the problem–solution fit and validate them with evidence, can lead to substantial changes and improved performance. This resonates with research that suggests that the business acumen of experienced decision-makers is often related to the ability to base decisions on mental representations of the business situation (Chi et al. 1988, Heshmati and Csaszar 2024).

Third, this paper’s results contribute to research on how to democratize entrepreneurship by supporting entrepreneurs from underrepresented demographic groups. Prior contributions have emphasized the existence of systematic biases against these entrepreneurs’ ideas, especially in the context of equity fundraising (Bapna and Ganco 2021, 2023, Guzman and Kacperczyk 2019, Lee and Huang 2018, Younkin and Kuppuswamy 2018). Research in this area has focused on ways to address this important issue by intervening in how an idea can be communicated to the audience to signal higher value. This paper identifies a complementary approach to the problem based on strategically redirecting ideas in ways that can deliver more value.

2. THEORETICAL BACKGROUND

2.1. The search process of user entrepreneurs

One of the key tenets of the literature on search is that individuals, when learning, face a choice between exploring new knowledge and exploiting familiar domains (Cyert and March 1963, March and Simon 1958). In this context, an individual’s current knowledge can become an “instrument of intelligence” (Levinthal and March 1993, p. 96, Gavetti and Levinthal 2000). To facilitate learning, individuals tend to focus on areas close to their existing knowledge rather than searching broadly (Cyert and March 1963, March and Simon 1958). This focus reinforces their strengths in familiar domains, further reducing the incentive to explore beyond them (Levinthal and March 1993).

One context in which this dynamic can unfold is user entrepreneurship, where individuals identify unaddressed problems or needs through their personal knowledge and experience and

subsequently develop a product or service to resolve these issues (Shah and Tripsas 2007).

Entrepreneurs often generate ideas by addressing needs they personally encounter, allowing them to recognize potential solutions ahead of others (Szulanski 2000, von Hippel 2010). Ideas developed through these pathways often translate into commercially valuable products and services.

However, being a user entrepreneur can also lead to incorrect assumptions about the target audience for their innovative idea or, more generally, to overlooking the best way to integrate the idea into a sound value proposition (Bapna and Ganco 2023, Cohen et al. 2019, Shah and Tripsas 2007). These entrepreneurs often create products or services based on needs they experienced as users but may lack the business experience necessary to assess the broader commercial potential beyond their own user group (Bapna and Ganco 2023). For example, familiarity with the needs of a female audience might lead a female entrepreneur to conceptualize products or services as female-targeted ideas, rather than considering the possibility that they might address the needs of a broader population (von Hippel 1986). Alternatively, user entrepreneurs might refrain from targeting different customer groups, anticipating the performance degradation that could occur when venturing into uncharted territories (Greenwood et al. 2019) or lacking confidence in their ability to serve customers outside their in-group. Additionally, user entrepreneurs might lack the skills or commercial intuition to effectively communicate their ideas and mobilize sufficient resources or stakeholders (Bapna and Ganco 2023, Bingham and McDonald 2022, McDonald and Bremmer 2020).

Prior work in the field of innovation has documented empirical patterns consistent with this intuition. For instance, Chan and Lim (2023) examined the innovative performance of user innovators and found that these users were more likely to become “fixated” on their understanding of a product’s potential uses, thus preventing them from conceiving of how the product could be used in novel ways (Andriani and Cattani 2016, Felin et al. 2016, Finke 1996, Jansson and Smith 1991, von Hippel and von Krogh 2016). Research has shown that this phenomenon is more prevalent among entrepreneurs from underrepresented demographic groups, i.e., groups that do not see themselves as the representative group in a certain category (Hebert 2023). For example, evidence suggests that female scientists and inventors are more likely to produce knowledge and inventions targeted at women (Koning et al. 2021, Nielsen et al. 2017) and that being part of an insular community significantly

impacts individuals' aspirations and willingness to engage in different behaviors (Krueger and Clement 1997, Lee et al. 2019). Results from a survey of 175 active investors reveal that one of the key challenges user entrepreneurs face, compared with producer entrepreneurs, is their limited ability to gauge market demand for their products or services and their lack of relevant business experience to run and grow their companies (Bapna and Ganco 2023).

Yet, current research on how user entrepreneurs can overcome these limitations is scarce. One crucial preliminary step in this direction has been made by researchers who have investigated how user entrepreneurs, particularly those from underrepresented groups, can *effectively communicate* the value of their high-quality, commercially appealing ideas to external audiences, especially potential funders. For example, Bapna and Ganco (2023) documented that investors are less inclined to invest in a firm founded by a user innovator compared with one founded by a producer innovator, due to concerns about the ability of nontraditional innovators to assess market demand and scale their companies. They suggest that user entrepreneurs can mitigate these investor biases by signaling the quality of their value proposition, such as evidence of firm growth and broad product appeal. Similarly, Younkin and Kuppuswamy (2018) found that prospective supporters rate identical projects lower when they believe the founder is African American. However, this bias diminishes when third-party endorsements or evidence of past success is provided, or when the founder's race is not disclosed. Notwithstanding this evidence, current research has not delved into how user entrepreneurs can address the root causes of these challenges and *enhance the very commercial value of their propositions*. Our work aims to bridge this crucial gap.

2.2. A scientific approach to decision-making to support user entrepreneurs' radical pivots

We address this gap by focusing on the role of decision-making approaches in supporting entrepreneurs' strategy development. Prior research has shown the important role that decision-making approaches can play in this area (e.g. Yang et al. 2020). We explore the role of a scientific approach to entrepreneurial decision-making (Camuffo et al. 2020, 2024, Felin and Zenger 2017, Zellweger and Zenger 2023) in improving the commercial exploitation of user entrepreneurs' ideas by encouraging them to radically pivot on the content of their value proposition and their preferred customer segment toward more commercially valuable propositions.

A scientific approach to decision-making, which mirrors the process followed by scientists when developing new knowledge, is based on four main steps: (1) the development of a theory regarding the business problem under investigation and how the proposed solution addresses this problem; (2) the formulation of clear, testable hypotheses that logically derive from the theory; (3) the execution of rigorous tests to validate these hypotheses; and (4) the disciplined assessment of results, which leads either to a decision or a revision of the original theory (Camuffo et al. 2020, 2024).

This scientific approach can effectively address the challenges and limitations user entrepreneurs face, particularly in their ability to gauge market demand for their products and assess the commercial viability of their business propositions. Prior research has highlighted that expert decision-makers, such as managers or experienced entrepreneurs, benefit from superior access to a large repertoire of mental representations, patterns, or attributes when making decisions (Chi et al. 1988, Ericsson 2006, Heshmati and Csaszar 2024). These mental representations enable them to regularly identify opportunities (Gavetti 2012, Gavetti and Porac 2018) and shift their focus from aspects of business related to their user experience to broader competitive concerns (Csaszar and Laureiro-Martínez 2018, Heshmati and Csaszar 2024).

A scientific approach to decision-making encourages entrepreneurs to develop such mental representations by formulating theories and hypotheses about business problems and their solutions. This process corresponds to creating a map—a stylized representation of the area being explored (Fleming and Sorenson 2004)—similar to those possessed by more expert entrepreneurs. Expressing the problem through a broader perspective might, in itself, lead to the identification of solutions that have applicability beyond the specific user context in which the problem was originally identified (Laureiro-Martínez et al. 2023, Mount et al. 2021, Nelson 1959, Novelli 2015), with positive implications for commercial potential. Engaging in deliberate cognitive processes helps decision-makers consider scenarios and actions beyond routine user-based perspectives (Felin, Gambardella et al. 2020, Felin, Kauffman et al. 2020; Furr et al. 2012, Gavetti and Levinthal 2000, Laureiro-Martínez and Brusoni 2018, Yang et al. 2020). For instance, Oculus VR's developer initially overlooked networking and messaging uses for the visor. However, these opportunities might have emerged as a result of a deliberate reflection about all potential uses of the device based on its technical features.

Furthermore, a scientific approach to decision-making encourages entrepreneurs to validate their mental representations with evidence, which serves as feedback on their assumptions (Levitt and March 1988). The objectivity of theory-guided evidence collection can prompt entrepreneurs to refocus their value proposition, moving away from a worldview rooted in their own user experience (Novelli and Spina, 2024). For example, while the Oculus VR developer might not have anticipated the future market size for messaging devices, a disciplined evidence collection process grounded in cognitive assumptions could have revealed this potential. This intuition is consistent with prior research that emphasizes the benefits of testing the assumptions underlying the cognitive templates (such as business models) used by firms reduces the uncertainty regarding the most appropriate model to use, helps them ground models in realistic and relevant information and leads to quicker and faster learning (McDonald & Eisenhardt, 2020).

3. ANALYTICAL APPROACH

While the above logic is plausible, we still have very limited conceptual and empirical research on the implications of the scientific approach in general, and specifically on the extent to which it can effectively address the challenges faced by user entrepreneurs. To study user entrepreneurs and assess the impact of the scientific approach on their decision-making, we will focus on female entrepreneurs who develop a female-targeted (as opposed to non-female-targeted) value proposition. Our goal is to develop extensive empirical evidence related to the theoretical issue we aim to study and to use this evidence to infer the best interpretation that can inform our theory (King et al. 2021, Lipton 2017).

Our empirical analysis will proceed as follows: First, we will provide descriptive evidence of the pattern under investigation (sections 4.1.2 and 4.1.3). We will then offer qualitative evidence from the case study of a female entrepreneur with a female-targeted value proposition who participated in one of our RCTs (section 4.1.4). Next, we will present evidence of the causal link between the use of a scientific approach to decision-making and the decision to engage in a radical pivot, using data from three RCTs involving 172 female entrepreneurs (section 4.1.5). Following a series of robustness checks (section 4.1.6), we will delve more deeply into the dynamics that generate this pattern and present a series of analyses aimed at supporting our interpretation that the treatment helps user entrepreneurs pivot the content of their value proposition and their preferred customer segment

(section 4.2). Finally, in section 4.3, we will explore the performance implications.

4. METHODOLOGY, DATA, AND RESULTS

4.1. Effect on strategic decisions: Does exposure to a scientific approach lead female entrepreneurs with female-targeted value propositions to pivot radically?

In this section, we explore the effect of the scientific approach on the pivoting behavior of entrepreneurs using data from our RCTs. We begin by describing the data, followed by a series of quantitative and qualitative analyses aimed at addressing our main research question.

4.1.1. Data: Randomized control trials

We examine the causal link between the use of a scientific approach to decision-making and the probability that female entrepreneurs with a female-targeted value proposition will engage in a radical pivot. To do so, we employ data from three large RCTs conducted in Milan (2017), Turin (2018), and London (2019). The experimental design was consistent across all three RCTs and involved an intervention embedded within a business support program. In line with recent studies that have implemented similar designs (see, for instance, Allcott 2015, Banerjee et al. 2015), the intervention was conducted in different settings and time periods to isolate the effects of time and location from the impact of the intervention itself.¹

The initial sample included 593 entrepreneurs, of whom approximately one-third were women (196), who participated in the program with an original value proposition. Of these 196 female entrepreneurs, 100 were randomly allocated to the treatment group and 96 to the control group.

Appendix A provides a detailed description of the RCTs' structure. Balance tables are presented in Appendix B, Table B.1, where Panel A shows that the randomization was successful.

The actual intervention included a similar number of sessions and teaching hours across all three RCTs, with minimal variations to accommodate local constraints, and focused on decision-making. Participants in both the treatment and control groups were introduced to the same tools and

¹ The three RCTs, whose funding was secured separately and at different times, were pre-registered separately on the American Economic Association RCT Registry. We decided to combine the three datasets to investigate this paper's research question to increase power, which was particularly relevant given that we focus on a theoretical context (user entrepreneurship) that affects only a portion of the population of interest. The analyses on user entrepreneurs presented in this paper were not pre-registered. In line with the exploratory nature of the study, we avoid the use of theory-testing language.

techniques designed to support a more cognitive approach to entrepreneurial decision-making (e.g., the Business Model Canvas or Balanced Scorecard), as well as multiple data collection and testing techniques supporting a more experiential or action-based approach to decision-making, such as surveys, qualitative interviews, and A/B testing (Ott et al. 2017).

The key difference between the treatment and control groups was that the treatment group was actively encouraged to apply strategic frameworks and techniques to support a scientific approach to decision-making. Entrepreneurs in this group used these frameworks to develop theories about how their business ideas created value, form hypotheses, gather evidence to test those hypotheses, and rigorously assess the results. In contrast, the control group was taught about the same tools and techniques but was not guided on how to apply them within the context of a scientific approach.

The training sessions were highly engaging and experiential, incorporating hands-on activities and feedback from the instructors. The instructors themselves underwent multiple “train-the-trainer” sessions to ensure that the training was delivered in alignment with the research design. Several measures were implemented to ensure the internal validity of our results. To address potential contamination and peer effects, the treated and control groups were taught on different days of the week (e.g., Wednesday and Thursday) or in different time slots on the same day (e.g., Saturday morning and afternoon), thereby preventing any chance of interaction, including serendipitous meetings, where they might discuss key elements of the treatment.

Data on all participants were systematically collected through telephone interviews conducted by trained research assistants under the supervision of the research team. The first interview occurred before the training, and subsequent interviews were conducted approximately once per month. Following the approach of Bloom and Van Reenen (2010), the interviews adhered to a predefined script featuring both open and closed questions concerning the entrepreneur’s decision-making process, key decisions made, and performance. All interviews in the RCTs were audio-recorded and subjected to regular consistency checks to ensure that research assistants conducted the calls according to the established guidelines. The overall data collection process lasted 18 months for the two Italian RCTs in Milan and Turin, and 10 months for the RCT in London.

As is common in RCTs, our sample experienced attrition, with some entrepreneurs leaving the

program over time (Gerber and Green 2012). Of the 196 women who initially began the program, 172 remained in the sample for at least one observation after the treatment. Because we are focused on detecting the effect of the treatment on the pivoting behavior of these entrepreneurs, our working sample includes only these 172 individuals who were observed both at baseline and in at least one post-treatment interview round.² This approach leaves us with an unbalanced sample of 1,843 entrepreneurs.³

4.1.2. Descriptive evidence on female entrepreneurs with a female-targeted value proposition

We begin our analysis with the exploration of the descriptive patterns we observed in our RCT data. Of the initial sample of 593 entrepreneurs, 33.05% were women. About 16.4% of entrepreneurs joined the program with a female-targeted value proposition, and 53.8% of those in our final sample were exposed to the scientific treatment. The percentage of those who pivoted at least once during the program is significant, at 75.9%. Table 1 reports the definition and descriptives of all variables.⁴

[Include Table 1 about here]

4.1.3. Graphical representation of descriptive patterns

Next, we explore the effect of the scientific treatment on the decision-making process of female entrepreneurs with a female-targeted value proposition on the pivoting behavior of entrepreneurs.

² Some program participants left the sample in subsequent interviews rounds. By defining attritors as entrepreneurs that either abandoned the program or their original idea at any point in time during the program, we observed eight participants that left after Interview 2, two after Interview 3, eight after Interview 4, six after Interview 5, four after Interview 6, seven after Interview 8, and nine after Interview 10. Between Interview 10 and Interview 18, 38 additional entrepreneurs exited the sample. The final sample retains all entrepreneurs up to the last interview round in which they took part. Table B.1 (Panel B) in Appendix B shows that balance checks also hold in this sample. Attrition is more the norm than the exception in field experiments (Gerber and Green 2012). To limit the attrition rate, we informed participants at the beginning of the program that their admission into the program was conditional on completing all interview rounds up until the end of the observation period. Moreover, to keep delivering value to participants when the intervention was over but the interviews were still in progress, we invited them to free monthly events on themes of general interest for entrepreneurs that ran until the end of the interview periods. These events were run exactly in the same way for treatment and control entrepreneurs but in different days for the two groups to avoid contamination. We verified that attrition rates were similar between the treatment and control groups. Table C.1 in the Appendix shows that our results remain consistent across different approaches to attritors.

³ We employed this approach to retain individuals in the sample for whom we have information both before and after the treatment. In Appendix C (Table C.1) we provide additional checks on the stability of our results according to different approaches to individual attritors.

⁴ For the subset of variables from experimental data used in the core empirical analysis, we provide more fine-grained descriptive statistics in Table E.1 in Appendix E. Table E.2 reports the correlation table for the same variables in the cross-section including 172 female entrepreneurs. To understand the extent to which the patterns we observe in our RCT data are representative of the general population of entrepreneurs, in Appendix D we compare them with a sample of 13,070 entrepreneurs derived from Crunchbase. Results show that the patterns observed in the two samples are similar, supporting their generalizability.

4.1.3.1. Variables

To this purpose we constructed four key variables. Our first key variable of interest, *Female-targeted value proposition_{it}*, was defined by manually classifying all ventures with respect to the content and target of their value proposition at the baseline. We used the description of the business idea submitted by the entrepreneur at the time she signed up for the program and manually classified each one based on whether the target customers were women (vs. not women). Female-targeted ideas included female-targeted products (such as garments and jewelry for women) and services (such as hairdressers or online travel platforms focused on women clients).

Our second variable of interest is *Radical pivot_{it}*. As illustrated by Kirtley and O'Mahony (2023), pivots refer to changes in a firm's strategy that reorients the firm's strategic direction. We captured these events as follows. During each interview, we referred to the Business Model Canvas taught to entrepreneurs during the training program and specifically asked them to describe any changes made to any of its nine dimensions (value proposition, customers, channels, customer relationships, key activities, key partners, key resources, revenue streams, cost structure). In line with Camuffo et al. (2020), we measured *Radical pivot_{it}* as a dummy variable taking the value of 1 if the firm reported a major change to its value proposition or customer segment at time t , and 0 otherwise. Therefore, the dummy for *Radical Pivot_{it}* is coded as 1 in every interview round in which the entrepreneur mentions that the business model underwent a pivot of this type.

We also constructed a variable labeled *Treated_i* as a dummy taking the value of 1 if the entrepreneur belonged to the group that received the scientific training, and 0 otherwise. Finally, we created the variable *Post-treatment period_t*, which is a dummy at the interview-round level that takes the value of 1 for all interview rounds after the beginning of administration of the treatment.

4.1.3.2. Results

We begin by observing the descriptive patterns in the data, focusing on the sample of female entrepreneurs throughout the entire period of RCT administration. We compare treated and control entrepreneurs and explore how their propensity to engage in radical pivots varies depending on the gender targeted by their value proposition. The results are reported in Figure 1. Overall, this figure shows that female entrepreneurs with female-targeted value propositions tend to pivot less than those

with non-female-targeted value propositions in the control group. The opposite is true for treated entrepreneurs.

Focusing on female entrepreneurs with non-female-targeted value propositions (1 and 3), we observe that the control group (1) pivots more frequently than the treated group (3) (8.6% vs. 6.3%). The evidence that the control group pivots more frequently than the treated group when joining the program with a non-female-targeted value proposition aligns with Camuffo et al. (2024), who showed that entrepreneurs employing a scientific approach tend to pivot only a few times compared to not pivoting at all or pivoting frequently, whereas non-scientific entrepreneurs are more likely to either not pivot at all or to engage in many pivots..⁵

However, the group of female entrepreneurs with a female-targeted value proposition (2 and 4) exhibits the opposite behavior: control group entrepreneurs (2) pivot only to a very limited extent (4.2%), while treated entrepreneurs (4) pivot much more frequently (11.4%). This evidence is intriguing, as it aligns with the possibility that female user entrepreneurs tend to search within their current local domains, making them more resistant to pivots due to the limited number of potential strategic reorientations within that domain. Since the treatment helps these entrepreneurs recognize the limitations of their approach and identify new pivoting opportunities, they pivot more than those in the control group when treated.

[Include Figure 1 about here]

4.1.4. Illustrative case study

To better illustrate the underlying dynamic, we present the case of an entrepreneur who participated in one of our business support programs and whom we have been able to follow over time (Ozcan et al. 2017). This entrepreneur joined the program with a value proposition centered on self-coaching training, business training, and one-on-one coaching for women from minority backgrounds to help them overcome barriers in career progression and maximize their potential. The

⁵ Camuffo et al. (2024) show that treated entrepreneurs are more likely to pivot once or twice than not at all or multiple times, while untreated entrepreneurs tend to show the opposite pattern. They propose that treated firms pivot in a focused way because the scientific approach improves the efficiency of their search and provides clarity on where to pivot. By contrast, control entrepreneurs either do not pivot at all or pivot in an untargeted way, employing a trial-and-error approach.

entrepreneur's idea was based on a very basic rationale, primarily driven by her own direct knowledge as a user of the specific needs of her target audience:

“So I’m targeting the females primarily coming from minority backgrounds in Europe, so that would be all of the Asian, Middle Eastern cultural backgrounds, and I’m solving for them the problem of overcoming their career challenges and career progression challenges that are sourced in your cultural background barriers. (...) I am the case myself and I just noticed that, well, I work in a different culture that I’ve been based in, and since I got the coaching training, it has helped me to actually progress in terms of my career significantly better. (...) A lot of females will have that internal barrier that is based in her cultural backgrounds, and because of that her career progression cannot be at the speed or the rate that it could be otherwise.”

Interestingly, the entrepreneur receives positive feedback on her idea during conversations with other women, which further reinforces her confidence in the idea and reduces her incentive to consider the potential of the opportunity beyond the initial target domain:

“I talk with a lot of females and all the time we come back in our conversation to the same very problems. So, I just thought that makes sense to make it a service because so many of them are experiencing it.”

During the treatment, she is encouraged to make the theory behind her value proposition explicit, which results in a more detailed and generalized cognitive map of the problem. This map assumes that internal cultural barriers hinder career progression and that addressing these barriers can help overcome them. This reconceptualized theory then guides the entrepreneur's action plan, including the selection of the target customer segment:

“So the product that we want to launch (...) is a self-coaching workshop. It is focusing on teaching how through coaching can females discover their internal barriers based in cultural differences, and then use that coaching techniques to actually on a day-to-day be able to stay focused and push forward in terms of their career progression. (...) The target customers are first of all the universities and corporates, so I have two different groups. The universities are purchasing that ultimately for their students that are about to graduate. (...) Then corporates is the second group and I would be looking at large corporates that most likely have their own female empowerment groups and so on. (...) And then the last group is the start-ups, so they are the entrepreneurs themselves that have already started with a company and are about to create teams.”

As she develops her theory and adjusts her value proposition accordingly, she regularly conducts a wide variety of tests, including focus groups, multiple rounds of surveys, interviews, and A/B testing, to gather evidence on the various dimensions underlying her theory. For example, she tests whether to use a corporate brand or to build the brand around her name and image:

“Yes, I tested, I did the AB testing with LinkedIn. That’s what I explained, whether using myself is going to make them click through or not.”

By the end of the program the initial value propositions gets developed into a much more articulated

and general one, targeted to a broader group of customers (“people”) and not only women:

“It does include coaching but it is basically a career-controlled center that is enabled by AI. It’s sort of a solution, I wouldn’t call it yet a platform or anything like that but more of a smart solution for people that is built based on a coaching principle.”

Through this process, the entrepreneur explicitly acknowledges that the idea of focusing exclusively on women was limiting the potential of her value proposition:

“I was initially thinking of targeting only female professionals. After doing some more tests, we discovered that targeting only women would be a mistake, so we are now focussing on both genders. There’s still big focus on the gender differences, so we will have different offering for both genders; however, we will work with both of them.”

The scientific approach helps the entrepreneur expand her search process both with the elaboration of a more articulated and general theory (about maximizing individuals’ potential as opposed to supporting women) as well as with testing that theory with a broader audience:

“We asked people to give us feedback. And yeah, the feedback was clearly that people didn’t understand why something that would be targeted at maximizing potential would be only targeted at women. And, we believe it was a good point, because we want to focus on lifelong employability, and if we want to decrease inequalities (...) we shouldn’t increase lifelong employability only for women, but we should focus on both genders. (...) I think the big impact is, well, it’s changed completely our view of the market, and we’ve changed the target market. And it also, I think, opened up the market for us, so now we are going to be ... Well, we were always focussing on B2B, but now we can have a broader offering for them. We’ve narrowed down to SMEs. (...) So, we have two additional big markets that we can focus on.”

The evidence gathered from this case study aligns with our theoretical intuition that the user knowledge possessed by the entrepreneur can limit the commercial exploitation of the idea and that being exposed to the scientific approach guides the entrepreneur toward making a radical pivot.

4.1.5. Econometric analysis

We use a longitudinal analysis to explore the causal impact of a scientific approach on the probability of engaging in radical pivots for women entrepreneurs with female-targeted value propositions. This choice reflects the nature of our dependent variable, which varies over time, and controls for unobserved heterogeneity that might affect our main variable for female-targeted value propositions.

4.1.5.1. Variables

Our core variables in this set of analyses are *Radical pivot_{it}*, *Treated_i*, *Post-treatment period_i*, and *Female-targeted value proposition_i*, which we have already described in section 4.2.1. In addition, we include control variables for the average weekly number of hours devoted to the development of the

idea as a proxy for effort and commitment together with individual and interview-round fixed effects.

4.1.5.2. Methodology

Following Wooldridge (2011), we begin by building a classic difference-in-difference (DiD) research design, and then we implement a difference-in-difference-in-difference (DDD) estimation approach which explores heterogeneous treatment effects by assessing whether women with and without female value propositions were affected by the intervention any differently. Recent research has employed DDD methodologies as an extension of the DiD setting allowing for intra-group heterogeneity in the treatment effect (Besley et al. 2017, Casas-Arce and Saiz 2015, Pierce and Schott 2016).

We fit the following model:

$$Radical\ pivot_{it} = \beta_0 + \beta_1 Treated_i + \beta_2 Post\ treatment\ period_t + \beta_3 Treated_i X Post\ treatment\ period_t + \gamma_{it} + \delta_t + u_i + \varepsilon_{it} \quad (1)$$

where $Treated_i$ denotes observations that were allocated to the treatment group; the dummy variable

$Post-treatment\ period_t$ is equal to 1 for observations taking place after the beginning of the training program and 0 for the baseline interview; γ_{it} corresponds to time-varying controls; δ_t refers to the interview-round dummies; u_i corresponds to the individual fixed effects; and ε_{it} corresponds to the error term. Results are reported in Table 2, Model 1. Because we include individual fixed effects, the time-invariant estimands (in this case the dummy $Treated_i$) are fully absorbed by the fixed effects. In this model the DiD estimand is the coefficient of the interaction term (β_3) and refers to the difference between the probability to engage in a radical pivot at time t before and after the training for treated firms compared with the same difference for control firms. Results show that, on average, the intervention did not have a clear impact on the pivoting behavior of female entrepreneurs.

Next, in Model 2, we explore whether the impact of the treatment on the probability to engage in a radical pivot is affected by whether the firm is operating with a female value proposition.

We fit the following model:

$$Radical\ Pivot_{it} = \beta_0 + \beta_1 Treated_i + \beta_2 Post\ treatment\ period_t + \beta_3 Treated_i X Post\ treatment\ period_t + \beta_4 Female\ targeted\ value\ proposition_i + \beta_5 Female-targeted\ value\ proposition_i X Post-treatment\ period_t + \beta_6 Treated_i X Female-targeted\ value\ proposition_i + \beta_7 Treated_i X Post-treatment\ period_t X Female-targeted\ value\ proposition_i + \gamma_{it} + \delta_t + u_i + \varepsilon_{it} \quad (2)$$

Also in this case, we use a fixed-effect model; therefore, in the model estimation the time-invariant estimands (in this case $Treated_i$, $Female-targeted\ value\ proposition_i$, and $Treated_i X Female-targeted$

value proposition_i) are fully absorbed by the individual fixed effects. The coefficient of interest is (β_7). Essentially, this term reflects how the difference between treatment and control before and after the treatment (β_3) when the entrepreneur at the baseline has a female targeted value proposition.

Results are reported in Table 2 (Model 2). When *Female-targeted value proposition_i* equals 0 (i.e., for firms *without* a female-targeted value proposition), the impact of the treatment on the probability of pivoting in the post treatment period compared with the control is captured by β_3 ($\beta_3 = 0.006, p = 0.807$), which suggests that the treatment does not have a clear impact on the probability of engaging in a radical pivot at time t. Instead, when *Female-targeted value proposition_i* equals 1 (i.e., for firms *with* a female-targeted value proposition), the treatment has a positive marginal impact compared with the control firm on the probability of engaging in radical pivoting at time t ($\beta_7 = 0.121, p = 0.043$), corresponding to 12.1 percentage points. This result is in line with the idea that entrepreneurs with a female-targeted value proposition are less likely to have identified a genuine opportunity than entrepreneurs without a female-targeted value proposition and that the treatment leads them more systematically toward a radical pivot.⁶

[Include Table 2 about here]

4.1.6. Robustness checks

The main challenge to our estimation approach hinges on the power of our experiment. Despite pooling together three different RCTs, the identification of the effect of interest in our sample stems from the cases of female entrepreneurs with female-targeted value propositions who make a radical pivot during the time window of the experiment. This group is almost by definition not large. To limit this issue, we conducted a robustness check in which we use an alternative way to identify female-

⁶ To facilitate the interpretation of the coefficients in our analysis we provide a graphical representation in Figure H.1 in Appendix H. In addition, to test the robustness of our results, we replicate our estimates across different specifications. The results of this exercise are reported in Table H.1 in the Appendix. Model 1 eliminates individual FE. Unlike results reported in Model 2 of Table 3 where time-invariant variables are dropped because of collinearity with the individual FE, in this new specification the variables *Treated*, *Female-targeted value proposition* and *Treated x Female-targeted value proposition* are reported in the regression. In Model 3, we drop also Interview-round dummies. This specification, which estimates all relevant parameters, is the one mapping closely into Figure 2 in the manuscript. Finally in Model 4 we eliminate the clustering of standard errors and estimate the naïve model where we drop all fixed effects and report robust standard errors. The coefficient of interest associated with the triple interaction *Female-targeted value proposition x Treated x Post-treatment period* is still positive, and the effect is precise with a coefficient of 0.102 in Model 3.

targeted value proposition.⁷ We followed Cao et al. (2023) and used a *natural language processing (NLP)* technique to build a continuous measure that identifies value propositions that are more *female oriented*, that is, value propositions articulated with words that are close in semantic space to a set of keywords that are associated with women. Specifically, we focused on the sample of UK entrepreneurs (whose interviews were conducted in English) and transcribed the audio files of their baseline interviews, during which each entrepreneur was asked to describe in detail the content of her idea. We first removed common stop words, keeping only nouns, verbs, and adjectives. For the remaining words, we then used a pre-trained word-embedding model to map each word to a 300-dimensional numeric vector.⁸ We calculated the extent to which each word in the interviews is nearer in semantic space to words associated with women. To identify these latter words, we used a list reported in Table D.1 in the Appendix as well as the list provided by the General Inquirer Harvard dictionary (reported in Table F.1). Following standard practice, for each word, we computed its TF-IDF (term-frequency inverse-document-frequency) weight, using texts of all interviews as the corpus. Next we calculated at the entrepreneur-interview level the TF-IDF weighted sum of words' closeness to the female keywords. As shown in Table 1, the two indicators derived from this approach—*Female-oriented value proposition (NLP1)*, constructed on the group of keywords reported in Model 1 of Table D.1, and *Female-oriented value proposition (NLP2)*, for the group of keywords from the General Inquirer Harvard dictionary in Model 1 of Table F.1—span a similar range of values.

We again estimated Equation 1 by replacing our core measure *Female-targeted value proposition* with each of the two continuous measures, both in standardized form. The results of this exercise are reported in Model 1 and 2 of Table 3. In both cases, the effect of the triple interaction

⁷ In the main analyses (Table 2), the variable Female-targeted value proposition is measured with a dummy. Therefore, the identification of the triple interaction occurs by comparing female entrepreneurs with a female-targeted value proposition with entrepreneurs without a female-targeted value proposition. Because only a relatively small portion of entrepreneurs are a female entrepreneur with a female-targeted value proposition (16.4%), one would get a substantial number of entrepreneurs in this category only if the overall sample was substantially large. Although the sample size remains the same, the use of the NLP measure offers the advantage of being a continuous measure as opposed to a dummy and therefore the opportunity to consider the *degree* of female orientation of the value proposition. As a result, the triple interaction term is identified for a larger number of entrepreneurs in our sample.

⁸ We used the fastText package developed by Facebook Research and estimated the skip-gram model on the Wikipedia corpus as training texts. The vector space has 300 dimensions. For more details, see <https://fasttext.cc/> and Bojanowski et al. (2017).

term between the dummy for post treatment, the treatment dummy, and the newly constructed variable for female-targeted value proposition remains positive and precise.

[Include Table 3 about here]

4.2. Boundary conditions: When does the scientific treatment matter more?

The evidence from Table 3 suggests that treated female entrepreneurs with a female-targeted value proposition are more likely to engage in a radical pivot after the treatment compared with control than those with a non-female-targeted value proposition. This pivoting behavior is consistent with the idea that user entrepreneurs become aware that the suboptimal configuration of the idea and engage in a radical pivot that affects the content of their value proposition and their preferred customer segment. In this section, we provide additional evidence in support of this intuition.

First, if the above interpretation is correct, we should expect to observe this effect for *other categories of user entrepreneurs*. We therefore present the case of ethnic entrepreneurs who develop an ethnic-focused value proposition. We focus on the subsample of UK entrepreneurs and define *Ethnic-focused value propositions* as value propositions incorporating elements related to a non-British national or cultural background. This variable was constructed by manually classifying value propositions based on the company description reported by the entrepreneur at the time (s)he joined the program. Ethnic value propositions include products and services targeted at specific ethnic groups (e.g., hairdressers specialized in treating African hair; a platform for the production of African sports content; a commerce platform focused on the Middle East). We then identify ethnic entrepreneurs as entrepreneurs with a non-British background. Appendix G describes the procedure followed to construct the sample of ethnic entrepreneurs. Table 4 reports the results of this exercise. Consistent with the evidence on female entrepreneurs, results reported in Model 1 show that ethnic entrepreneurs who develop an ethnic-focused value proposition are more likely to pivot radically after they undertake the scientific treatment ($\beta = 0.101, p = 0.056$).

Second, if our interpretation is correct, the effect should be weaker for entrepreneurs who are not users of the product or service they develop, as they should not be influenced by their own user experience in defining their baseline value proposition. Thus, they are more likely to have identified a genuinely valuable opportunity and less likely to engage in a strategic reorientation. In Table 4, we

performed a placebo test on non-ethnic entrepreneurs who developed an ethnic-focused value proposition and male entrepreneurs developing female-targeted value propositions. In line with our intuitions, results show smaller effects with a very high degree of variability on the probability of pivoting for treated non-ethnic entrepreneurs with an ethnic-focused value proposition (Model 2) and for male entrepreneurs with a female-targeted value proposition (Model 3).

Third, if our interpretation is correct, this effect should be weaker for entrepreneurs with more business acumen, which should improve their decision-making. A good proxy for this construct is the number of years of prior managerial experience, since managerial positions require making business-related decisions on a regular basis. These entrepreneurs should be more likely to have initially identified a strong value proposition, so we should observe fewer radical pivots after the treatment among those with more managerial experience. To test this intuition, we distinguish between entrepreneurs with a number of years of managerial experience above median and those below the median value in the sample. Results, presented in Table 4, Models 4 and 5, are consistent with our intuition. Entrepreneurs with less advanced business insight with a female-targeted value proposition pivot after being treated with the scientific approach. No clear effect is found for entrepreneurs with more advanced business insight. Overall, these analyses support our interpretation of the results presented in Table 2.

[Include Table 4 about here]

4.3. Performance implications: Does pivoting lead to positive performance implications for treated female entrepreneurs with female-targeted value propositions?

In the previous section, we showed that a scientific approach prompts female entrepreneurs who target women to pivot on their initial value proposition. How do they perform compared to those who did not pivot? To test this, we employed different indicators for performance that are both internal to the RCT – and therefore collected soon after the treatment – and derived from external data, allowing us to look at performance in the medium term.

4.3.1. Termination: RCT evidence

First, we leveraged the data collected in the context of the RCTs to investigate whether treated entrepreneurs with female-targeted value propositions who pivoted at any time after the treatment had

a higher probability to still be working on their original idea at the end of the RCT.

4.1.3.1. Variables and methodology

For this exercise, we focused on a dependent variable defined as *Termination* and measured as a dummy equal to 1 if the entrepreneur abandoned her original idea at any time during the RCT window of observation, and 0 otherwise. The choice of termination as a performance outcome is particularly suitable for this paper given that we are interested in a signal of performance that is temporally close to pivoting decisions. The focus on termination leads us to choose a cross-sectional specification given that termination is a one-shot event and time variation is not relevant (i.e., once the entrepreneur terminates, the choice is irreversible). Because we are interested in the performance outcome of the treatment and the related induced pivoting behavior, we estimated this specification using the cross-section of entrepreneurs observed in the last interview round in which they participated. At that point in time, all entrepreneurs in the treatment group had been treated and all pivots that resulted from the treatment had been recorded. The parameter of interest is the triple interaction term *Female-targeted value proposition x Treated x Radical pivot*.

4.1.3.2. Results

Results, reported in Table 5, Model 1, show that treated female entrepreneurs with a female-targeted value proposition who pivoted during the RCT are less likely to terminate their idea than entrepreneurs in the same category who have not pivoted, and that the effect is precise.⁹ These results support the short-term positive performance implications of these pivoting decisions and suggest that entrepreneurs who pivoted benefit from their decision in terms of idea continuity.¹⁰ They are also consistent with the idea that entrepreneurs who decide to make a radical pivot will require time to

⁹ Figure H.2 in Appendix H splits the sample according to whether the entrepreneur is in the treatment or in the control group and estimates the effect of the interaction term *Female-targeted value proposition x Radical Pivot* on *Termination*, controlling for whether the individual has a degree, instructor dummies, entrepreneurial and work experience band dummies, RCT dummies, and the weekly number of hours worked on the idea at the baseline. Results support the intuition that entrepreneurs with a female-targeted value proposition who pivoted during the program have a lower probability of termination than those who did not pivot.

¹⁰ Additional results available from the authors suggest that individuals with a female-targeted value proposition, who are treated and pivoted during the program, earn higher revenues than both those who were untreated and those who did not pivot. Interestingly, we also find that entrepreneurs that start with a female-targeted value proposition, are in the control group, and do not pivot—who show a lower likelihood of termination in Model 1 of Table 5—earn instead lower revenues. The combination of these two pieces of evidence suggests that this group of entrepreneurs, whose venture is strongly grounded in their domain, is likely to stick to their own ideas and avoid termination even when market feedback is negative.

implement the pivot and observe its outcomes and, in the meanwhile, will keep the project active.

4.3.2. Venture launch and continuity: LinkedIn data evidence

Second, we investigated the medium-term performance effect of our focal entrepreneurs' pivots.

4.3.2.1. Data, variables, and methodology

To this purpose, we engaged in an extensive data collection from the LinkedIn profiles of the entrepreneurs who took part in our three RCTs. To make sure that we identified our entrepreneurs, we cross-validated information on the name of the entrepreneur, the name of the venture, and the location. We were able to retrieve LinkedIn profiles for 116 entrepreneurs and collect information on the actual status of the focal venture for all of them. The LinkedIn data collection took place in the spring of 2023. As in the previous case, a cross-sectional specification is appropriate.

From LinkedIn information we constructed two dependent variables. The first, *Venture launch*, concerns whether the original value proposition eventually led to the formal founding of the venture; that is, whether at any point in time the focal venture is listed among the work experience of the entrepreneur in her LinkedIn resume. Our second dependent variable, *Venture Continuity*, is a dummy equal to 1 if the LinkedIn records suggest that the firm was still active (i.e., it was reported as active on the entrepreneur's LinkedIn page) as of spring 2023. The parameter of interest is that associated with the triple interaction term *Female-targeted value proposition x Treated x Radical pivot*.

4.3.2.2. Results

Results show that this group of entrepreneurs was more likely to establish a venture related to their original business idea after the training compared to those that did not pivot (Table 5, Model 2). Also, these ventures were more likely to still be active as of Spring 2023 (Table 5, Model 3).

Taken together, this evidence demonstrates that entrepreneurs who joined the program with a female-targeted value proposition and pivoted after being treated fared better than those who did not, both in the short and in the medium term. This result is in line with the interpretation that a scientific approach to decision-making helps user entrepreneurs improve upon their initial ideas.¹¹

¹¹ When looking at individuals joining the program with a female-targeted value proposition, because our experimental setting excludes a priori selection into the treatment, differences between treated individuals who pivot (captured by the triple interaction term *Female-targeted value proposition x Treated x Radical pivot*), treated individuals who do not pivot (*Female-targeted value proposition x Treated*), untreated individuals who

[Include Table 5 about here]

5. DISCUSSION AND CONCLUSIONS

In this paper, we have explored the extent to which a “scientific” approach to decision-making can act as a mechanism that prevents entrepreneurs from being unnecessarily constrained by their own knowledge as users when identifying opportunities. We examined the case of female entrepreneurs developing female-targeted value propositions as an example of this broader issue. We build on the intuition from the literature that when user entrepreneurs develop ideas based on their own user knowledge and experience, they have a limited ability to gauge market demand for their products or services (Agarwal and Shah 2014, Bapna and Ganco 2023, Chan and Lim 2023, Thompson 2014). This effect might be even more pronounced for entrepreneurs from underrepresented demographic groups (Einio et al. 2022, Lee et al. 2019), which makes the case of women focusing on female-targeted value propositions ideal for exploring the topic we targeted.

Of course, the choice of a female entrepreneur to develop products or services targeted to female customers can be the result of identifying a genuinely valuable market opportunity. However, our approach is based on the intuition that when we observe an entrepreneur whose value proposition is focused on her own user group, there is a higher chance that this might have been influenced by her own knowledge as a user rather than by a conscious commercial decision. In addition, given the

pivot (*Female-targeted value proposition x Radical pivot*), and untreated individuals who do not pivot (*Female-targeted value proposition*) likely capture the performance implications associated with heterogeneous selection into the decision to pivot on the original idea across the treatment and the control group. Following Kowalski (2023), we take heterogeneity across these different groups as an opportunity to discuss the general implications. We focus on *Termination* and map the above coefficients from Column 1 in Table 5 to Figure H.3 in Appendix H. Interestingly, whereas the groups of treated who do not pivot and untreated who do pivot underperform as expected, both the groups of treated who pivot and untreated who do not show higher performance. We argue that these two outcomes map onto different kinds of behaviors. Treated entrepreneurs who decide to pivot are likely those that respond to the treatment by redirecting their initial value proposition to a better strategic alternative. Compared with treated entrepreneurs who do not pivot, lower termination rates in their case reflect the heterogeneous performance effects due to their selection into pivoting as a result of the recognition of the initial limitations of their business proposition. Untreated entrepreneurs who do not pivot, instead, are individuals who relied on their user knowledge and experience to draw their value proposition and did not receive from the training inputs that should systematically lead them to reconsider their original ideas. Compared with untreated entrepreneurs who do pivot—but likely do it without a clear strategic alternative in mind—these are entrepreneurs who stick to their original business proposition and therefore do not terminate their idea in the short run. Interestingly, the size of the coefficient increases monotonically from Column 1 to Column 3, suggesting that the actual sustainability of these ventures in the medium and long run is not straightforward. Unfortunately, because we cannot observe the performance of these ventures over the long run, this interpretation remains speculative.

nature of our treatment, which stimulates entrepreneurs to reflect on the theoretical assumptions behind their business propositions and to test them rigorously, treated entrepreneurs who have identified a valuable market opportunity should, if anything, be encouraged to pursue it even further. Thus, if we observe that women with female-targeted value propositions are more likely to engage in a radical pivot after being treated, we interpret this result as evidence that a scientific approach is effective in inducing a strategic change of direction.

Consistent with our expectations, our results show that female entrepreneurs with female-targeted value propositions are more likely to make radical pivots in their ventures after being exposed to the treatment. Finally, we show a positive effect on the performance of treated female entrepreneurs with female-targeted value propositions after they engage in a radical pivot, including lower project termination rates and higher venture creation and continuity rates. These performance implications are consistent with the idea that the pivoting induced by the treatment was beneficial and presumably improved the market potential of their original idea.

These results contribute to different streams of research and suggest related avenues for future contributions. First, they contribute to research on a scientific approach to decision-making (Agarwal et al. 2024, Camuffo et al. 2024, Felin and Zenger 2017, Novelli and Spina 2024, Zellweger and Zenger 2023) and to the important stream of research on the determinants of strategic pivots (Gans et al. 2019, Kirtley and O'Mahony 2023, Pillai et al. 2020). This study's results align with the idea that a scientific approach can significantly benefit entrepreneurs, particularly those with limited business knowledge, in understanding and gauging market demand for their products or services. Prior research by Bapna and Ganco (2023) and Shah and Tripsas (2007) shows that this inability often stems from a lack of business acumen necessary to accurately assess the commercial potential of their products or services. In our RCTs, both the treatment and control groups received standard entrepreneurial training, but only the treatment group was encouraged to build and validate a conceptual map. The significant differences we observe in treatment group outcomes highlight the fundamental role that the ability to develop and validate these mental maps can have in supporting entrepreneurial decision-making.

Our findings also add to recent work on user entrepreneurship and the limitations faced by these

entrepreneurs when launching and scaling their ideas (Agarwal and Shah 2014, Bapna and Ganco 2021, 2023). Particularly in the context of women entrepreneurs, Shah and Tripsas (2007) suggest that the tendency of women entrepreneurs to systematically engage in smaller, lower-growth businesses than men might be explained by women self-selecting into businesses that leverage their experience as users, rather than by an inherent lack of ambition or capability. We advance this research area by exploring an approach that encourages entrepreneurs, especially women, to look beyond their user knowledge domain and capture opportunities more broadly. Whereas prior research in this field has mainly investigated mechanisms that can support user entrepreneurs *ex post* by reducing biases in audiences' assessments of the quality of their ideas, our work aims to identify mechanisms that can tackle the problem at its origin.

Finally, our results regarding the case of female and ethnic entrepreneurs have important implications for the organizational literature on women and underrepresented demographic groups in entrepreneurship (Conti et al. 2022, Lyons and Zhang 2017). Unlike prior research focusing on the challenges faced by these categories of entrepreneurs, our study outlines the intriguing possibility that decision-making approaches based on a rigorous logic and the rigorous testing of assumptions can play a role in supporting these entrepreneurs on their path toward success.

Although our study shows that using a scientific approach benefits entrepreneurs who pivot, it is important to recognize that this approach is not always ideal. Entrepreneurs may choose to target niche markets for intrinsic reasons, such as addressing societal issues or supporting disadvantaged groups. While highlighting the economic costs of these decisions might encourage the pursuit of more lucrative opportunities, it could also divert them from their passions. Additionally, focusing solely on promising economic opportunities might lead to the neglect of certain customer groups.

We also acknowledge some limitations of our study that constitute fruitful opportunities for future research. First, by focusing on the case of entrepreneurs who possess user knowledge regarding a product or service, the paper offers an example of a situation in which such entrepreneurs might focus on a suboptimal value proposition. While the choice of a suboptimally narrow target market is an important problem for entrepreneurs, being a user entrepreneur is only one of the reasons that might lead in this direction. For instance, this outcome can also be the result of a lack of confidence in

addressing a broader customer market, anticipation of stereotype threat by out-group customers, lack of information about the market, or lack of time and other resources to target a broader market.

Second, in our analysis, we had limited opportunities to examine the micro-mechanisms leading to the effect we observed. The case study presented in section 4.1.4 shows a specific way in which the scientific approach to decision-making supported the user entrepreneur: it stimulated her to expand her search process beyond the original area and to pursue a more relevant business opportunity. Our data do not allow us to provide more systematic evidence of the specific ways in which the radical pivots completed by our entrepreneurs addressed the limitations in their baseline value propositions. Future research should consider exploring more in detail the tendency of user entrepreneurs to process information consistent with their personal experience or beliefs and delving deeper into the direction and nature of the pivots stimulated by the scientific approach. In addition, the phenomenon under investigation (female entrepreneurs with female-targeted value propositions and, more generally, user entrepreneurship) represents a relatively small portion of our sample population. We have addressed this limitation by presenting several tests that demonstrate the robustness of the effect irrespective of the sample chosen. However, it would be valuable for future research to replicate these patterns on a different and larger group of entrepreneurs and over a longer horizon.

This paper's results present relevant policy implications. They highlight the crucial importance for policymakers of supporting and facilitating training initiatives that encourage entrepreneurs who might have valuable ideas but lack business experience to look beyond their immediate knowledge domains. Encouraging them to revise their value propositions may not only enhance customer appeal but also bolster the venture's ability to attract and mobilize resources later on (Bingham and McDonald 2022, McDonald and Bremmer 2020). This is especially important for groups such as women or minority entrepreneurs, who have been found to be prone to user entrepreneurship dynamics and often face significant constraints in raising entrepreneurial funding (Bapna and Ganco 2021, Dutt and Kaplan 2018, Guzman and Kacperczyk 2019). Helping these entrepreneurs redirect their value propositions toward more valuable alternatives allows for addressing structural funding deficiencies at their roots by improving the market appeal of these ventures.

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FIGURES AND TABLES

Table 1: Variables' description and descriptive statistics

RCT Variables							
	Variables' description	Unit of Obs.	Obs	Mean	SD	Min	Max
Dependent Variables							
<i>Radical pivot</i>	Dummy variable = 1 if the entrepreneur changes the value proposition or customer segment at time t, 0 otherwise	Entrepreneur–interview round	1843	0.076	0.265	0	1
<i>Termination</i>	Dummy variable = 1 if the entrepreneur terminates her project, 0 otherwise	Entrepreneur	172	0.326	0.470	0	1
Independent Variables							
<i>Female-targeted value proposition</i>	Dummy variable = 1 if the entrepreneur develops a value proposition that targets women, 0 otherwise	Entrepreneur–interview round	1843	0.164	0.370	0	1
<i>Post-treatment period</i>	Dummy = 1 for all periods after the start of the treatment, 0 otherwise	Entrepreneur–interview round	1843	0.907	0.291	0	1
<i>Treated</i>	Dummy = 1 if the entrepreneur undergoes the scientific training, 0 otherwise	Entrepreneur–interview round	1843	0.538	0.499	0	1
<i>Female-oriented value proposition (NLP1)</i>	NLP-based female intensity of the value proposition based on the dictionary reported in Table D.1 (Model 1)	Entrepreneur–interview round (UK sample only)	749	-0.941	1.610	-3.067	11.489
<i>Female-oriented value proposition (NLP2)</i>	NLP-based female intensity of the value proposition based on the General Inquirer Harvard dictionary reported in Table F.1 (Model 1)	Entrepreneur–interview round (UK sample only)	749	-1.326	2.151	-4.235	15.131
<i>Ethnic-focused value proposition</i>	Dummy variable = 1 if the entrepreneur develops a value proposition that incorporates ethnicity-related elements, 0 otherwise	Entrepreneur–interview round (UK sample only)	1138	0.145	0.352	0	1
Control Variables							
<i>Weekly hours worked on the idea</i>	Number of hours devoted to the development of the idea per week	Entrepreneur–interview round	1843	18.862	18.049	0	100
<i>Work experience band</i>	Variable based on the number of years of work experience at the baseline; = 1 if years of work experience < 5, = 2 if >= 5 & < 10, = 3 if >= 10 & < 20, = 4 if >= 20 & < 30, = 5 if >= 30	Entrepreneur	172	2.686	1.100	1	5
<i>Entrepreneurial experience band</i>	Variable based on the number of years of entrepreneurial experience at the baseline; = 1 if years of work experience < 5, = 2 if >= 5 & < 10, = 3 if	Entrepreneur	172	2.093	0.893	1	4

RCT Variables							
	Variables' description	Unit of Obs.	Obs	Mean	SD	Min	Max
	≥ 10 & < 20 , = 4 if ≥ 20 & < 30 , = 5 if ≥ 30						
<i>Degree</i>	Dummy variable = 1 if the entrepreneur has a degree, 0 otherwise; measured at the baseline (Interview round 1)	Entrepreneur	172	0.930	0.255	0	1
LinkedIn Variables							
<i>Venture launch</i>	Dummy variable = 1 if the venture was listed at any point in the in the entrepreneur's LinkedIn resume, 0 otherwise	Entrepreneur	116	0.595	0.493	0	1
<i>Venture continuity</i>	Dummy = 1 if the venture is still reported as active in the entrepreneur's LinkedIn page in 2023	Entrepreneur	116	0.543	0.500	0	1

Notes. 1,843 entrepreneur–interview round observations refer to 172 entrepreneurs observed over multiple observation rounds. They include 172 entrepreneurs observed in interview rounds 1 and 2, 164 in interview-round 3, 162 in round 4, 154 in round 5, 148 in round 6, 144 in round 7, 137 in round 8, 126 in round 9, 53 in round 10, 52 in rounds 11 and 12, 51 in round 13, 49 in round 14, 45 in round 15, 42 in rounds 16 and 17, 40 in round 18, and 38 in round 19. Entrepreneurs participating in the UK RCT are observed for 9 interview rounds (baseline +8), those participating in the Italian RCT in Milan and Turin are observed for 19 (baseline +18) interview rounds. 749 entrepreneur–interview round (UK sample) observations refer to entrepreneurs participating in the UK RCT only. They include 95 entrepreneurs observed in interview rounds 1 and 2, 90 entrepreneurs in interview rounds 3 and 4, 85 in round 5, 80 in round 6, 76 in round 7, 7 in round 8, and 66 in round 9.

Table 2: The effect of the scientific treatment on the pivoting behavior of female entrepreneurs

	(1) Radical Pivot Panel	(2) Radical Pivot Panel
Post-treatment period (β_2)	0.018 (0.036)	0.024 (0.038)
Treated x Post-treatment period (β_3)	0.025 (0.022)	0.006 (0.026)
Female-targeted value proposition x Post-treatment period (β_5)		-0.043 (0.045)
Female-targeted value proposition x Treated x Post-treatment period (β_7)		0.121** (0.057)
Weekly hours worked on the idea	0.002*** (0.001)	0.002*** (0.001)
Constant (β_0)	-0.026* (0.014)	-0.026* (0.014)
Entrepreneur-time observations	1,843	1,843
R-squared	0.239	0.240
Interview-round dummies	YES	YES
Individual FE	YES	YES

Note: Clustered-robust standard errors at the instructor, intervention, and RCT levels in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. The number of observations (1,843) refers to 172 entrepreneurs observed over multiple observation rounds.

Table 3: NLP-based measures of value propositions' female orientation

	(1) Radical Pivot Panel	(2) Radical pivot Panel
Post-Treatment period	0.068* (0.031)	0.068* (0.031)
Treated x Post-Treatment period	0.040** (0.017)	0.040** (0.017)
Post-Treatment period x Female-oriented value proposition (NLP1)	-0.019 (0.018)	
Treated x Post-Treatment period x Female-oriented value proposition (NLP1)	0.065* (0.033)	
Post-Treatment period x Female-oriented value proposition (NLP2)		-0.019 (0.018)
Treated x Post-Treatment period x Female-oriented value proposition (NLP2)		0.065* (0.034)
Weekly hours worked on the idea	0.002*** (0.000)	0.002*** (0.000)
Constant	-0.062*** (0.014)	-0.062*** (0.014)
Entrepreneur-time observations	749	749
R-squared	0.307	0.307
Interview-round dummies	YES	YES
Individual FE	YES	YES

Note: Clustered-robust standard errors at the instructor, intervention, and RCT levels in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. The number of observations (749) refers to 95 entrepreneurs observed over multiple interview rounds. These specifications focus only on the sample of UK entrepreneurs because of the availability of interview data.

Table 4: Boundary conditions

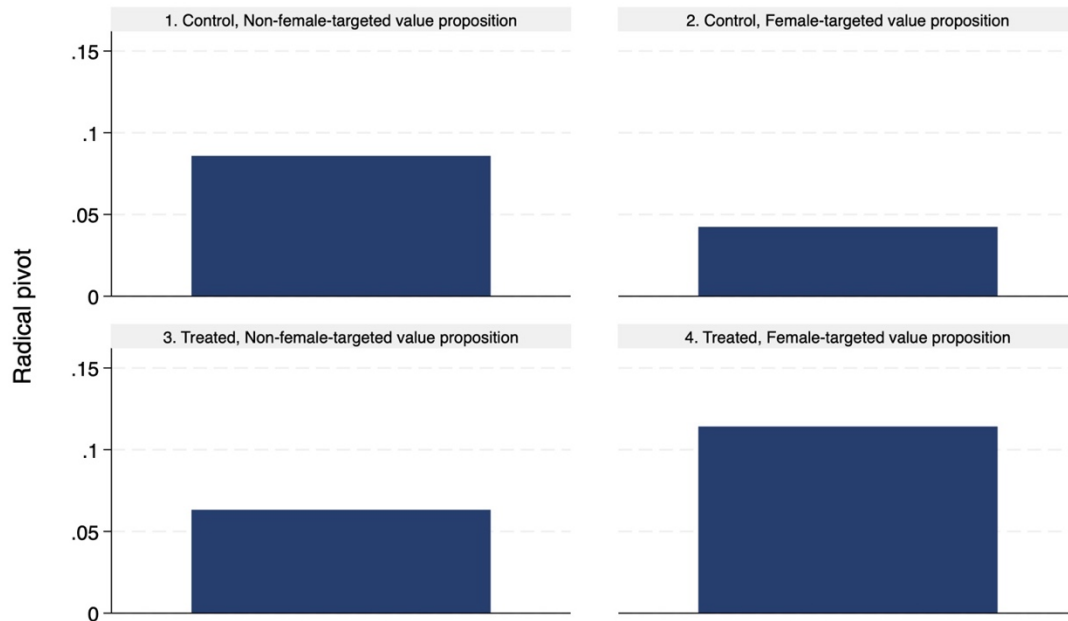
Dep.Var.	(1) Radical pivot Other user entrepreneurs: Ethnic entrepreneurs Panel	(2) Radical pivot Non-user entrepreneurs (non-ethnic with an ethnic- focused value proposition) Panel	(3) Radical pivot Non-user entrepreneurs (males with female- targeted value propositions) Panel	(4) Radical pivot Entrepreneurs with lower business acumen Panel	(5) Radical pivot Entrepreneurs with higher business acumen Panel
Post-Treatment period	0.074*** (0.013)	0.085** (0.030)	0.015 (0.016)	-0.011 (0.021)	0.122 (0.093)
Treated x Post-treatment period	0.006 (0.023)	-0.017 (0.036)	-0.023 (0.017)	-0.007 (0.038)	0.004 (0.030)
Ethnic-focused value proposition x Post-treatment period	-0.038 (0.033)	-0.089** (0.030)			
Ethnic-focused value proposition x Treated x Post-treatment period	0.101* (0.056)	0.066 (0.048)			
Female-targeted value proposition x Post-treatment period			-0.016 (0.051)	-0.108 (0.067)	0.001 (0.058)
Female-targeted value proposition x Treated x Post-treatment period			-0.010 (0.070)	0.181* (0.098)	0.113 (0.086)
Weekly hours worked on the idea	0.002** (0.001)	0.002 (0.001)	0.001** (0.000)	0.0026** (0.001)	0.001 (0.001)
Constant	-0.073** (0.0319)	-0.048 (0.0315)	-0.003 (0.008)	-0.034 (0.023)	-0.020 (0.016)
Entrepreneur-time observations	1,138	571	4,249	937	876
R-squared	0.264	0.234	0.216	0.251	0.247
Interview-round dummies	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES

Note: Clustered-robust standard errors at the instructor, intervention, and RCT levels in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Models 1 and 2 refer to the UK RCT only, Models 3 to 5 to all three RCTs in the sample. The number of observations in Model 1 (1,138) refers to 150 ethnic entrepreneurs, both men and women, observed over multiple interview rounds; in Model 2 (571) to 73 non-ethnic entrepreneurs, both men and women, entrepreneurs observed during multiple interview rounds; in Model 3 (4,249) to 346 entrepreneurs observed over multiple interview rounds; in Model 4 (937) to 82 entrepreneurs (all RCTs sample) observed during multiple interview rounds; and in Model 5 (876) to 85 entrepreneurs observed during multiple interview rounds. Five entrepreneurs have missing information on the years of managerial experience at the baseline.

Table 5: Performance implications. Short and medium term

Dep.Var.	(1) Termination Cross-section	(2) Venture Launch Cross-section	(3) Venture continuity Cross-section
Female-targeted value proposition	-0.420** (0.182)	0.387** (0.185)	0.339* (0.183)
Radical pivot	-0.253** (0.118)	-0.016 (0.118)	-0.056 (0.106)
Treated	-0.108 (0.082)	0.087 (0.101)	0.047 (0.089)
Female-targeted value proposition x Radical pivot	0.728** (0.332)	-0.481 (0.585)	-0.780*** (0.281)
Female-targeted value proposition x Treated	0.374* (0.192)	-0.982*** (0.263)	-0.904*** (0.246)
Radical pivot x Treated	0.274* (0.150)	0.169 (0.154)	0.152 (0.146)
Female-targeted value proposition x Treated x Radical pivot	-1.011** (0.386)	1.331** (0.594)	1.780*** (0.319)
Constant	0.867*** (0.285)	0.538 (0.382)	0.875** (0.327)
Entrepreneurs-only observations	172	116	116
R-squared	0.234	0.476	0.543

Note: Clustered-robust standard errors at the instructor, intervention, and RCT levels in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All models include controls for whether the individual has a degree, instructor dummies, entrepreneurial and work experience band dummies, RCT dummies, and the weekly number of hours worked on the idea at the baseline.

Figure 1: Pivoting behavior. Comparison of treated/control female entrepreneurs with female-/non-female-targeted value propositions

Source: RCT data, $N = 1,843$; 734 in Panel 1, Control, Non-female-targeted value proposition; 118 in Panel 2, Control, Female-targeted value proposition; 807 in Panel 3, Treated, Non-female-targeted value proposition; and 184 in Panel 4, Treated, Female-targeted value proposition. Note: When comparing 1 and 3, $\text{mean}(\text{control}) = \text{mean}(\text{treatment})$ if female-targeted value proposition = 0, $t = 1.70$, $p\text{-value} = 0.090$. When comparing 2 and 4, $\text{mean}(\text{control}) = \text{mean}(\text{treatment})$ if female-targeted value proposition = 1, $t = -2.17$, $p\text{-value} = 0.030$.