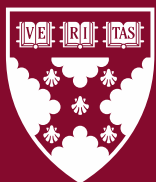


Working Paper 24-042

# The Uneven Impact of Generative AI on Entrepreneurial Performance

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There is a growing belief that scalable and low-cost AI assistance can improve firm decision-making and economic performance. However, running a business involves a myriad of open-ended problems, making it hard to generalize from recent studies showing that generative AI improves performance on well-defined writing tasks. In our five-month field experiment with 640 Kenyan entrepreneurs, we assessed the impact of AI-generated advice on small business revenues and profits. Participants were randomly assigned to a control group that received a standard business guide or to a treatment group that received a GPT-4 powered AI business mentor via WhatsApp. While we find no average treatment effect, this is because the causal effect of generative AI access varied with the baseline business performance of the entrepreneur: high performers benefited by just over 20% from AI advice, whereas low performers did roughly 10% worse with AI assistance. Exploratory analysis of the WhatsApp interaction logs shows that both groups sought the AI mentor's advice, but that low performers did worse because they sought help on much more challenging business tasks. These findings highlight how the tasks selected by firms and entrepreneurs for AI assistance fundamentally shape who will benefit from generative AI.

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# 1 Introduction

Since the launch of ChatGPT in November 2022, there has been an explosion of research on generative AI and its potential economic implications (The White House, December, 2022; Agrawal, Gans, and Goldfarb, 2023; Eloundou et al., 2023; Hui, Reshef, and Zhou, 2023). Much of this recent work is driven by the belief that conversations with large language models (LLMs) can yield helpful assistance, feedback and advice, ultimately improving firm performance and growth (Brynjolfsson, Li, and Raymond, 2023; Dell’Acqua et al., 2023; Noy and Zhang, 2023; Peng et al., 2023; Kumar et al., 2023). Given the substantial variation that exists in both worker and firm productivity, both within and across countries (Bloom and Van Reenen, 2007; Bartelsman, Haltiwanger, and Scarpetta, 2013), the emergence of nearly zero marginal cost generative AI “mentors” has the potential to radically improve the productivity and performance of everyone; from the thousands of CEOs running companies listed on the New York Stock Exchange to the hundreds of millions of entrepreneurs running small and medium-sized businesses (SMB) in developing economies (McKenzie and Woodruff, 2017; McKenzie, 2021; Björkegren, 2023).

Consistent with the optimism currently surrounding generative AI (AI hereafter), recent experiments show that conversing with and receiving AI assistance causes workers to write faster and better business text, including press releases, ad copy, consulting memos, and customer support messages (Brynjolfsson, Li, and Raymond, 2023; Dell’Acqua et al., 2023; Doshi and Hauser, 2023; Noy and Zhang, 2023; Chen and Chan, 2023). However, it remains unclear whether the benefits of such AI feedback generalize to the broader set of tasks that firms engage in. Running a business involves more than writing great memos; firms must also manage employees, raise capital, pilot new initiatives, develop advertising strategies, price their services, react to competitors, and decide which of these and myriad other tasks to focus their efforts on (Chandler, 1977). Even for early-stage or small business entrepreneurs, the sheer multitude of tasks involved in running a business greatly increases the complexity of effectively integrating AI assistance into business activities (Lazear, 2004; Anderson and McKenzie, 2022).

The plethora of tasks that entrepreneurs face can result in inattention and failure to

seek out advice or acquire new information, potentially limiting the benefits of even the most advanced AI-generated advice (Hanna, Mullainathan, and Schwartzstein, 2014; Kim, 2023). Even when entrepreneurs do recognize the need to ask a question, it is not obvious which tasks they should ask for help with, how to formulate effective questions to get useful feedback, or how to interpret and act upon the advice received (Bryan, Tilcsik, and Zhu, 2017; Camuffo et al., 2020; Agrawal, Gans, and Stern, 2021; Dimitriadis and Koning, 2022). Moreover, while the advice provided by an AI tool might be useful in theory, the entrepreneur may lack the complementary skills and resources to act on that agent’s recommendations (Brynjolfsson and Hitt, 2000; Brynjolfsson, Rock, and Syverson, 2021).

Furthermore, even if the entrepreneur’s question is well-crafted, it is unclear how useful advice from AI will be in practice. Given the myriad tasks entrepreneurs undertake, it is plausible that AI advice generates a mix of useful answers, ineffective recommendations, and potentially detrimental advice that could hinder firm performance (Dell’Acqua et al., 2023). If most tasks require personalized advice to be useful, then AI feedback is likely to be especially valuable given its ability to contextualize responses. However, if most tasks are standardized, then AI will help, but potentially no better than the common advice an entrepreneur might get from reading a book or browsing the web. It is also possible that most business tasks are tacit and not yet codified as text, in which case AI tools may lack the relevant training data to provide useful answers to an entrepreneurs’ questions (Autor, 2014). Of greatest concern, generative AI might yield overconfident or flawed recommendations for many real-world business tasks (Moore, 2022; Dell’Acqua et al., 2023), leading entrepreneurs to implement “solutions” that worsen rather than improve firm performance.

Taken together, these arguments suggest that studying the potential impact of AI-generated advice on entrepreneurial decision-making is useful for at least two reasons. First, it sheds light on whether and when AI advice can spur entrepreneurial learning, better performance, and improvements in economic productivity, all of which are core concerns for both managers and policymakers. Second, understanding if AI can assist entrepreneurial decision-making provides more general insights into whether generative AI can provide meaningful benefits in contexts that are more complex and interconnected than those studied in prior work (Sato et al., 2023)

## 2 Experimental Design

We measure the impact of AI advice on entrepreneurial performance by running a field experiment with 640 Kenyan SMBs. We selected this research context because while recent experiments document that entrepreneurs in developing economies greatly benefit from the context-specific and wide-ranging nature of human feedback (Brooks, Donovan, and Johnson, 2018; Cai and Szeidl, 2018; Chatterji et al., 2019), this context has been almost entirely overlooked in recent research on the potential productivity impacts of generative AI (Björkegren, 2023). Because obtaining personalized advice is especially challenging in developing economies, the benefits of AI advice in these contexts might be especially valuable (Dimitriadis and Koning, 2022, 2023).

Specifically, we developed an AI “mentor” for Kenyan entrepreneurs using GPT-4, an LLM released by OpenAI in March 2023 (OpenAI, 2023). ChatGPT, a simple Q&A interface for interacting with LLMs released by OpenAI, rocketed to an estimated 100 million monthly active users within two months of its launch (Hu, 2023). Building on the popularity of ChatGPT’s chat interface, we developed our own AI tool (hereafter the AI mentor) that can be accessed through WhatsApp. Development of this AI mentor took place over four months and involved extensive user testing by the authors, research assistants, and SMB entrepreneurs in Kenya (see Appendix D for more details on the AI mentor development process). We selected WhatsApp because it is used by nearly 90% of people in Kenya (Wamuyu, 2020) and because of the low cost of sending text over WhatsApp relative to SMS texts. Figure 1 depicts an example participant interaction with the AI mentor.

Interacting with the AI mentor differs from interacting directly with an LLM such as GPT-4 in three ways. First, we developed a system prompt that provides the AI with additional context about the Kenyan SMBs who would use our app, which increased the odds that the advice provided to entrepreneurs by the AI mentor was contextually relevant.<sup>1</sup> Second, we instructed our AI mentor to generate three to five practical pieces of advice in response to each question posed by the entrepreneur, with each piece of advice accompanied by an

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<sup>1</sup>For example, if asked about how to raise capital, GPT-4 may recommend raising venture capital funds; a financing strategy that is out-of-scope for the SMB entrepreneurs in our study. Instead, our system prompt would lead the AI mentor to focus on contextually relevant alternatives, like approaching family and friends or building a “chama,” an informal cooperative society.

explanation of its benefits and implementation details. Finally, to encourage entrepreneurs to engage further with the advice they received, the system prompt instructed the AI mentor to structure responses in such a way that users could quickly and easily ask for more information about each piece of advice. The diverse ways that entrepreneurs interact with the AI mentor, as well as the level of personalization provided by the tool are further highlighted in Appendix H, which presents full chat logs for two entrepreneurs in our sample. In one conversation, a restaurant owner is considering changing the menu and asking for assistance thinking through the possibilities and sources of uncertainty involved in making this decision. In the other, a business owner selling wholesale and retail milk is asking how to expand their product offerings to increase profits. Other conversation topics across our full sample include how to motivate employees, the best way to deploy capital when expanding a store, tips for hatching and raising healthy chickens, and how to deal with bankruptcy.

Our AI mentor is one of many AI tools that have recently been developed to assist entrepreneurs and firms (Baxter and Schlesinger, 2023). However, despite the popularity of these tools, there is scant evidence on their causal impact, at least in part because measuring the causal impact of AI assistance on business performance remains difficult. Conceptually, defining the appropriate counterfactual for the AI mentor is non-trivial because AI-based interventions can offer multifaceted benefits. In our context, the AI mentor not only provides information akin to what an entrepreneur could have learned from a book or the internet (Dalton et al., 2021); it also personalizes this information for the individual like a mentor or advisor might. As a result, the treatment effect of access to the AI mentor relative to an unassisted control might simply reflect the usefulness of information more generally. Empirically, measuring business performance in developing economies almost always involves surveying participants, which raises concerns that giving entrepreneurs an AI mentor might lead to “demand effects,” i.e., changes in the behavior of participants due to cues about what is considered appropriate and/or desirable (Zizzo, 2010).

To address these conceptual and empirical issues, we tested our AI tool against a control group that received business guides from the International Labor Organization (2015), designed specifically for low-income entrepreneurs operating in developing economies. By providing control participants with access to business training materials, we isolate the ef-

fect of access to an AI mentor, net of the causal impact of access to information that can be learned through these guides. Equally as important, under the assumption that the demand effects induced by the business training guides are equivalent to those induced by the AI mentor, treatment effects should be attributable to actual changes in performance. This helps rule out the possibility that any changes we observe are merely due to demand effects, as both groups received a tool to help them improve their businesses.

We recruited entrepreneurs into our study over the Meta ad platform in partnership with *Busara*, a Kenyan research organization, starting in May 2023.<sup>2</sup> Our recruitment strategy involved running ads on Facebook to invite entrepreneurs to a short paid survey (Figure A1). All entrepreneurs who responded to our ads were required to pass basic attention checks and take part in three rounds of pre-treatment surveys, which helped us reduce post-treatment attrition and ensure valid causal inference. Appendix E describes our surveys, which asked about firm profits, revenues, and management practices, among other measures. Our final sample includes 640 Kenyan entrepreneurs who completed all three pre-treatment surveys. The average entrepreneur in this sample was 26 years old, had been running their business for one year, and held a college degree (Table A1). Our sample reflects the heterogeneity present amongst Kenyan SMBs, with entrepreneurs running businesses from fast-food joints to poultry farms to cybershops<sup>3</sup> across Kenya (see Figure A2 and Figure A3). Pre-treatment performance in our sample ranged from monthly profits of 3,850 Kenyan Shillings (bottom decile; about \$25 USD) to over 55,500 Kenyan Shillings (top decile; about \$360 USD)

Following the final pre-treatment survey wave, the entrepreneurs in our sample were block-randomized into treatment and control, with entrepreneurs stratified based on their gender and pre-treatment business performance (Appendix C). Treated entrepreneurs received free and unlimited use of the WhatsApp-based AI mentor, along with regular reminders to use the tool. Control participants were provided easy access to the aforementioned business training guides and were also sent regular reminders to use the guides (Appendix D). Entrepreneurs in the two groups were comparable in terms of both performance

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<sup>2</sup>See Figure 2 and Appendix C for more details on the experiment timeline and sample recruitment process, respectively.

<sup>3</sup>Cybershops provide a range of services ranging from computer access, internet browsing, printing, scanning, photocopying, and computer repair and technical support.



and the other characteristics we measured prior to treatment (Table A1). Of the 640 participants who were randomized into control or treatment, 634 (99%) completed at least one post-treatment survey and 622 (97%) completed all four post-treatment surveys deployed over the two months following treatment (Appendix C).

Firm performance exhibits considerable variability in emerging markets (Fafchamps et al., 2012; Anderson, Lazicky, and Zia, 2021). In light of this heterogeneity, we pre-registered several steps to improve the statistical precision and credibility of our experimentally-estimated causal effects (see Appendix E for more details on the pre-registration). First, our outcome variable is an index that combines standardized measures of weekly and monthly revenue and profits to reduce noise in our dependent variable. Second, we analyze our data using a variant of simple ordinary least squares (OLS) regression that conditions on the average pre-treatment performance data collected from participants in the three pre-treatment survey waves (McKenzie, 2012). Third, we control for additional pre-treatment variables using a double-LASSO approach (Belloni, Chernozhukov, and Hansen, 2014). Fourth, we pool data from all four of our post-treatment periods to further increase statistical power. We detail the construction of our outcome variables and our econometric strategy in Appendix E.

### 3 Results

Using the regression specification outlined in our pre-analysis plan, we find no average treatment effect of access to the AI mentor on firm performance. This result is robust to whether we winsorize performance at the 99% level ( $\delta = 0.06$  standard deviations (s.d.),  $p = 0.35$ ) or the 95% level ( $\delta = -0.01$  s.d.,  $p = 0.80$ ), and is also robust to the exclusion of 18 participants who did not complete our entire post-treatment survey panel (95% winsorization:  $\delta = -0.01$  s.d.,  $p = 0.88$ ; 99% winsorization:  $\delta = 0.06$  s.d.,  $p=0.34$ ) (see Figure A4). Our failure to reject the null stands in stark contrast to many recent experiments showing that access to large language models leads to large, positive impacts on productivity (Brynjolfsson, Li, and Raymond, 2023; Dell’Acqua et al., 2023; Noy and Zhang, 2023).

However, this overall null effect masks both positive and negative heterogeneous treatment effects. Again following our pre-registration plan, we split our sample of entrepreneurs

based on pre-treatment performance.<sup>4</sup> For those with below-median pre-treatment performance (hereafter “low performers”) we find that access to the AI mentor reduced business performance by 0.11 s.d. ( $p = 0.0004$ ),<sup>5</sup> whereas for those with above-median pre-treatment performance (hereafter “high performers”) the AI treatment increased business performance by 0.20 s.d. ( $p = 0.07$ ).<sup>6,7</sup> The negative treatment effect we observe among low performers is equivalent to a 10% drop in profits or revenue for an entrepreneur whose pre-treatment performance is just below the median, while the positive treatment effect we observe among high performers is equivalent to a 20-25% increase for entrepreneurs whose pre-treatment performance was just above the median.<sup>8</sup> Figure 4 plots the distribution of post-treatment performance changes for all four possible combinations of treatment status and binarized pre-treatment performance. Relative to the control group, the distribution of performance changes is shifted to the left for AI-treated low performers, but shifted to the right for AI-treated high performers. In other words, our results differ from those of prior studies not only in terms of the overall treatment effect but also in terms of the direction of treatment effect heterogeneity with respect to pre-treatment performance levels (Noy and Zhang, 2023; Peng et al., 2023; Brynjolfsson, Li, and Raymond, 2023; Dell’Acqua et al., 2023).

One major difference between our field experiment and prior research on the economic impacts of generative AI is the level of discretion participants were granted in how and when they used AI assistance. In previous experiments, experimenters narrowly constrained the tasks participants completed, the extent to which they engaged with the AI tool (Brynjolfsson, Li, and Raymond, 2023), and/or the length of time that they were granted use of generative AI (Noy and Zhang, 2023; Dell’Acqua et al., 2023). In contrast, the entrepreneurs in our experiment had much more discretion over how they used AI assistance. For instance,

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<sup>4</sup>Following our pre-registration plan, we also test for heterogeneous treatment effects with respect to both prior ChatGPT use and gender, as female entrepreneurs in developing economies often face additional constraints compared to men, such as childcare (Delecourt and Fitzpatrick, 2021). We find no evidence of heterogeneous treatment effects on either dimension.

<sup>5</sup>Appendix F discusses the ethical considerations for our study given that we detect this negative effect.

<sup>6</sup>Table A3 shows that these heterogeneous treatment effects are also robust to whether we winsorize performance at the 95% or 99% level, and to the exclusion of the 18 participants who did not complete our entire post-treatment survey panel.

<sup>7</sup>In Appendix G we show that our findings are not due to spillovers.

<sup>8</sup>The median entrepreneur in our sample has revenues of 21,116 Kenyan Schillings. The distribution has a standard deviation of 25,273 Kenyan Schillings. These numbers imply that a 0.11 s.d. decrease corresponds to a 13.1% drop relative to the median; a 0.21 s.d. increase to a 23.9% increase.

they were able to choose how many questions to ask the AI mentor, and the importance of the tasks that they requested assistance with. They could also ask for assistance on a wide range of topics, including, but not limited to financing, marketing, operations, and farming practice.<sup>9</sup> The discretion afforded to participants in our study suggests that differences in AI usage between low and high performers might explain the heterogeneous treatment effects that we observe in our sample.

We first test for differences in the quantity and quality of business-related questions that treated entrepreneurs sent to the AI mentor.<sup>10</sup> Figure 5 shows the distribution of number of business questions asked by both high and low performers during our experiment. Both distributions are quite skewed, with roughly 15% of entrepreneurs asking not a single business question and a small number of entrepreneurs asking one nearly every other day. We find that among both high and low performers, those that did ask at least one business question asked roughly one a week. Overall, the two distributions are extremely similar; although on average, high performers sent 0.59 more messages than low performers, this difference is not statistically significant ( $p = 0.33$ ). We also test for differences in the human-evaluated quality of questions asked by low and high performers, and the length of questions asked by the two groups; in both cases, we fail to detect a statistically significant difference (Table A5). In other words, the negative returns to AI assistance for low performers cannot be explained by differences in the number, quality, or length of questions that they asked the AI mentor relative to high performers.

Although we do not detect differences in the quantity or quality of business questions

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<sup>9</sup>Consistent with this argument, we conduct a pre-registered analysis of the impact of the AI mentor on a number of pre-specified questions designed to identify potential treatment effect mechanisms. We find little evidence that the AI mentor led to consistent changes in our survey measures of management practices, time management, technology use, innovation, or information-seeking behavior (Figure A5). However, it is worth noting that if only 10% of our sample asked about management, 10% about time use, 10% about technology, and so on, then we would be severely under-powered to detect average treatment effects along any of these individual dimensions. More broadly, the personalized nature of AI suggests that social scientists may need to rethink how they identify the underlying mechanisms driving treatment effects when interventions are personalized and/or algorithmic in nature.

<sup>10</sup>While most questions sent to the AI mentor were business-focused, some entrepreneurs also asked the mentor about non-business topics (e.g. how to quit smoking) or sent in text by mistake (e.g. messages intended for someone else). The entrepreneurs also sent in questions of varying quality, sometimes writing full sentences and other times writing no more than a couple of cryptic words. Appendix I outlines the process by which two human coders evaluated the focus and quality of each question sent to the AI mentor. Our final dataset of business-related questions includes over 1,300 questions.

asked by high and low performers, this does not mean that the questions asked by the two groups do not differ meaningfully; entrepreneurs in our study also had the freedom to choose the topics they discussed with the AI mentor. Given that by definition, low performers had weaker revenues and profits than high performers prior to our treatment intervention, one possibility is that whether by choice or by necessity, low performers simply sought advice on especially difficult tasks. These topics and problems may be well beyond what an AI mentor—or even a human mentor—can help with, in part because these problems often require financial capital and/or other complements to solve. For instance, a firm facing stiff competition or a farm experiencing a drought might struggle even after receiving extremely high-quality advice. Even changes that had a neutral impact on growth and/or sales could have resulted in lower profits and worse performance, given that many of the AI mentor’s recommendations were costly to implement. We use word embedding methods to develop a principled and scalable measure of the extent to which each question in our dataset is focused on an especially difficult business problem.<sup>11</sup> Appendix J documents our approach in detail. In short, we map each question onto a standardized uni-dimensional *challenge-focused* measure. We do so by calculating the relative closeness of each question’s word embedding vector to the word embedding vectors for two different benchmark questions, one of which describes a business in dire straights and one of which describes a business facing few challenges.

Our *challenge-focused* measure has strong face validity. Questions that are rated as more challenge-focused tend to be about difficult problems that are unlikely to be fixed using an AI mentor’s recommendations.<sup>12</sup> Some of the most challenge-focused questions include:

1. “currently facing loses in my show shop due to low demands rendering business bankrupt. please advise” (99<sup>th</sup> percentile)
2. “hi, i have a beauty shop behind kenyatta university. at first it was the best selling shop around but now it’s nearly the last. what could be the problem and how do i solve it?” (95<sup>th</sup> percentile)
3. “i have a business competitor one in specific,,he has noticed that my business is doing

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<sup>11</sup>Word embeddings map text into high dimensional vectors (Mikolov et al., 2013) and have been used to measure semantic differences ranging from whether a startup idea is more likely to benefit women to how cultural associations have evolved over the twentieth century (Cao, Koning, and Nanda, 2023; Kozlowski, Taddy, and Evans, 2019).

<sup>12</sup>Table A6 shows above-median-length example questions pulled from the 50<sup>th</sup> to 100<sup>th</sup> percentiles of the *challenge-focused* distribution, oversampling examples from the top decile.

well and has decided too the price of the products so i cannot get customers” (91<sup>st</sup> percentile)

Conversely, the least challenge-focused questions are clearly from businesses in less harrowing situations. These questions tend to focus on expansion and growth, as opposed to fundamental business challenges. It is plausible that the AI mentor is more effective at helping entrepreneurs tackle these problems.<sup>13</sup> Some of the least challenge-focused questions include:

1. “i have ksh 20000 to expand my business which it would specialize on selling food stuffs. i would like to do this expansion in a new location. what should i consider first to maximize my profit?” (1<sup>st</sup> percentile)
2. “i have been operating a cereals shop for five years and it is doing very well lately for the last two years.which strategies can i use to expand the business to increase capacity to serve many customers and increase the products i’m selling?” (2<sup>nd</sup> percentile)
3. “i run a salon and barber shop in one room, recently customers have started to gain interest on massage after shave, this means there is need for expansion and more resources, kindly help me to unlock this potential.” (17<sup>th</sup> percentile)

We test for differences in the difficulty of the questions posed by low and high performers by regressing our measure of *challenge-focused* on our binarized measure of baseline firm performance. We find that high performers do in fact ask questions that are less challenge-focused than those asked by low performers ( $\delta = -0.22$  s.d.,  $p = 0.1$ ). This finding is robust to analyzing our data at the message-level, as opposed to the entrepreneur-level ( $\delta = -0.25$  s.d.,  $p = 0.04$ ),<sup>14</sup> and to regressing our measure of *challenge-focused* on a continuous, rather than binarized measure of baseline firm performance (entrepreneur-level:  $\delta = -0.36$  s.d.,  $p = 0.05$ ; message-level:  $\delta = -0.48$  s.d.,  $p = 0.03$ ).<sup>15</sup> Figure 6 visualizes the relationship between baseline firm performance and question difficulty using a binned scatter plot. There is a clear negative relationship between an entrepreneur’s baseline performance and how challenge-focused their questions are. In summary, whether by choice or by necessity, low-performing entrepreneurs in our sample asked the AI mentor for assistance with more challenging tasks than high performers.

This finding helps reconcile our inequality-increasing heterogeneous treatment effects with recent results that suggest generative AI reduces differences in productivity (Noy and

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<sup>13</sup>Table A7 shows above-median-length example questions pulled from the 1<sup>th</sup> to 49<sup>th</sup> percentiles of the *challenge-focused* distribution, oversampling examples from the bottom decile.

<sup>14</sup>For message-level analyses we cluster standard errors at the level of the entrepreneur.

<sup>15</sup>These non-causal effect sizes correspond to a one standard deviation increase in an entrepreneur’s pre-treatment performance index.

Zhang, 2023; Peng et al., 2023; Brynjolfsson, Li, and Raymond, 2023; Dell’Acqua et al., 2023). Even if the returns to AI advice on any given task for low performers are greater than or equal to the returns for high performers (as suggested by other studies), the endogenous selection of low performers into asking questions about more challenging tasks could explain our heterogeneous treatment effects. Figure 4 illustrates how the business impact of AI advice within a task can be radically different than the aggregate impact of AI advice when entrepreneurs, firms, and workers endogenously select the tasks for which they receive AI assistance.

## 4 Discussion

Our findings highlight that in more open-ended and complex contexts, the productivity and performance implications of generative AI fundamentally depend on the tasks for which firms and entrepreneurs choose to use AI tools. In contrast to existing studies that find positive effects of generative AI on productivity within specific business tasks (Noy and Zhang, 2023; Brynjolfsson, Li, and Raymond, 2023; Dell’Acqua et al., 2023), we find that access to generative AI negatively impacted low-performing entrepreneurs and positively impacted high-performing entrepreneurs, resulting in an overall null result. Analysis of the interaction logs between treated participants and the AI mentor suggests that this difference stems from low-performing entrepreneurs asking for advice on particularly challenging problems. While the AI generated well-structured advice in response to these difficult questions, our findings suggest that when low-performing entrepreneurs actually put that advice into action, the end result was performance declines relative to our control group.

Beyond this contribution, our study is—to our knowledge—the first randomized control trial testing the impact of generative AI on firms in developing economies. Many people in developing economies face barriers to getting helpful personalized feedback, mentorship, and training (Dimitriadis and Koning, 2023; Björkegren, 2023). While researchers have raised concerns that LLMs may be less effective when used to address problems in developing economies due to the dominance of AI training data from the U.S. and other developed economies (Tao et al., 2023), our findings show that generative AI-based tools can serve

as an efficient source of personalized feedback for many entrepreneurs in low- and middle-income countries. That being said, we also find evidence that generative AI can widen the gap between low- and high-performing businesses in these contexts.

Our study is not without limitations. First, the AI mentor that we evaluate is built on top of GPT-4 with only a relatively short system prompt, and was distributed to entrepreneurs along with only a 5-minute-long online training survey. It is possible that by fine-tuning the language model using a corpus of relevant information, by iterating further on the system prompt provided to the model, and/or by providing more training to the entrepreneurs interacting with the AI mentor, we might be able to further improve the positive impacts we observe among high performers and reduce (or reverse) the adverse effects that we observe among low performers. Second, although the five-month-long duration of our experiment is significantly longer than the overwhelming majority of prior experiments measuring the economic impacts of generative AI (cf. Brynjolfsson, Li, and Raymond, 2023), there may still be longer-term impacts of exposure to the AI mentor that we do not observe. Such longer-term impacts could be driven by a number of different factors, including learning among the entrepreneurs in our sample.<sup>16</sup> Finally, our experiment took place from May to November 2023, a period of time during which exposure to and experience with generative AI tools such as ChatGPT was still low, particularly in developing market contexts such as Kenya.<sup>17</sup> As both business owners and workers become more familiar with generative AI tools, experiments such as ours may yield different results because treated participants, control participants, and even competing businesses outside the experiment may all be using AI tools (Raymond, 2023).

Despite these limitations, our study also points to numerous avenues for future research. While we find that low-performing entrepreneurs asked more challenging questions, we do not know if this was by choice, or by necessity. Future research should explore the mechanisms that drive entrepreneurs, firms, and workers to ask for AI assistance on some tasks but not others. Similarly, we find that some entrepreneurs use AI despite the presence of negative

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<sup>16</sup>In fact, learning that the AI mentor’s recommendations do not improve (and may even hurt) performance may, with time, lead some entrepreneurs to realize their best option is to pivot or shut down their businesses entirely (Koning, Hasan, and Chatterji, 2022).

<sup>17</sup>While this is true in a general sense, it is worth noting that one-third of the entrepreneurs in our sample reported using ChatGPT at least once a week in our pre-treatment surveys.

returns, yet our analysis sheds little light on why this is the case. Relatedly, it’s possible that the AI mentor’s heterogeneous impacts are at least in part attributable to biases in GPT-4’s training data, and that a model trained on better data could yield positive AI returns for even the most challenging business tasks (Tao et al., 2023). Finally, the AI mentor in our experiment does not learn, nor have we explored how the AI mentor impacted entrepreneurial learning. In theory, the data from our experiment could be used to improve the AI mentor’s recommendations, opening up the possibility not only of better mentors, but also of strategic concerns around asking for advice from an AI tool that may also be used by a competitor (Brynjolfsson, Li, and Raymond, 2023). How entrepreneurs will change their ideas, skills, and judgement in the presence of generative AI tools also remains an open question (Lebovitz, Lifshitz-Assaf, and Levina, 2022; Gaessler and Piezunka, 2023; Boussioux et al., 2023; Girotra et al., 2023; Hui, Reshef, and Zhou, 2023).

While there is still much to learn, our field experiment demonstrates the value of studying the impact of AI within the actual day-to-day decisions and tasks that take place within businesses (Harrison and List, 2004). That our treatment effects differ from prior estimates on the impact of AI provide further evidence of the value of measuring the impact of interventions through “in vivo” experimentation, above and beyond measuring the impact of those same interventions through “in situ” experiments (Aral and Walker, 2012). Indeed, the findings from our field experiment highlight that not only are the impacts of AI uneven, but that these uneven impacts radically shift depending on the tasks that AI tools are used for.



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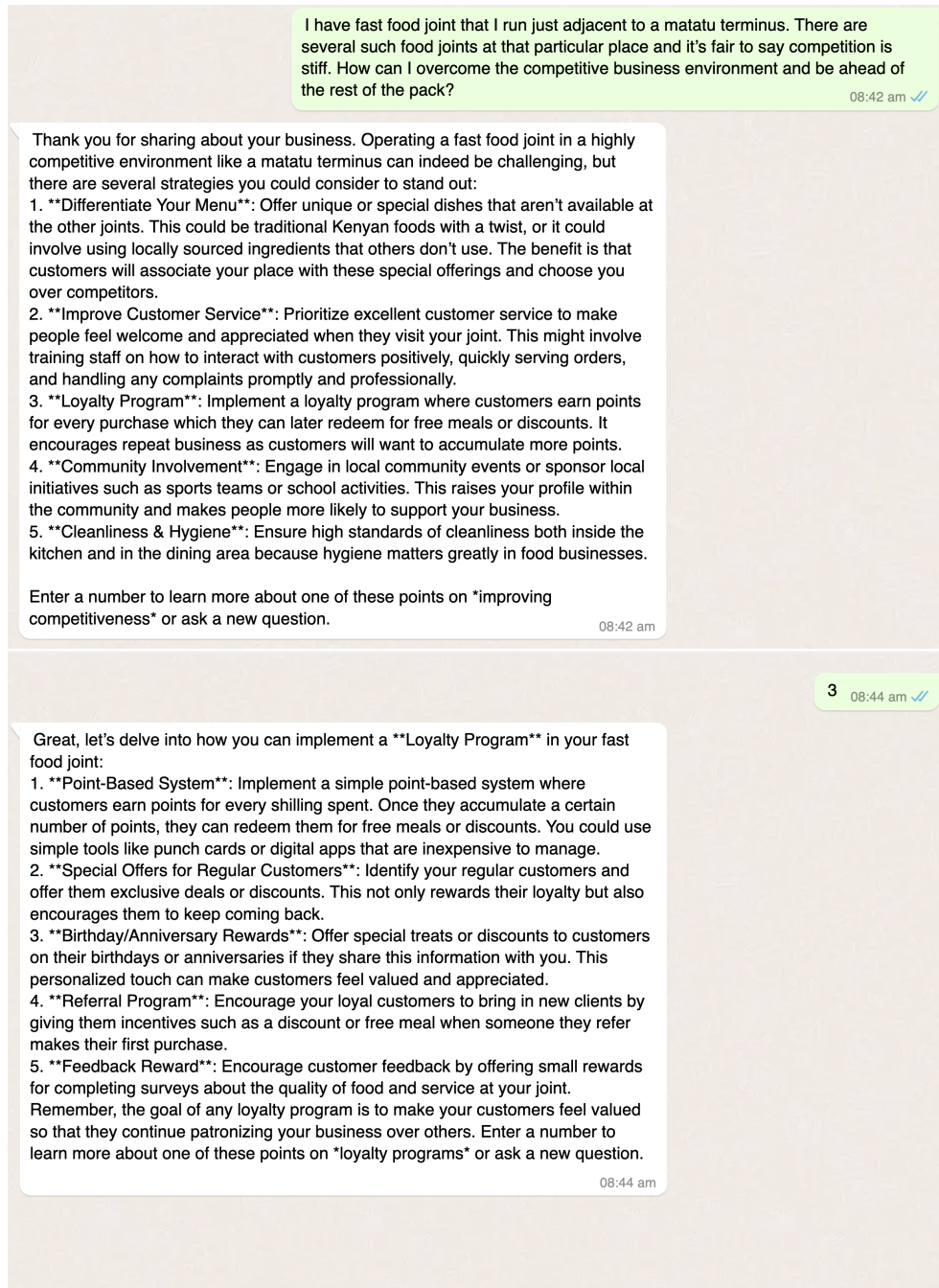
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Figure 1: An example of a real interaction between a participant and the AI mentor, illustrating how we structured the AI mentor to push entrepreneurs to dig deeper and learn more when asking business questions.



Notes: This figure presents a rendering of an entrepreneur-AI interaction in WhatsApp. The text is original (including the typos). A “matatu” is a word commonly used to describe a minibus in Kenya. In Appendix H, we display the full conversation histories for two treated entrepreneurs. In Table A6 and Table A7 we provide additional example questions illustrating variations in how challenging the business tasks described in the questions are.

Figure 2: Overview of the experimental timeline from date of the first survey

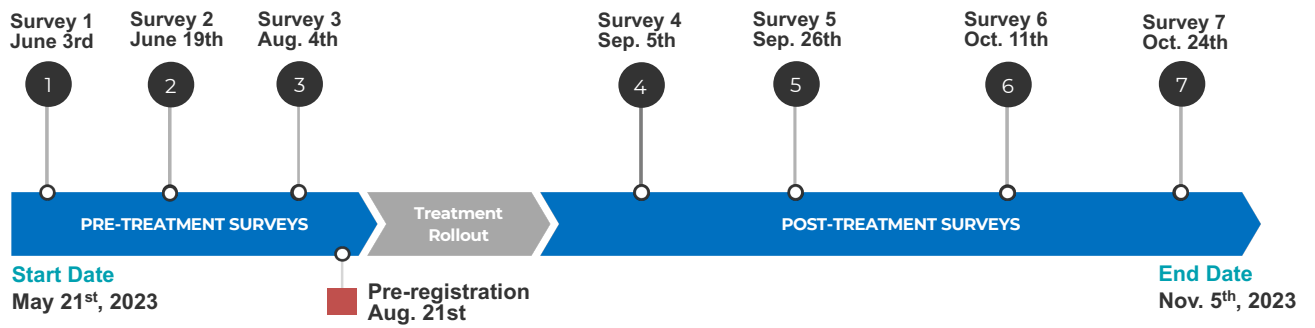
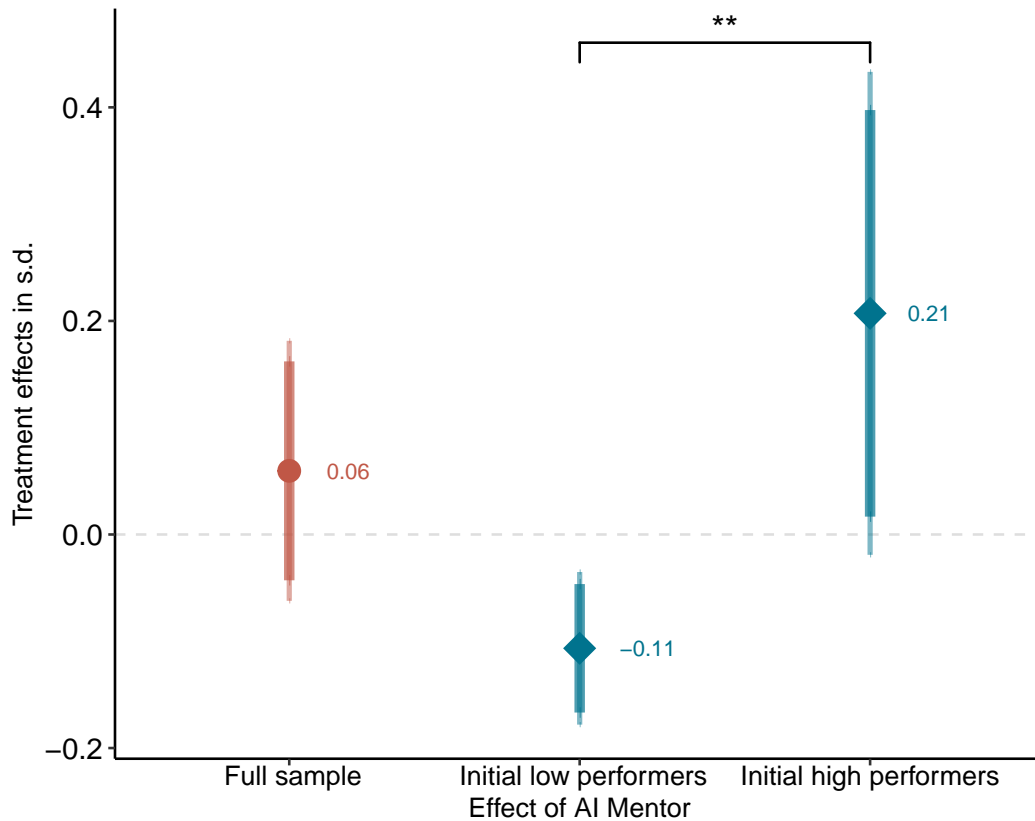


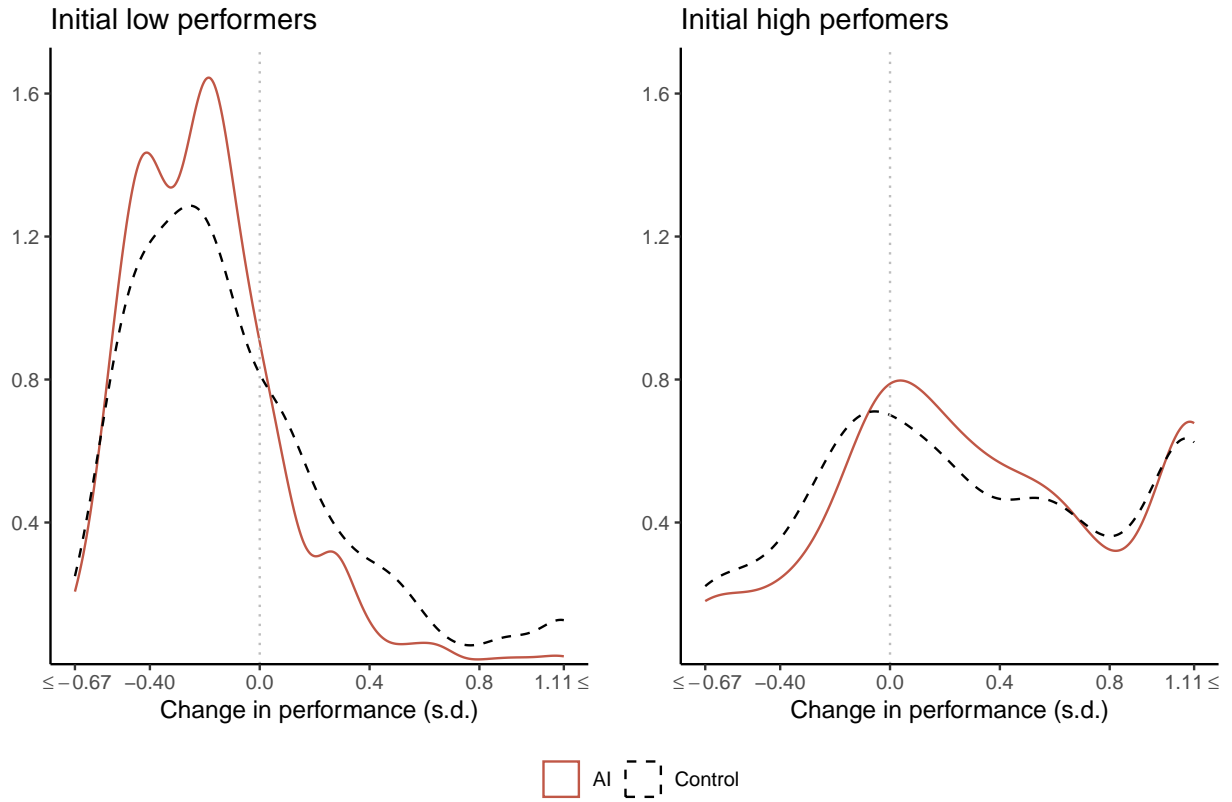
Figure 3: Treatment effect estimates reveal an overall null effect for our full sample of entrepreneurs, but a negative treatment effect for low performers (defined as having below-median pre-treatment performance), and a positive treatment effect for high performers (defined as having above-median pre-treatment performance).



Notes: The effect of access to the AI mentor on our index of business performance winsorized at the 99% level, restricting to participants who have completed the panel. Outcomes are presented in standard deviations. Effects are estimated using a regression model that controls for pre-treatment outcome levels and baseline covariates selected using a double-LASSO procedure. Error bars present 90 and 95% confidence intervals. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

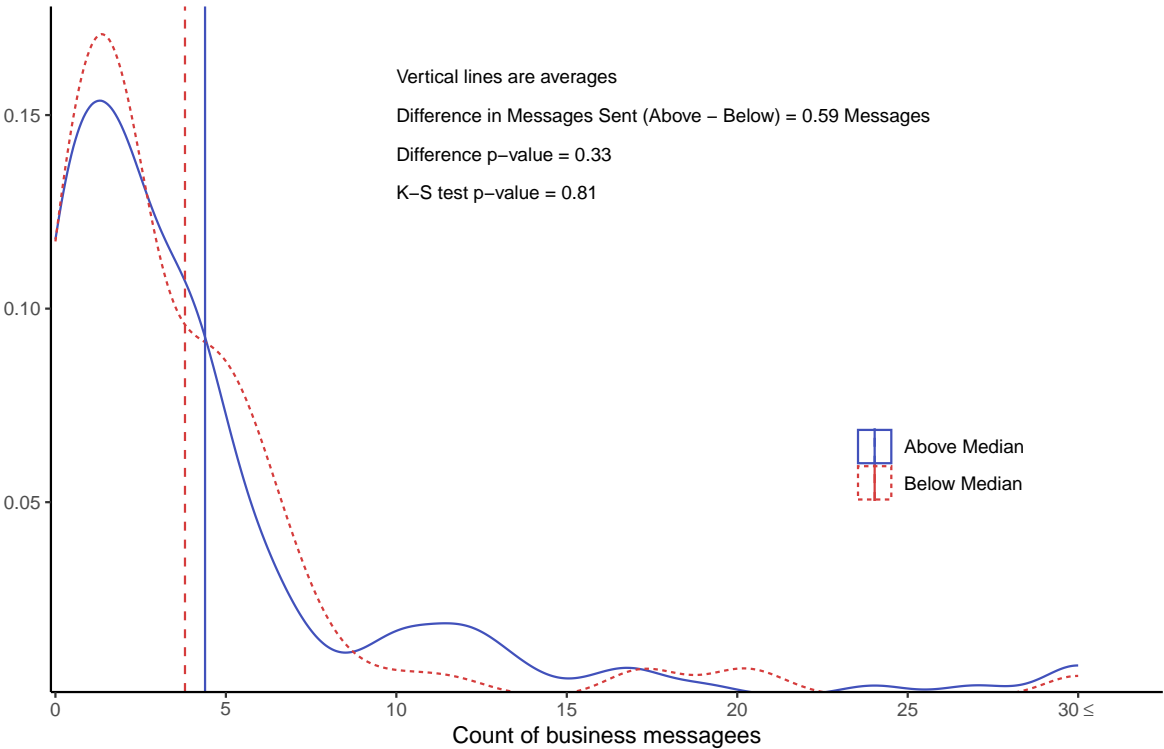


Figure 4: The distribution of changes in performance shifts to the left for treated low performers, whereas it shifts to the right for treated high performers.



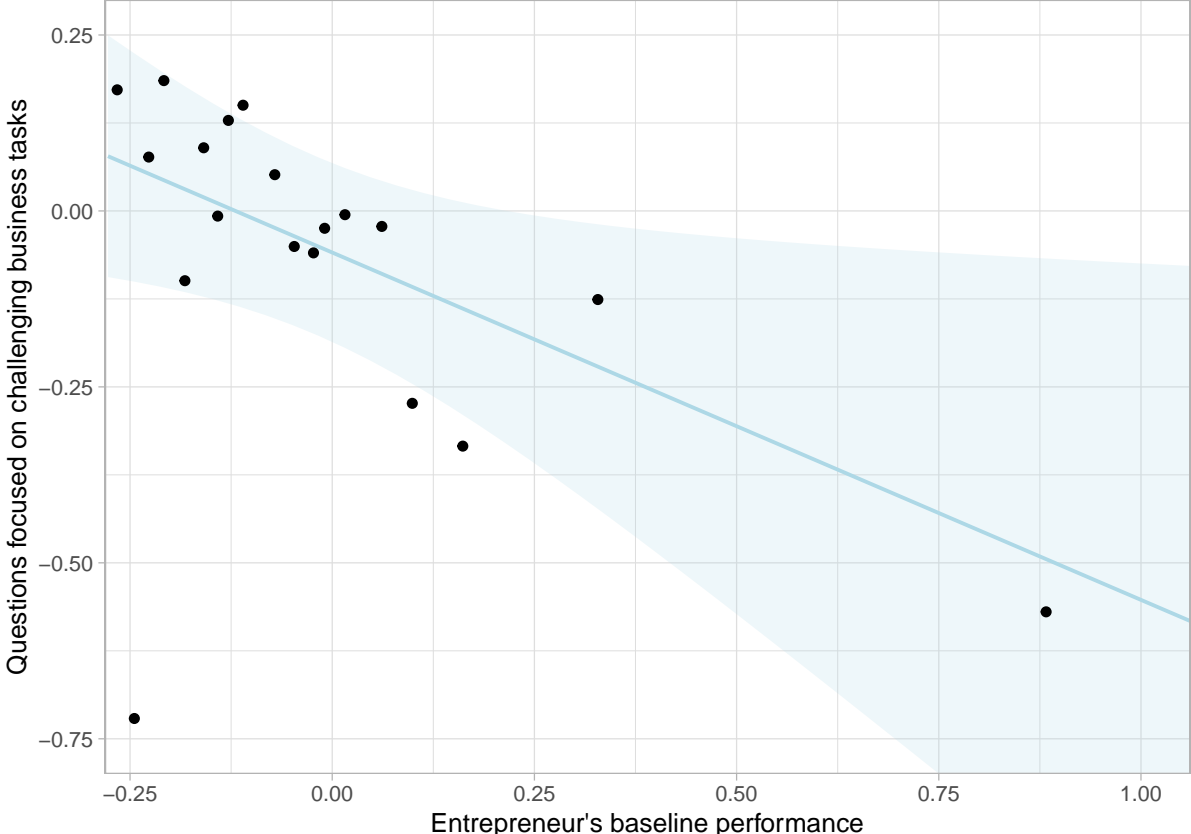
Notes: This figure presents density plots of changes in our performance index among entrepreneurs. It compares those with initial low performance (below-median pre-treatment performance; left panel) to those with initial high performance (above-median pre-treatment performance; right panel), across both treatment and control groups. The x-axis is the longitudinal change in performance, calculated as the difference between the post-treatment and pre-treatment performance indices (winsorized at the 99% level). All post-treatment observations are included in this figure, and observations are at the entrepreneur  $\times$  survey wave level.

Figure 5: The distribution of engagement with our AI mentor is the same for initially high- and low-performing entrepreneurs.



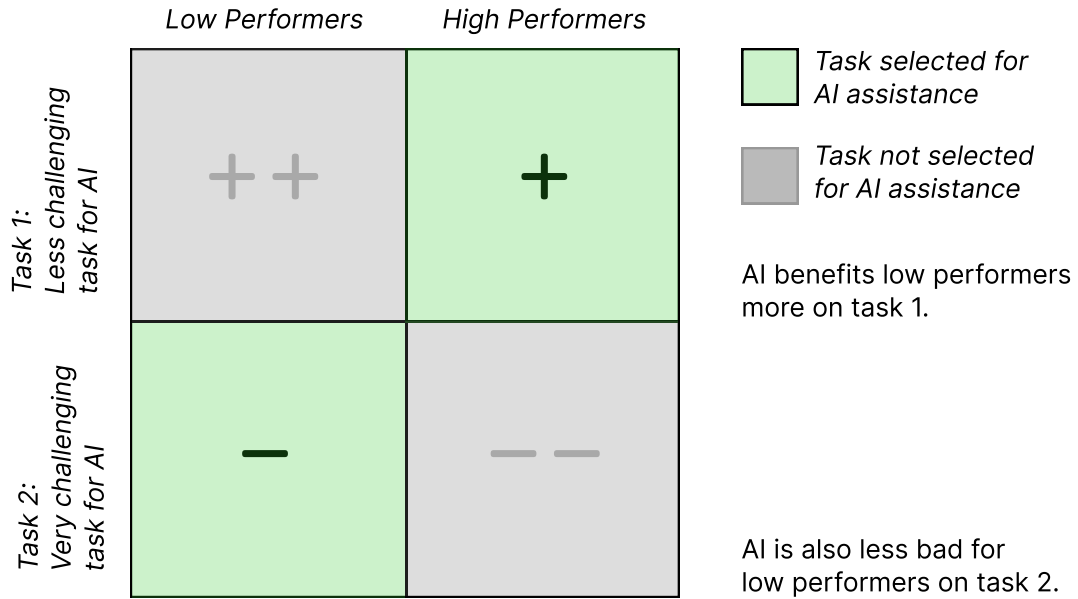
Notes: Kernel density plot showing the distributions of the number of business messages sent to the AI mentor for below-median (red, dashed line) participants versus above-median (blue, solid line) participants, winsorized at the 99% level. Vertical lines denote the average number of messages sent.

Figure 6: Entrepreneurs with stronger baseline performance asked the AI mentor about less challenging business tasks, whereas entrepreneurs with worse initial performance asked about more challenging tasks.



Notes: This binned scatterplot shows the relationship between how *challenge-focused* an entrepreneur's questions were (y-axis) and the entrepreneur's baseline pre-treatment level of performance (x-axis). Each dot represents the average of our *challenge-focused* variable for each ventile (one-twentieth) of the baseline performance distribution. The units for both axes are standard deviations. The plot only includes entrepreneurs in our sample who asked at least one business question to the AI mentor. The blue line corresponds to the regression estimate in column 4 of Table A8 and blue-shaded region shows the 95% confidence intervals.

Figure 7: Returns to AI assistance by task type and baseline pre-AI performance.



Low performers, despite having better within task AI returns, have worse AI returns than high performers due to task selection.

Notes: Two-by-two illustrating how even if low performers benefit more than high performers from AI on any given task, if low performers are more likely to select AI assistance on more challenging tasks the end result is that AI will lead to greater returns for high performers than low performers. The values in each cell represent the returns to AI use with ++ indicating positive and large returns, + positive but somewhat smaller returns, - - very negative returns, and - negative but less so. Figure A7 presents a more detailed numerical example that illustrates how task selection can yield the estimates we present in Figure 3 even if low performers benefit more from AI on each task, as suggested by recent work (e.g., Noy and Zhang, 2023; Peng et al., 2023; Brynjolfsson, Li, and Raymond, 2023; Dell’Acqua et al., 2023).

# Online Appendix

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# A Appendix Figures

Figure A1: Recruitment ad



Figure A2: The distribution of study participants across Kenya

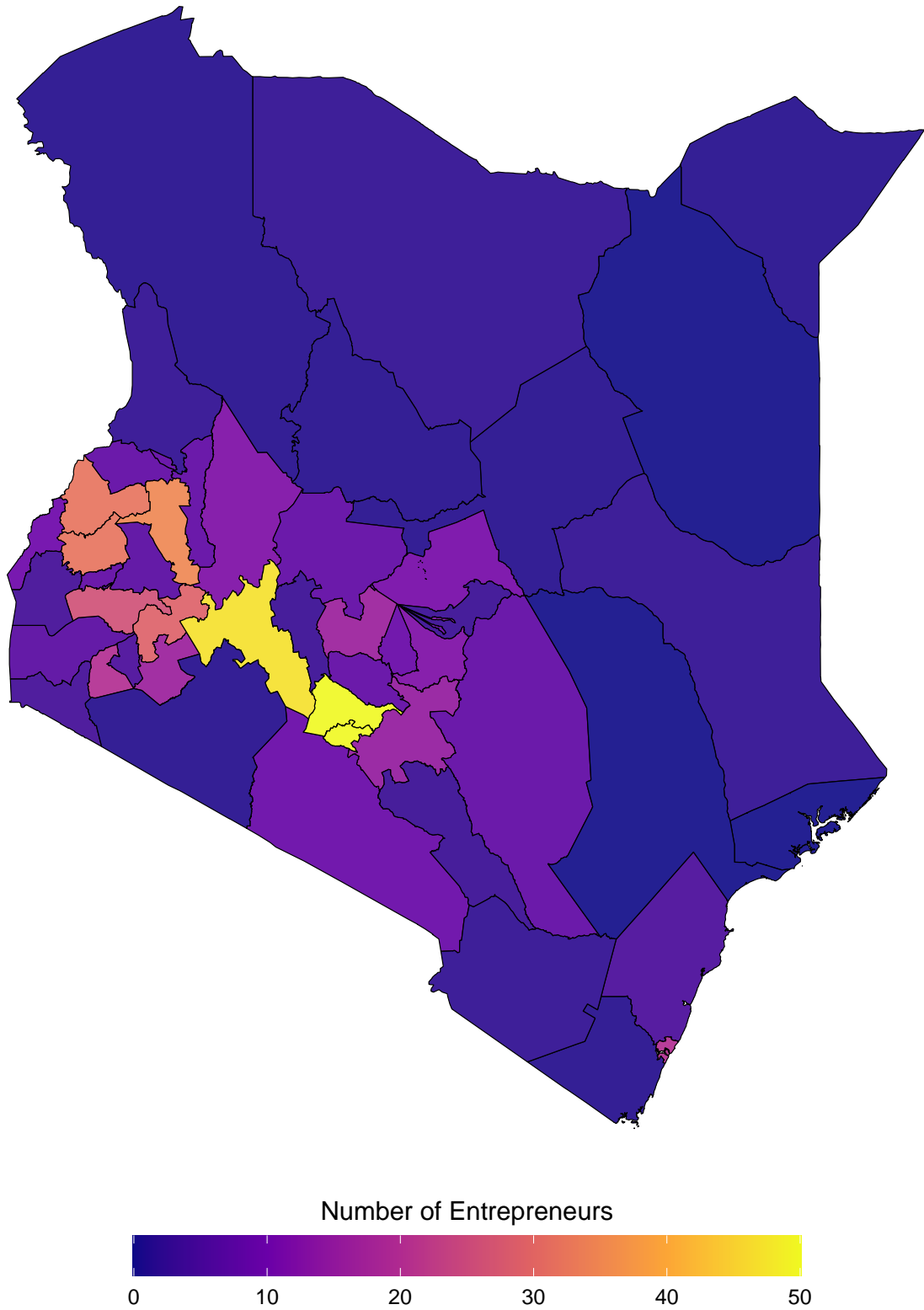
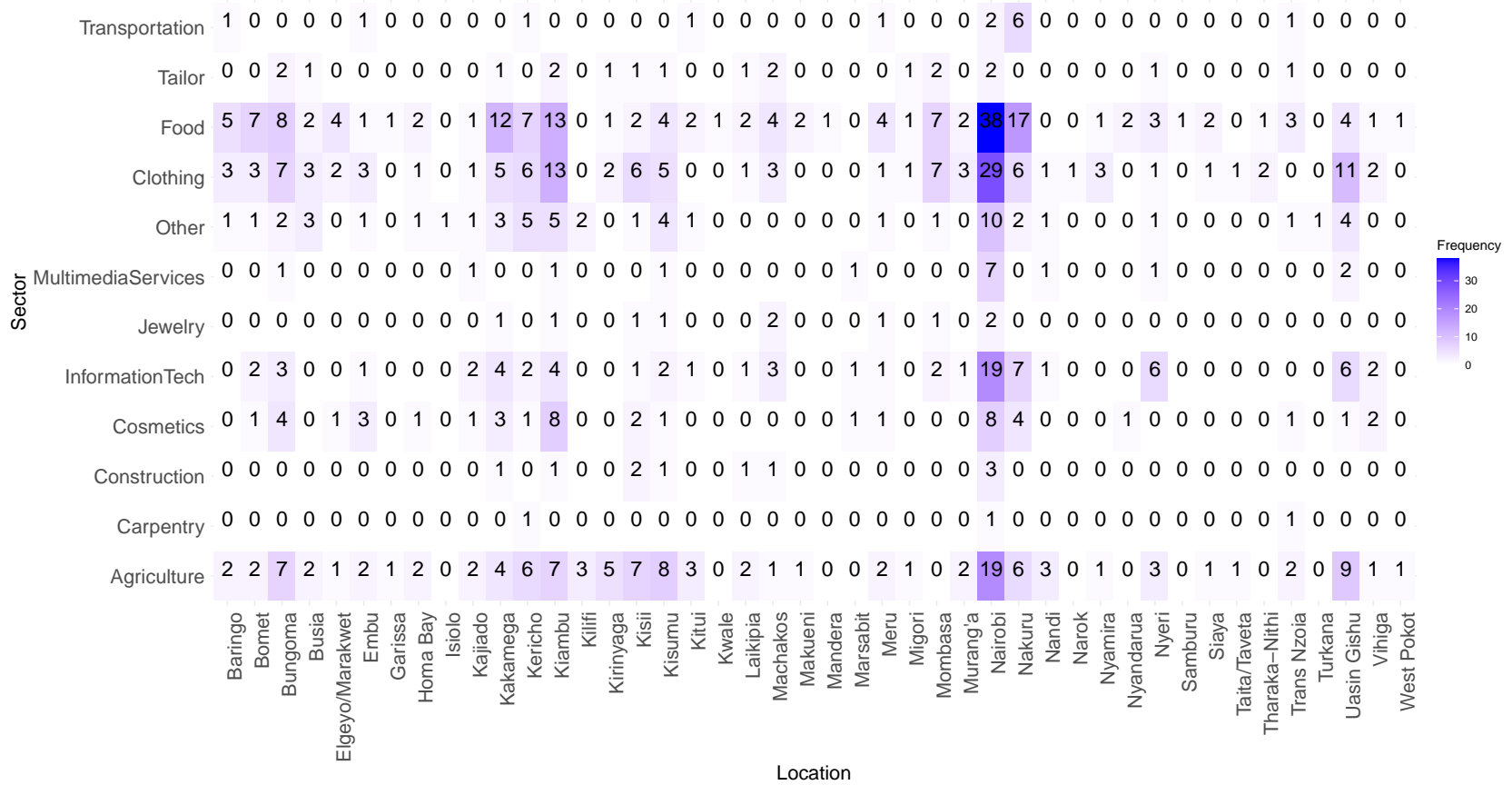


Figure A3: Distribution of Sectors and Kenyan Counties



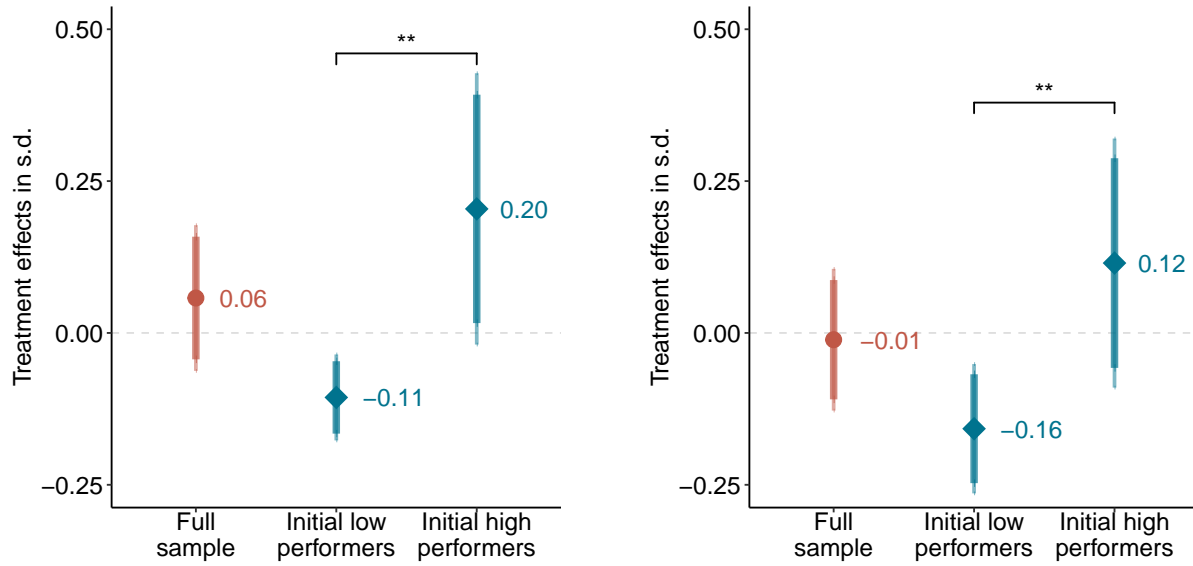
Notes: This figure depicts the distribution of Kenyan counties and firm sectors. Note that each participant may be involved in multiple business sectors.



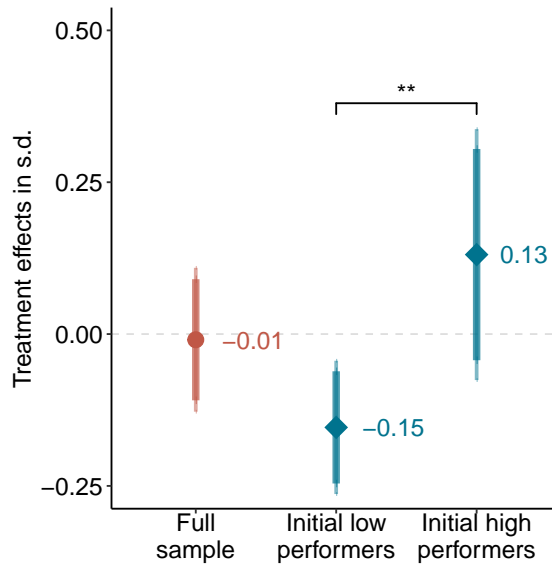
Figure A4: Performance effects (Robustness checks)

(A) Winsorized at the 99% level, all observations

(B) Winsorized at the 95% level, all observations

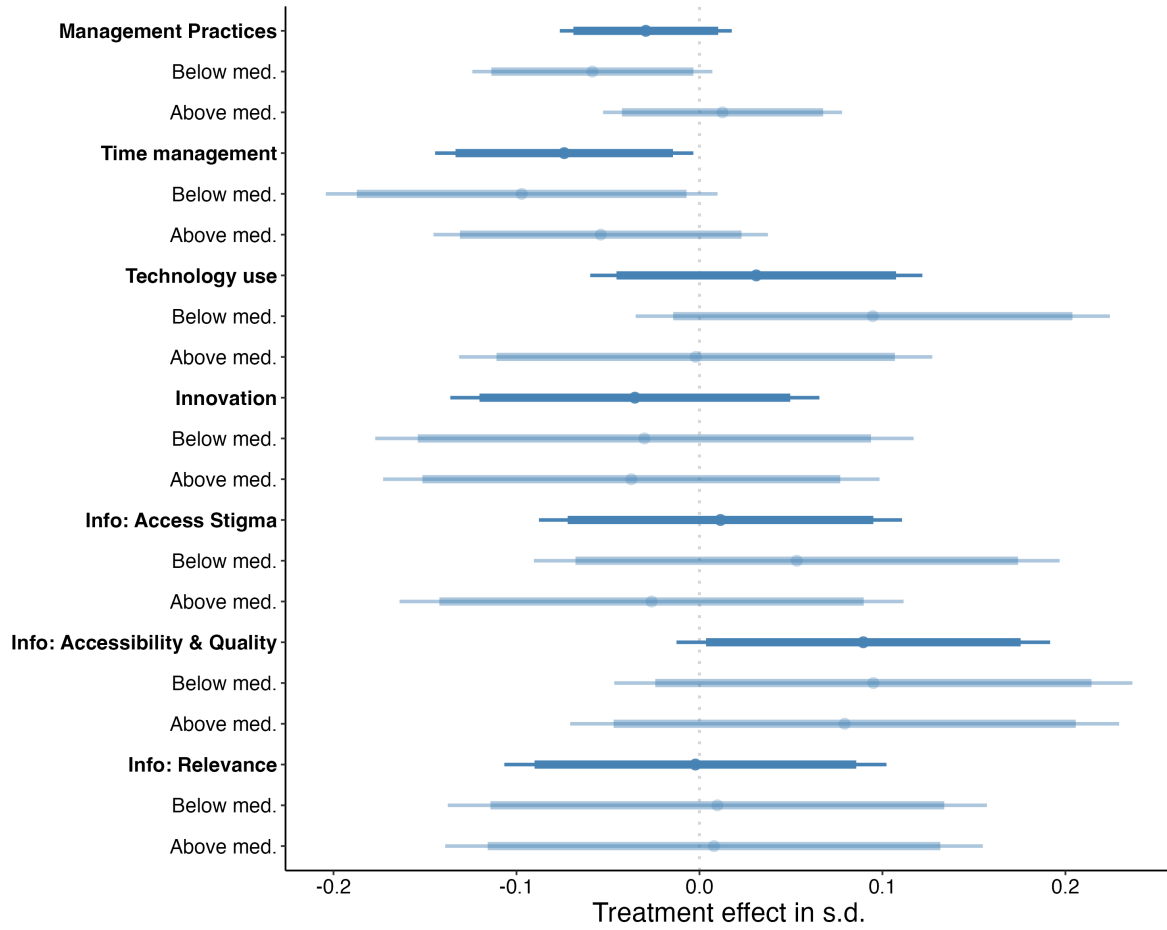


(C) Winsorized at the 95% level, completed panel



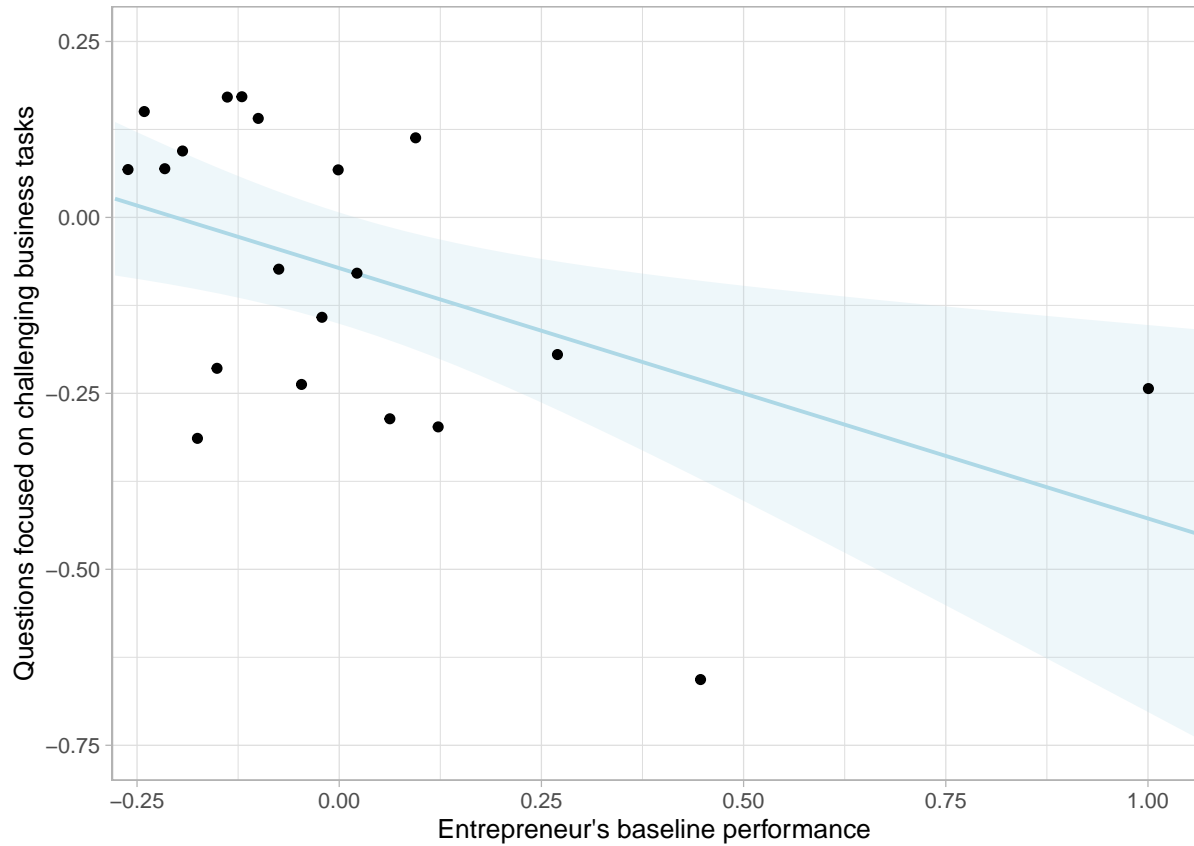
Notes: This figure presents the causal effect of access to the AI mentor on business performance. Outcomes are presented in standard deviations. Panel (A) and (B) present results winsorized at the 99% and 95% respectively for all participants' observations. Panel (C) presents results winsorized at the 95% level restricting to individuals who have completed the panel. Effects are estimated using an intent-to-treat specification that controls for pre-treatment outcome levels and baseline covariates selected using a double LASSO procedure. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$  Error bars present 95 and 99% confidence intervals.

Figure A5: Effects on mechanism questions



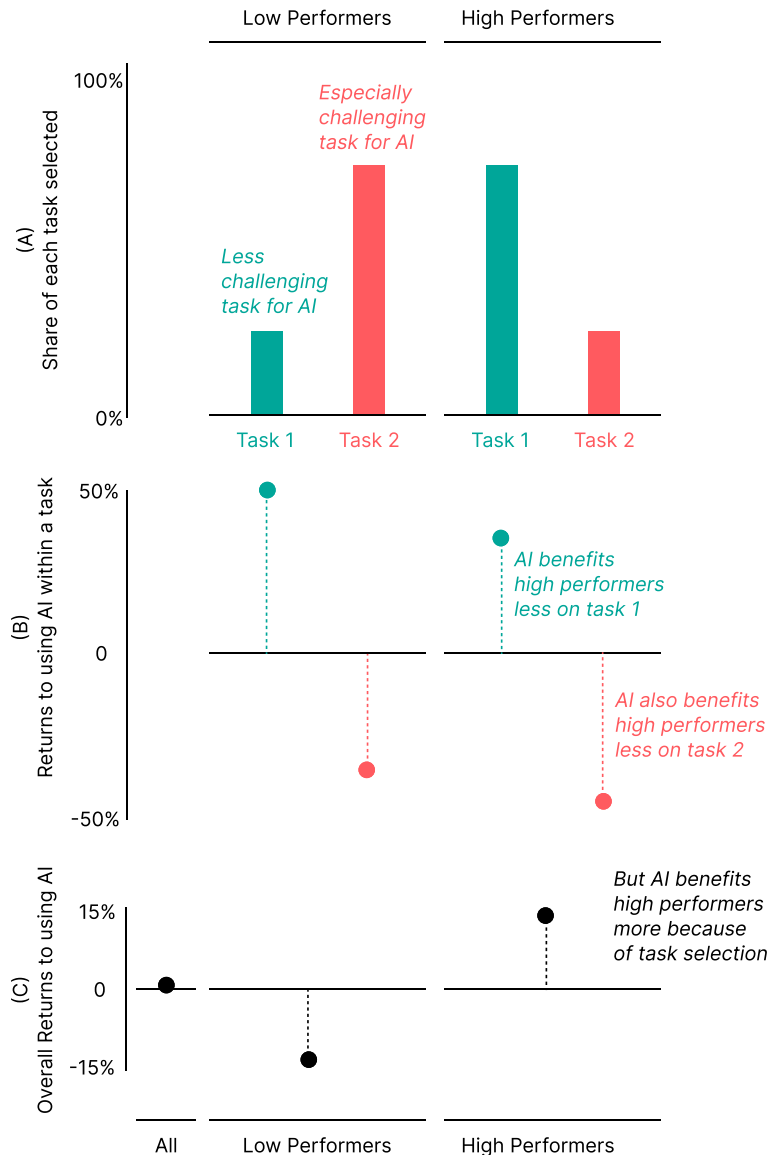
Notes: This figure depicts treatment effect estimates for our seven pre-registered mechanism indices. Dark bars present average treatment effect estimates with lasso covariates selection among all responding participants. Light bars present treatment effect estimates for above- and below-median initially performing firms using the 99% winsorized pre-treatment performance index to generate the median split.

Figure A6: This figure is conceptually the same as Figure 6, but the data is plotted at the message-level rather than the entrepreneur-level. We again see that entrepreneurs with stronger baseline performance ask the AI mentor about less challenging business tasks.



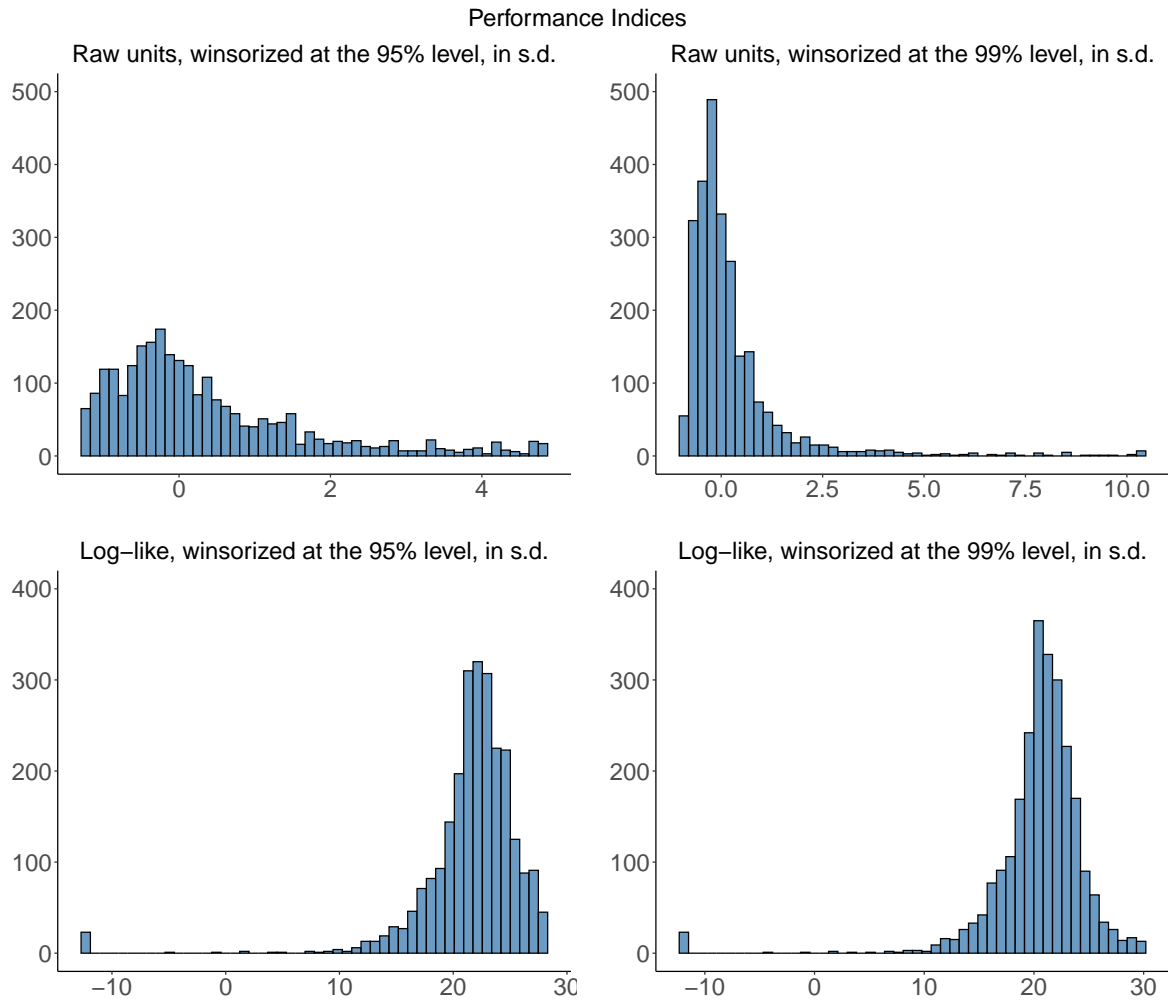
Notes: This binned scatterplot shows the relationship between how *challenge-focused* a question is (y-axis) and the entrepreneur's baseline pre-treatment level of performance (x-axis). Each dot represents the average of our *challenge-focused* variable for each question for each ventile of the baseline performance distribution. The units for both axes are standard deviations. The plot only includes entrepreneurs in our sample who asked at least one business question of the AI. The blue line corresponds to the regression estimate in Model 3 of Table A8 and blue shaded region shows the 95% confidence intervals.

Figure A7: Numerical example showing that even if within tasks, low performers benefit more than high performers, differences in task selection can drive performance effects in the opposite direction.



Notes: The three panels above present a stylized example illustrating how task selection can radically shift the distributional consequences of AI. In Panel (A) we assume 75% of low performers select challenging tasks (Task 1) for AI assistance compared to 25% of high performers. In Panel (B) we assume the treatment effects (returns) of using AI for task 1 are 50% for low performers as against only 35% for high performers; for task 2 we assume -35% for low and -45% for high performers. Yet, in Panel (C) we see the overall impact of AI mirrors our experimental findings: despite assuming the returns to AI assistance are greater for low performers on both tasks, the overall returns from AI are essentially null at 1.25%, the returns for high performers are 15%, and the returns for low performers are -13.75%.

Figure A8: Distribution of outcomes



Notes: These figures present the distribution of four functional forms of our performance index. The top two figures depict results measured in raw units (KSH), and the bottom two depict results measured following an inverse hyperbolic sine transformation. In the first column results are winsorized at the 95% level and in the second column they are winsorized 99% level. In all cases, these results are presented in standard deviations for comparability.

# B Appendix Tables

Table A1: Balance

	Full analytic sample				Any post-treatment				Completed Panel			
	All	AI	Control	<i>p</i>	All	AI	Control	<i>p</i>	All	AI	Control	<i>p</i>
<b>Business features</b>												
Avg. pre-treat. performance (s.d.)	0.000	-0.009	0.010	0.472	0.000	-0.009	0.010	0.495	0.003	-0.006	0.011	0.525
Management practices count	13.100	13.084	13.116	0.878	13.106	13.085	13.127	0.841	13.124	13.106	13.141	0.868
Oldest bus.: less than 1 year	0.205	0.202	0.208	0.859	0.205	0.201	0.210	0.782	0.203	0.199	0.206	0.842
Oldest bus.: 1 year	0.408	0.413	0.403	0.787	0.410	0.417	0.403	0.725	0.410	0.418	0.402	0.684
Oldest bus.: 2 years	0.230	0.224	0.236	0.713	0.227	0.219	0.235	0.642	0.228	0.219	0.238	0.567
Oldest bus.: 3 or more years	0.158	0.161	0.154	0.798	0.158	0.163	0.152	0.714	0.159	0.164	0.154	0.743
Any employees	0.359	0.348	0.371	0.541	0.358	0.348	0.368	0.595	0.360	0.347	0.373	0.505
<b>Sector</b>												
Agriculture	0.188	0.183	0.192	0.781	0.189	0.185	0.194	0.780	0.188	0.186	0.190	0.918
Cosmetics	0.070	0.059	0.082	0.261	0.071	0.060	0.083	0.261	0.069	0.055	0.084	0.155
Carpentry	0.005	0.006	0.003	0.570	0.005	0.006	0.003	0.570	0.005	0.006	0.003	0.563
Information technology	0.113	0.137	0.088	0.052	0.110	0.132	0.089	0.086	0.113	0.135	0.090	0.076
Jewelry	0.016	0.022	0.009	0.209	0.016	0.022	0.010	0.209	0.016	0.023	0.010	0.203
Multimedia services	0.025	0.034	0.016	0.135	0.025	0.034	0.016	0.135	0.026	0.035	0.016	0.129
Clothing	0.209	0.220	0.198	0.487	0.208	0.223	0.194	0.371	0.209	0.225	0.193	0.325
Food	0.266	0.236	0.296	0.088	0.267	0.238	0.295	0.105	0.268	0.238	0.299	0.086
Tailor	0.030	0.031	0.028	0.838	0.028	0.028	0.029	0.978	0.027	0.029	0.026	0.806
Transportation	0.022	0.022	0.022	0.981	0.022	0.022	0.022	0.981	0.023	0.023	0.023	1.000
Other	0.084	0.090	0.079	0.603	0.085	0.091	0.079	0.603	0.085	0.090	0.080	0.667
<b>Participant features</b>												
Female	0.320	0.307	0.333	0.484	0.320	0.307	0.333	0.482	0.312	0.296	0.328	0.388
IHS(Children)	0.549	0.532	0.566	0.496	0.545	0.526	0.566	0.425	0.544	0.523	0.565	0.402
Age	25.859	25.730	25.991	0.543	25.849	25.708	25.990	0.513	25.865	25.717	26.013	0.498
Complete college	0.530	0.534	0.525	0.820	0.530	0.536	0.524	0.758	0.531	0.534	0.527	0.873
Started college	0.370	0.373	0.368	0.901	0.371	0.373	0.368	0.901	0.373	0.376	0.370	0.869
No college	0.100	0.093	0.107	0.563	0.099	0.091	0.108	0.475	0.096	0.090	0.103	0.588
ChatGPT at least once a week	0.361	0.342	0.381	0.307	0.360	0.339	0.381	0.267	0.362	0.341	0.383	0.279
Agreeableness	9.569	9.460	9.679	0.094	9.576	9.467	9.686	0.098	9.592	9.495	9.688	0.147
Conscientiousness	10.212	10.152	10.274	0.281	10.218	10.147	10.289	0.210	10.215	10.141	10.289	0.195
Extraversion	8.453	8.307	8.601	0.066	8.457	8.323	8.594	0.091	8.457	8.312	8.601	0.074
Openness	10.200	10.130	10.270	0.234	10.194	10.125	10.263	0.243	10.211	10.148	10.273	0.294
Neuroticism	7.264	7.311	7.217	0.511	7.265	7.307	7.222	0.553	7.265	7.309	7.222	0.549
<b>Location (county)</b>												
Machakos	0.023	0.025	0.022	0.813	0.024	0.025	0.022	0.813	0.024	0.026	0.023	0.794
Bomet	0.025	0.028	0.022	0.631	0.025	0.028	0.022	0.631	0.026	0.029	0.023	0.613
Nyeri	0.025	0.025	0.025	0.980	0.024	0.022	0.025	0.775	0.023	0.023	0.023	1.000
Kisii	0.031	0.019	0.044	0.066	0.032	0.019	0.044	0.066	0.032	0.019	0.045	0.069
Mombasa	0.031	0.034	0.028	0.671	0.032	0.034	0.029	0.671	0.032	0.035	0.029	0.650
Kisumu	0.041	0.031	0.050	0.219	0.041	0.031	0.051	0.218	0.042	0.032	0.051	0.230
Kericho	0.045	0.043	0.047	0.823	0.044	0.044	0.044	0.973	0.045	0.045	0.045	1.000
Bungoma	0.050	0.056	0.044	0.491	0.050	0.056	0.044	0.491	0.050	0.055	0.045	0.581
Kakamega	0.050	0.056	0.044	0.491	0.050	0.056	0.044	0.491	0.051	0.058	0.045	0.469
Uasin Gishu	0.055	0.053	0.057	0.833	0.055	0.053	0.057	0.832	0.055	0.051	0.058	0.725
Nakuru	0.073	0.068	0.079	0.618	0.073	0.069	0.076	0.726	0.074	0.071	0.077	0.760
Kiambu	0.083	0.075	0.091	0.446	0.084	0.075	0.092	0.445	0.082	0.074	0.090	0.466
Nairobi	0.208	0.208	0.208	0.987	0.207	0.207	0.206	0.986	0.206	0.203	0.209	0.843
Other	0.259	0.280	0.239	0.243	0.260	0.279	0.241	0.280	0.259	0.280	0.238	0.235
Completed Panel	0.972	0.966	0.978	0.353	0.981	0.975	0.987	0.252	1.000	1.000	1.000	0.349
Sample size	640	322	318		634	319	315		622	311	311	

Mean values and balance statistics for all participants in the analytic sample, all participants who complete at least one post-treatment outcome survey, and all participants who complete the entire panel.

Table A2: Overview of survey measures

Outcomes	Waves	Preregistered
(1)	(2)	(3)
Performance Index	Surveys 1-7	✓
Management Practices	Surveys 3-7	✓
Time Management	Surveys 4-7	✓
Technology Use	Surveys 4-7	✓
Innovation Activities	Surveys 4-7	✓
Info: Access Stigma	Surveys 4-7	✓
Info: Relevance	Surveys 4-7	✓
Info: Accessibility and Quality	Surveys 4-7	✓

This table reports which outcomes were collected in each survey wave. Surveys 1-3 are pre-treatment waves and surveys 4-7 are post-treatment waves. The final column indicates whether the outcome was preregistered.

Table A3: Effects on performance

	Full sample				Below median		Above median	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>A) All observations, winsorized at the 99% level</b>								
AI mentor	0.039 (0.082)	0.048 (0.060)	-0.110*** (0.038)	-0.095** (0.038)	-0.111*** (0.039)	-0.104*** (0.035)	0.190 (0.160)	0.190* (0.111)
AI mentor*( $\geq$ median)			0.298* (0.164)	0.285** (0.115)				
Post-treatment obs	2,514	2,514	2,514	2,514	1,255	1,255	1,259	1,259
<b>B) All observations, winsorized at the 95% level</b>								
AI mentor	-0.049 (0.068)	-0.005 (0.060)	-0.170*** (0.059)	-0.147*** (0.056)	-0.170*** (0.059)	-0.156*** (0.054)	0.061 (0.123)	0.130 (0.104)
AI mentor*( $\geq$ median)			0.230* (0.136)	0.276** (0.118)				
Post-treatment obs	2,514	2,514	2,514	2,514	1,255	1,255	1,259	1,259
<b>C) Completed panel, winsorized at the 99% level</b>								
AI mentor	0.036 (0.083)	0.059 (0.061)	-0.111*** (0.039)	-0.091** (0.038)	-0.113*** (0.039)	-0.105*** (0.036)	0.180 (0.162)	0.204* (0.114)
AI mentor*( $\geq$ median)			0.295* (0.167)	0.298** (0.118)				
Post-treatment obs	2,488	2,488	2,488	2,488	1,244	1,244	1,244	1,244
<b>D) Completed panel, winsorized at the 95% level</b>								
AI mentor	-0.055 (0.069)	-0.009 (0.060)	-0.168*** (0.061)	-0.146** (0.057)	-0.166*** (0.061)	-0.153*** (0.056)	0.059 (0.124)	0.130 (0.105)
AI mentor*( $\geq$ median)			0.225 (0.138)	0.273** (0.120)				
Post-treatment obs	2,488	2,488	2,488	2,488	1,244	1,244	1,244	1,244
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Rand. block FE	Y	Y	Y	Y	Y	Y	Y	Y
Pre-treat. covariates	N	Y	N	Y	N	Y	N	Y

This table reports the performance effects of the AI mentor. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Cols. 1-2 report average treatment effects. Cols. 3-4 report heterogeneous treatment effects based on whether the entrepreneur has pre-treatment performance that was above median. Cols 5-6 report average effects on below-median entrepreneurs, and 7-8 report effects on above-median entrepreneurs. Panels A and B report effects using all post-treatment observations, and panels C and D report effects for participants who complete the entire panel. Panels A and C report effects winsorized at the 99% level, and panels B and D report effects winsorized at the 95% level. Standard errors are clustered at the individual level.



Table A4: Effects on performance  
(Log-like transformation)

	Full sample				Below median		Above median	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>A) All observations, winsorized at the 99% level</b>								
AI mentor	-0.018 (0.084)	-0.006 (0.078)	-0.116 (0.125)	-0.091 (0.120)	-0.119 (0.126)	-0.129 (0.118)	0.076 (0.115)	0.061 (0.096)
AI mentor*( $\geq$ median)			0.191 (0.171)	0.178 (0.153)				
Post-treatment obs	2,514	2,514	2,514	2,514	1,255	1,255	1,259	1,259
<b>B) All observations, winsorized at the 95% level</b>								
AI mentor	-0.031 (0.087)	-0.015 (0.081)	-0.118 (0.132)	-0.090 (0.127)	-0.122 (0.134)	-0.129 (0.126)	0.052 (0.114)	0.031 (0.096)
AI mentor*( $\geq$ median)			0.171 (0.175)	0.155 (0.158)				
Post-treatment obs	2,514	2,514	2,514	2,514	1,255	1,255	1,259	1,259
<b>C) Completed panel, winsorized at the 99% level</b>								
AI mentor	-0.025 (0.085)	-0.010 (0.078)	-0.124 (0.126)	-0.097 (0.120)	-0.127 (0.126)	-0.133 (0.118)	0.072 (0.115)	0.056 (0.096)
AI mentor*( $\geq$ median)			0.196 (0.171)	0.180 (0.153)				
Post-treatment obs	2,488	2,488	2,488	2,488	1,244	1,244	1,244	1,244
<b>D) Completed panel, winsorized at the 95% level</b>								
AI mentor	-0.038 (0.087)	-0.019 (0.081)	-0.126 (0.133)	-0.096 (0.127)	-0.130 (0.134)	-0.132 (0.126)	0.047 (0.114)	0.026 (0.096)
AI mentor*( $\geq$ median)			0.175 (0.176)	0.156 (0.159)				
Post-treatment obs	2,488	2,488	2,488	2,488	1,244	1,244	1,244	1,244
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Rand. block FE	Y	Y	Y	Y	Y	Y	Y	Y
Pre-treat. covariates	N	Y	N	Y	N	Y	N	Y

This table reports the performance effects of the AI mentor. Outcomes are reported for an inverse-hyperbolic sine transformation. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Cols. 1-2 report average treatment effects. Cols. 3-4 report heterogeneous treatment effects based on whether the entrepreneur has pre-treatment performance that was above median. Cols 5-6 report average effects on below-median entrepreneurs, and 7-8 report effects on above-median entrepreneurs. Panels A and B report effects using all post-treatment observations, and panels C and D report effects for participants who complete the entire panel. Panels A and C report effects winsorized at the 99% level, and panels B and D report effects winsorized at the 95% level. Standard errors are clustered at the individual level.

Table A5: Means and Differences for Above and Below Median Performers

Variable	Below Median	Above Median	Difference	P-Value
Business Questions Count	3.925	4.713	0.788	0.309
Business Questions (99 Wins)	3.800	4.389	0.589	0.331
Business Questions (95 Wins)	3.529	3.978	0.450	0.329
Sample: All treated businesses. Number of firms: 319				
Business Questions Count	4.664	5.792	1.128	0.206
Business Questions (99 Wins)	4.546	5.458	0.912	0.198
Business Questions (95 Wins)	4.248	4.954	0.706	0.178
Sample: Asked a business question. Number of firms: 267				
Human Quality Rating	2.168	2.095	-0.072	0.294
Log Number of Words	2.748	2.637	-0.111	0.136
Sample: Asked a business question. Number of firms: 267				
Challenge Focus of Business Questions	0.057	-0.191	-0.248	0.0427
Sample: Asked an above median length business question. Number of messages: 695				

Table A8: Regressions showing lower-performing entrepreneurs ask questions about more challenging and difficult business tasks. Sample restricted to above-median length business questions.

Dependent Variable: Model:	Challenge Focused			
	(1)	(2)	(3)	(4)
<i>Variables</i>				
Above Median Performer	-0.247** (0.123)	-0.215* (0.129)		
Baseline Performance			-0.359* (0.183)	-0.483** (0.215)
Log(Num of Words)	0.021 (0.105)	-0.212 (0.137)	0.049 (0.104)	-0.203 (0.137)
Level	Message	Entrepreneur	Message	Entrepreneur
Observations	695	229	695	229
R <sup>2</sup>	0.014	0.021	0.010	0.028

Standard errors in parentheses are clustered at the level of the entrepreneur. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The dependent variable is our standardized measure of how *challenge-focused* the entrepreneur's questions for the AI mentor are. Columns 1 and 3 are the level of the individual messages sent. In Columns 2 and 4 we collapse the data down to the level of the entrepreneur by selecting the least challenging question the entrepreneur asks. All models control for the log number of words. The sample in this table only includes above median (14 words or more) length messages. These messages provide more context and information which tends to result in better measurement of how challenging the business situation is.

Table A6: Sample above-median length questions from different points of the 100<sup>th</sup> to 50<sup>th</sup> percentiles of the distribution for our *challenge-focused* measure

%tile	Questions	Challenge
100	currently facing loses in my show shop due to low demands rendering business bankrupt.please advise	2.91
100	my hotel business has faced a drastic change and is now incurring losses no matter what changes i try to implement. how can i bring back my business to thriving	2.49
99	am having a difficult time with customers since the prices have gone up and they are requesting a bargain every time	2.42
99	i run a jewelry store near zetech university. it used to have many customers but now we barely sell. what could be the problem and solutions to it?	2.41
99	hello for the past few months am experiencing low customer turnout than my neighbouring businesses	2.36
98	i am a small poultry farmer and i keep chicken in my small farm. for past few days my hens stopped laying. what could be the problem?	1.89
96	hi, i have a beauty shop behind kenyatta university. at first it was the best selling shop around but now it's nearly the last. what could be the problem and how do i solve it?	1.70
96	hello, i am a poultry farmer and i have been doing it for about 2 years but unfortunately my two months chicks have been dying more often. what could be the problem... if any, what could be the solution?	1.67
95	i have a cereals shop,and the type of cereals i have have been saturated in the market,how can i go about selling them without incurring losses since the prices have dropped	1.61
92	what debt collection strategies can i use to recover debts that customers have deliberately refused to pay	1.37
92	how should i convince my once customers who left due to a certain service demand which was not fulfilled	1.38
91	i have a business competitor one in specific,,he has noticed that my business is doing well and has decided too the price of the products so i cannot get customers	1.32
91	i run a bar and restaurant near thika. off late my workers have been running away and though it's not my fault they aren't free to say the problem. what should i do?	1.32
82	i sell household goods in nakuru. i have a problem in keeping my customers.they keep on trying other goods at my competitors how can l overcome the challenge and win my customers back?	0.98
75	nowadays i have noticed certain trend in the flow of my customers. they tend to buy more of my new introduced products as compared with the previous existing ones though i have maintained the quality. kindly advice me, what could be wrong or rather right	0.76
62	hello.my business has been doing great lately.i do my budget well allocating money correctly.but sometimes i still find some money missing when i calculate the expenditure and profits. what might be the problem?	0.29
55	in a case where i've listed the services i offer against the amount of money a client pays after the service, do i allow clients to negotiate?	0.07

Table A7: Sample above-median length questions from different points of the 49<sup>th</sup> to 1<sup>st</sup> percentiles of the distribution of our *challenge-focused* measure

%tile	Questions	Challenge
40	my hotel business in tharaka nithi county has picked and is very fruitful, but i have a problem. my customers are demanding for some services which are somehow expensive and requires some capital to introduce. how do i go about it?	-0.38
38	i have tried to offer a new special meal menu in my restaurant and i must admit that the returns have been quite fair. is it okay if i do a whole menu overhaul and start offering some different special meals altogether, even though it would make the price of each plate to be higher than before. i'm stuck between giving new menu or staying with current ones for the fear of losing the current clientele.	-0.42
27	i own a small barber shop in nairobi with about 2-4 customers a day. i am trying to find ways to promote my business. i already put up posters near my shop. what are some other ways that i could gain new customers and get the word out about my business?"	-0.79
18	if we focus on having a menu that stands out from what others are offering, by what margin may i lose, retain or increase my customer base. and what is the likelihood of having rewards for customer's referrals?	-1.08
17	i run a salon and barber shop in one room, recently customers have started to gain interest on massage after shave, this means there is need for expansion and more resources, kindly help me to unlock this potential.	-1.12
11	i have a small hotel at tharaka nithi county where i sell tea and chapati and some other meals. how can i motivate my customers to increase my earnings?	-1.39
9	okay so i mainly deal with coffee and at times i feel like i should add more flavors like ginger and lemon to my customers but i don't know how to do it because i feel like i will interfere with other customer's preferences. so how best should i do it to ensure equality	-1.47
7	i'm thinking of investing in a new business such as farming. what ways do i need use to determine a good venture whose capital is less than let's say 50,000 shillings? and what are some of the ventures?	-1.63
7	the demand for electronics products locally has recently went up. i am looking to expand my business by opening 2 branches. the only problem is i am worried about management of the business, i don't know what could happen. what suggestions may you have?	-1.64
5	i have a grocery shop in nakuru. i offer delivery services to my customers. what else can i do to increase the number of customers?	-1.82
3	i started adding milk sales to my business, i saw there was a market gap and i wanted to add more, should i run it alongside my shop or i specialise on milk since it makes more profits?	-2.04
2	i have been operating a cereals shop for five years and it is doing very well lately for the last two years. which strategies can i use to expand the business to increase capacity to serve many customers and increase the products i'm selling?	-2.44
1	hi I operate an hardware store in my town and i have thinking of how to expand the hardware store to the neighboring town what am i suppose to consider	-2.72
1	i have ksh 20000 to expand my business which it would specialize on selling food stuffs. i would like to do this expansion in a new location. what should i consider first to maximize my profit?	-2.85

Table A9: Regressions showing lower performing entrepreneurs ask questions about more challenging and difficult business tasks. Sample includes all business questions regardless of length.

Dependent Variable:	Challenge Focused			
Model:	(1)	(2)	(3)	(4)
<i>Variables</i>				
Above Median Performer	-0.119 (0.092)	-0.190 (0.120)		
Baseline Performance			-0.328** (0.164)	-0.450** (0.208)
Log(Num of Words)	-0.132*** (0.040)	-0.299*** (0.097)	-0.123*** (0.039)	-0.294*** (0.098)
Level	Message	Entrepreneur	Message	Entrepreneur
Observations	1,392	267	1,392	267
R <sup>2</sup>	0.013	0.043	0.017	0.049

Standard errors in parentheses are clustered at the level of the entrepreneur. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The dependent variable is our standardized measure of how *challenge-focused* the entrepreneur's questions for the AI mentor are. Columns 1 and 3 are the level of the individual messages sent. In Columns 2 and 4 we collapse the data down to the level of the entrepreneur by selecting the least challenging question the entrepreneur asks. All models control for the log number of words. This sample includes all business questions asked by the entrepreneurs.

## C Experimental Design and Timeline

Our field experiment lasted approximately five months, and involved 640 Kenyan entrepreneurs and seven separate performance surveys. It was structured in three stages:

1. **Recruitment and pre-treatment Surveys:** Initially, entrepreneurs were recruited online and screened using three pre-treatment surveys.
2. **Assignment to Interventions:** Participants were then assigned either to an AI mentorship program or to receive a standard business training guide.
3. **Performance Tracking:** Finally, we assessed each participant’s subsequent business performance through four post-treatment surveys.

We provide details on these stages below.

### Stage 1: Recruitment and pre-treatment Surveys

Participant recruitment took place over the Meta ad platform (Facebook penetration in Kenya is over 80% (Wamuyu, 2020)). A partner survey organization created advertisements offering a paid survey targeting entrepreneurs and businesses. The advertisements were shown throughout Kenya and the only restriction on the advertisement was it was only to be shown to individuals over the age of 18 (see Figure A1).

Individuals who clicked on our ad were directed to a Qualtrics survey, which was the first of three pre-treatment surveys we conducted with participants. These pre-treatment surveys aimed to screen out individuals: (i) who did not own and operate enterprises; (ii) who would be likely to attrit over the long time horizon of our study; (iii) who were inattentive respondents.

Our sample predominantly consists of relatively young businesses, with 61% having been in in operation for one year or less, and only 16% having been operating for over three years. The businesses were primarily concentrated in three sectors: Food and Beverage (27%), Clothing (20.8%), and Agriculture (18.9%). A significant majority of these businesses (64%) operated without any employees. Pre-treatment the median firm in our sample earned a monthly profit of 14,000 Kenyan Shillings (about \$90 USD) and had a monthly revenue of 30,000 Kenyan Shillings (about \$190 USD).

Participants came from 44 of Kenya’s 47 counties, with the largest number of participants coming from Nairobi (133 participants), Kiambu (53 participants), and Nakuru (47 participants). Nairobi’s 4-million-person capitol has the highest concentration of study participants (20%). Participants in our sample generally exhibited a high level of education, with only 10% not having any college education. The sample demonstrated a low level of gender diversity, with women accounting for only 32% of the participants, although this may in part reflect a lower level of business ownership among women in Kenya (The World Bank Group, 2018). Additionally, the average age of participants in our study was 26 years old. See Table A1 for additional details on our sample.

Participants who completed the first survey were contacted via SMS messages through a “Shortcode” (a shortened phone number used to bulk send text messages) and also over email inviting them to participate in a second survey. These individuals were sent invitations to a second survey via a personalized Qualtrics link that could only be used one time.<sup>18</sup> Those completing the second survey were sent a third and final pre-treatment survey over WhatsApp. Following the completion of the pre-treatment surveys but prior to random assignment, we preregistered the following exclusion criteria:

1. Participants who do not run a business or do not state that they are willing to take subsequent surveys
2. Participants who tried to take any Qualtrics survey more than once, as identified by Qualtrics duplicate score or by duplicated phone numbers or emails
3. Participants who fail the following attention check:

*The next question is about the following problem. In questionnaires like ours, sometimes there are participants who do not carefully read the questions and just quickly click through the survey. To show that you read our questions carefully, please enter orange as your answer to the next question. What is your favorite color? {red; yellow; green; blue; black; orange; white; purple; pink}*

4. Participants who stated that their weekly profits (revenue) were greater than their monthly profits (revenue), or who stated that their profits were greater than revenue (separately for weekly and monthly measures).

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<sup>18</sup>All subsequent surveys waves also used similar one-time-use personalized Qualtrics links.



## Stage 2: Treatment

After the third pre-treatment survey wave, we randomly assigned participants to one of the following experimental conditions.

1. **AI-mentor.** Participants assigned to the AI-mentorship condition received access to our WhatsApp-based AI-mentor. The AI mentor was powered by GPT-4 and designed to give business mentorship and advice to low-income Kenyan SMBs.
2. **Control.** Participants assigned to the control condition received access to widely used business training materials developed for low-income SMB by the International Labour Organization.

Randomization was stratified on Gender  $\times$  (Quartile of pre-treatment business performance), for a total of  $2 \times 4 = 8$  strata.

**Onboarding survey.** Before participants gained access to the business guide or the AI mentor, they were required to complete a brief *Onboarding Survey*. The first page of the onboarding survey provided a concise summary of the expected time to complete the survey and the mobile airtime compensation they would receive upon completion, which offset the data costs of taking the online survey. Notably, the first page did not disclose the participant's treatment group. Participants who did not proceed beyond the first page, where treatment status was undisclosed, are considered pre-treatment dropouts. Our analytic sample is comprised of 640 participants who advanced to the second page of the Training Survey, where they were informed of their treatment status. These participants had already successfully completed three rounds of pre-treatment surveys and passed pre-registered attention checks.

## Stage 3: Post-treatment surveys

Following treatment, we conducted four additional survey waves in which participants were contacted via SMS messages. Each of these waves contained a battery of questions exploring mechanisms in addition to our set of performance measures. See Appendix E for an overview of the contents of each survey.

## Survey Incentives

Participants completing the first survey were sent a small airtime transfer of KSH 30 as a participation incentive. These credits could be used to purchase phone credits and cellular data to access the internet. To reduce attrition we used an increasing survey incentive scheme: The second pre-treatment survey paid KSH 50, and the third paid KSH 100. All post-treatment surveys paid KSH 200.

## Attrition

Our analytic sample, defined by preregistered exclusion criteria (see Appendix C) is comprised of 640 participants. A total of 18 (3%) of participants attrit from the survey post-treatment (i.e., did not complete our final survey, but may have completed at least one pre-treatment survey).<sup>19</sup> The final row of Table A1 reports the final sample size by experimental condition. In total 11 participants attrited from the “AI” condition and 7 attrited from the control condition. The difference in attrition across conditions is 1.2 pp ( $p = 0.35$ ).

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<sup>19</sup>In comparison, studies such as Banerjee et al. (2015) and (Bossuroy et al., 2022) report attrition rates of approximately 9%.

## D Detailed Intervention Overview

### AI mentor

Our AI mentor was powered by the GPT-4 and Whatsapp APIs. WhatsApp has very high adoption in Kenya (e.g., Wamuyu (2020) report that 89% of Kenyans use WhatsApp and 81.7% use Facebook). Participants interacted with the AI mentor over WhatsApp by texting our WhatsApp number. While the number was public (anyone can text the number), we programmed the AI mentor only to respond to participants on a designated access list. Thus, there was no risk that control participants could interact with the AI mentor. The AI mentor used the standard GPT-4 corpus and was contextually tailored using prompt engineering alone. All parameter values (e.g., “temperature”) were set to GPT-4’s default values.

### Development of the AI Mentor

We used an iterative process to develop our AI mentor over the course of several months. This process was structured into three, interconnected phases.

1. In the first phase, we worked with a team of research assistants to craft prompts aimed at providing strategic advice to Kenyan entrepreneurs. This involved a two-step process: first, a team member posed basic business questions to GPT-4. Then, another evaluated the responses for quality and relevance. We cycled through this process repeatedly, refining the prompts in each cycle based on the feedback received in the cycle prior.
2. The second stage involved a team member manually forwarding questions asked by a pilot sample of Kenyan entrepreneurs to GPT-4. As part of this process, our team and the sample of Kenyan entrepreneurs evaluated the quality and form of the GPT-produced responses. As above, we progressively revised our system prompt based on feedback.
3. The third and final cycle took place after we had built an early version of the AI mentor that was able to communicate with participants over WhatsApp. Here, we recruited a new sample of Kenyan pilot participants who were given early access to the AI

mentor. In addition to asking questions directly to AI mentor, these pilot participants completed surveys that captured more detailed feedback on the tool, which we again used to iteratively revise our system prompt.

Based on this process, our final product was an AI mentor instructed to adhere to the following guidelines:

- For each query, the AI mentor provided 3 to 5 tailored, actionable, enumerated strategies.
- After each response, the AI mentor prompted further engagement with: “Enter a number to explore more about one of these points on [topic name], or ask a new question,” ensuring conversational clarity and flow.
- When a user replied with a number, indicating interest in a specific strategy, the AI mentor offered 3 to 5 additional actionable tips related to that strategy.

The AI mentor was endowed with the personality of “an expert business mentor specialized in guiding Kenyan entrepreneurs with limited resources” whose goal was to “improve business performance and profitability by providing actionable, contextually relevant, specific, detailed advice that produces sustained improvements in competitive advantage.”

### **AI Mentor System Prompt**

Below is the final version of the system prompt that we provide to GPT-4 in order to create the AI business mentor:

As an expert business mentor, your specialization is guiding Kenyan entrepreneurs with limited resources. Your mission is to improve business performance and profitability by providing actionable, contextually relevant, specific, detailed advice that produces sustained improvements in competitive advantage. Interactions follow these steps:

- [1] When a question is asked, respond by learning about specific business needs relating to the business location, type, etc. Then, provide 3 to 5 actionable, easy-to-implement strategies tailored to the business in question. Offer a clear explanation for each strategy, including benefits & step-by-step guidance on implementation. Enumerate these options with [#].
- [2] After each message, prompt further discussion with the statement: "Enter a number to learn more about one of these points on *\*topic name\** or ask a new question." Offer a clear explanation for each tip, including the benefits & how to implement them.
- [3] If a number is given in the response, it indicates the desire to explore the corresponding strategy further. Offer 3 to 5 additional actionable tips related to the chosen strategy. Enumerate these options with [#].
- [4] Again, after each message, prompt further discussion with the statement: "Enter a number to learn more about one of these points on **(bold topic name)** or ask a new question."

Communicate in the language of inquiry. Use simple non-technical English. **Bold** key advice and message topics. Avoid high-tech or costly solutions as your interlocutor is a Kenyan entrepreneur with limited resources. Avoid jargon. As a business mentor, do not discuss health, religion, politics, or current events. Only discuss business topics.

The most critical rule to remember: Whenever a number is entered, ALWAYS interpret it in reference to your last message. E.g., if the user responds "3", it refers to point "3" in your most recent (last) message. If the user responds "2", it refers to point "2" in your most recent message.

## ILO guide

In the control group participants were provided with a guide developed by the International Labor Organization. Specifically, we texted (over WhatsApp) the first three PDFs (out of a series of 9 PDFs in the guide) to participants. We also provided a link where participants could access the other PDFs. The full series of ILO guide PDFs can be accessed at [https://www.ilo.org/empent/areas/start-and-improve-your-business/WCMS\\_192062/lang--en/index.htm](https://www.ilo.org/empent/areas/start-and-improve-your-business/WCMS_192062/lang--en/index.htm).

## Reminders

In both experimental conditions, we provided participants with intermittent reminders to engage with the business manual or AI mentor for each condition.

## E Pre-analysis Plan

### Overview of pre-registration

We preregistered our study design and analysis on osf.io after the third pre-treatment survey.

The following dimensions were preregistered:

**Outcomes:** Table A2 outlines all of our preregistered survey outcomes:

- (i) Performance (revenue and profits)
- (ii) Management Practices
- (iii) Time Management
- (iv) Technology use
- (v) Innovation activities
- (vi) Information: Access Stigma
- (vii) Information: Relevance
- (viii) Information: Accessibility and Quality

We also pre-registered the construction of our performance index and the level of winsorization we would apply our outcome variables. A more detailed overview of our survey measures is included below.

**Statistical analysis:** We preregistered our primary ANCOVA regression specification (see below).

**Heterogeneous effects:** We preregistered three dimensions with respect to which we would measure treatment effect heterogeneity:

- (i) Initial performance
- (ii) Gender
- (iii) Pre-treatment ChatGPT use

We elaborate on each component of the pre-registration below.

## Econometric Strategy

Our main pre-registered estimation strategy is an ANCOVA variant of a simple OLS regression (McKenzie, 2012):

$$y_{t,i} = \alpha + \beta \text{AI}_i + y_{i,-t} + X_{-t,i} + \sum_S \theta_s \mathbb{1}(i \in s) + \sum_T \tau_j \mathbb{1}(j = t) + \varepsilon_{t,i} \quad (1)$$

where  $y_{t,i}$  is an outcome variable measured for participant  $i$  at time  $t$ .  $\alpha$  is the constant, and  $\text{AI}_i \in \{0, 1\}$  is a dichotomous dummy taking a value of 1 if  $i$  is assigned to receive access to the AI mentor.  $\beta$  captures the average causal effect of access to the AI mentor in post-treatment periods.  $y_{i,-t}$  is the pre-treatment values of outcome  $y$  in pre-treatment periods ( $-t$ ).  $X_{-t,i}$  is a vector of baseline control variables.  $\theta_s$  captures stratification dummy variables and  $\tau_j$  captures post-treatment time dummy variables.  $\varepsilon_{t,i}$  is the error term. Standard errors are clustered at the individual level.

**Heterogeneous treatment effects:** We estimate heterogeneous treatment effects for three preregistered dimensions: gender, baseline business performance, and whether participants report frequent use of ChatGPT at baseline. In practice, we operationalized baseline business performance as a median split of a standardized performance index over the three pre-treatment periods, and we operationalized frequent ChatGPT use as whether the person uses ChatGPT at least once a week. We did not provide the heterogeneous treatment effects estimating equation in our pre-analysis plan but for clarity we report the parallel heterogeneous treatment effects estimation equation to Equation 1 below:

$$y_{t,i} = \alpha + \beta_1 \text{AI}_i + \beta_2 \text{Het}_i + \gamma(\text{AI}_i \times \text{Het}_i) + y_{i,-t} + X_{-t,i} + \sum_S \theta_s \mathbb{1}(i \in s) + \sum_T \tau_j \mathbb{1}(j = t) + \varepsilon_{t,i} \quad (2)$$

where  $\text{Het}_i$  is the relevant dimension of heterogeneity, and  $\gamma$  captures the heterogeneous treatment effect.

**Covariate adjustment:** We follow a principled approach to covariate selection using the

double post-LASSO method (Belloni, Chernozhukov, and Hansen, 2014). This approach involves first running a LASSO to identify outcome-relevant covariates, and second, to identify variables predictive of treatment assignment. The union of this set of covariates is then included as controls in our regression analysis. The same double-LASSO-selected covariates are used in the average treatment effect and the heterogeneous treatment effect variations of each model. Additionally, we always control for randomization strata blocks and time period.

The following variables are included in our covariate selection: pre-treatment performance, management practices (sum), gender, oldest business age, sector, IHS(children), age, education, GPT use, Big 5 personality (agreeableness, conscientiousness, extroversion, openness, neuroticism), and county. The LASSO-selected covariates for Figure 3 are (1) pre-treatment management practices (sum), (2) “completed college”, and (3) extroversion. We also present unadjusted regression results.

## Overview of Outcomes

**Business performance.** We measure business performance using a combination of measures of sales and profits. Following Anderson and McKenzie (2022), we apply the following transformations:

1. Winsorize the outcome at the 95th percentile (and 99th percentile in a separate specification).
2. After applying the step above, generate an average  $z$ -score following Kling, Liebman, and Katz (2007) by subtracting the mean of the control group, dividing by the standard deviation of the control group, and then averaging across items: (a) Weekly sales; (b) Weekly profits; (c) Monthly sales; (d) Monthly profits.

**Business practices.** We create an average  $z$  score out of a set of sixteen management practices based on McKenzie and Woodruff (2017) and McKenzie, Osman, and Rahman (2023):

In the following set of questions, we will ask you about certain business practices that you may or may not be implementing in your business. Please only respond ‘Yes’ if you have implemented this business practice at least one time in the last 3 months. It is okay if you



are not doing every activity we describe and not all the practices we ask about may make sense for all businesses to do. We are just trying to assess where your business stands now. Over the last three months...

- [M1] ...have you visited at least one of your competitor's businesses to see what prices they are charging? {No,Yes}
- [M2] ...have you visited at least one of your competitor's businesses to see what products your competitors have available for sale? {No,Yes}
- [M3] ...you asked existing customers whether there are any other products they would like your business to sell or produce? {No,Yes}
- [M4] ...have you talked with at least one former customer to find out why they have stopped buying from your business? {No,Yes}
- [M5] ...have you asked a supplier about which products are selling well in your business's industry? {No,Yes}
- [M6] ...have you ever attracted new customers with a special offer? {No,Yes}
- [M7] ...have you marketed or advertised in any form? {No,Yes}
- [M8] ...have you made use of digital social media for marketing purposes? (e.g., Facebook, WhatsApp, Twitter, LinkedIn) {No,Yes}
- [M9] ...have you attempted to negotiate with a supplier/vendor for a lower price on raw material/stock/inputs to your business? {No,Yes}
- [M10] ...did you keep track of every sale made by the business (all money into the business)? {No,Yes}
- [M11] ...did you keep track of every purchase/expenditure (all money out) made by the business? {No,Yes}
- [M12] ...did you use records regularly to know whether sales of a particular product are increasing or decreasing from one month to another? {No,Yes}
- [M13] ...did you know which goods, products, or services make the business the most profit per item selling? {No,Yes}
- [M14] ...have you worked out the cost to your business for each of your main products or services you sell? {No,Yes}
- [M15] ...did you have a written budget, which states how much is owed or should be spent each month on rent, electricity, equipment maintenance, transport, advertising, and other indirect costs to business? {No,Yes}

[M16] ...have you set targets for how much you will sell? {No,Yes}

### **Time management**

[TM1] In the last seven days, how effectively did you feel you managed your time in running your business? {I managed my time running my business very poorly, Poorly, Neither poorly or well, Well, I managed my time running my business very well}

[TM2] In the last seven days, how many of your planned tasks were you able to accomplish? {I accomplished none of my planned tasks, A few of them, About half of them, Most of them, I accomplished all of my planned tasks}

[TM3] In the last seven days, how often did you find yourself working outside of your planned hours or feeling rushed? {Never worked outside planned hours or felt rushed, Rarely, Sometimes, Often, Always worked outside planned hours or felt rushed}

### **Innovation**

[In1] In the past 30 days, have you considered any new products, services, or business process ideas for your business? No (I have NOT considered any new products, services, or business process ideas), Yes (I HAVE considered new products, services, or business process ideas)

[In2] In the past 30 days, have you tested or experimented with any new products, services, or business process ideas for your business? No (I have NOT tested or experimented with new products, services, or business process ideas), Yes (I HAVE tested or experimented with new products, services, or business process ideas)

[In3] In the past 30 days, have you implemented any new products, services, or business process ideas for your business? No (I have NOT implemented with new products, services, or business process ideas), Yes (I HAVE implemented with new products, services, or business process ideas)

### **Technology use**

[TE1] How frequently do you use technology (like computers, applications, software) in running your business? I never use technology (like computers, applications, software) in running my business {Rarely, Sometimes, Often, I very often use technology (like computers, applications, software) in running my business}

[TE2] To what extent do you think technology has impacted your business performance like

your growth in profits or customer base? {Technology has had no effect, Technology has had a small effect, Technology has had a moderate effect, Technology has had a large effect, Technology has had a very large effect}

[TE3] In the last 30 days, have you started using any new technologies in your business? {No (no new technologies), Yes, one new technology, Yes, two new technologies, Yes, three or more new technologies}

**Information: Quantity and quality**

[IQ1] In the last 30 days, how easy has it been for you to get advice, mentorship, or information for your business when you need it? {Very difficult to get advice, mentorship, or information, Difficult, Neutral, Easy, Very easy to get advice, mentorship, or information}

[IQ2] In the last 30 days, how would you rate the quality of advice, mentorship or information you received for your business (across all sources you receive advice, mentorship, and information from)? {The quality of advice, mentorship, and information I receive is Very poor, Poor, Neutral, Good, The quality of advice, mentorship, and information I receive is very good}

**Information: Stigma and negative judgement**

[IS1] In the past 30 days, how often have you felt judged or looked down upon when asking for advice, mentorship, or information for your business? {I have always felt judged or looked down upon when asking for advice, mentorship, or information for my business, Almost always, Sometimes, Almost never, I have never felt judged or looked down upon when asking for advice, mentorship, or information for my business}

[IS2] In the past 30 days, has fear of negative judgement ever prevented you from seeking advice or mentorship or information for your business? {Fear of negative judgement has always prevented me from seeking advice or mentorship or information for my business, Almost always, Sometimes, Almost never, Fear of negative judgement has never prevented me from seeking advice or mentorship or information for my business}

**Information: Relevance of mentorship/advice**

[IR1] In the past 30 days, is the advice, mentorship, or information you have received directly relevant to your current business needs? {The advice I received is never relevant to my current business needs, Rarely, Sometimes, Often, The advice I received is always relevant to my current business needs}

[IR2] In the past 30 days, how frequently have you found the advice, mentorship or information you received to be modern and up-to-date with current business trends and practices? {The advice I received is never modern and up to date, Rarely, Sometimes, Often, The advice I received is always modern and up to date}

## Explanation of Preferred Functional Forms

In our preregistration, we pre-specified four different variations on a performance index: 95 and 99% winsorization and a log-like inverse hyperbolic sine transformation  $y' = \log(y + (y^2 + 1)^{1/2})$  transformation of these two winsorizations. In the paper body, we focus on the raw outcome variable and report the raw unit results as our preferred specification for two reasons.

First, recent work has shown that the inverse hyperbolic sine transformation (and other similar log-like transformations) is highly sensitive to artefactual statistical features like scaling of the outcome (e.g., measuring performance in units of thousands of KSH), and also the presence of zeros (Chen and Roth, 2023; McKenzie, 2023). We observe exactly this sensitivity to zeros in our data. Figure A8 shows the distribution of our performance indices, winsorized at the 95% level on the left and the 99% on the right. The top row depicts raw units and the bottom depicts log-like units. We observe that for the log-like index, there is an extreme left tail that arises from zeros in the performance distribution, with outcome values close to or above -10 standard deviations.

Second, for the purpose of studying inequality, it makes more sense to focus on raw changes as proportional changes can reflect radically different performance impacts depending on whether the entrepreneur comes from the top or bottom of the distribution.

## F Ethical Considerations

In our field experiment, we found no overall impact on business performance from the treatment intervention. However, we did detect heterogeneous treatment effects with respect to initial performance levels; high performers experienced a performance increase due to AI advice, while low performers experienced a performance decrease. These unexpected negative results gave us pause. Given that our treatment appears to have led to worse performance for some entrepreneurs in our sample, in this section we outline why our experiment is ethical, above and beyond having received approval from and followed the policies of the UC Berkeley’s Institutional Review Board.

First, according to Asiedu et al. (2021), a key ethical consideration is policy equipoise, which involves meaningful uncertainty about the efficacy of each treatment arm. Indeed, if there was consensus that one treatment arm would be superior to the other, then it would *not* be ethical to randomize it unless the treatment was costly and therefore scarce. In the context of our experiment, there was uncertainty regarding participants’ benefits from each arm of the study. To the best of our knowledge, we are the first to test whether AI advice can increase entrepreneurial performance, especially in a context like Kenya. That said, recent research on generative AI and research on advising and mentoring between entrepreneurs suggested that an AI mentor had the potential to increase business performance. While we believed there were benefits, there was no consensus at the time we deployed the experiment that one treatment would be superior to the other. Given the presence of equipoise, we argue it was more ethical to test the impact of AI with a few hundred entrepreneurs in a well-designed study, rather than not testing and making policy decisions that could a) deny millions of entrepreneurs access to a useful tool if the treatment effect was positive or b) encourage adoption of a technology that hurts productivity by millions of entrepreneurs if the treatment effect was negative (Glennerster and Takavarasha, 2014).

Beyond the presence of equipoise, we also ensured all participants in our study were well-informed and free to decide whether to participate or not. Our participants were also free to decide whether to continue using our AI mentor, and it was easy to stop using it, consistent with the ethical standards around participant choice.

While our experiment revealed that one particular subgroup did not benefit from access to the AI mentor, negative treatment effects for subpopulations commonly occur in experiments conducted in the social and medical sciences. Given the growing use of generative AI, understanding the impact of such tools on society is especially valuable.

## G Accounting for Spillovers

In this appendix, we examine the plausibility of two types of spillovers that could impact our results: treatment access spillovers, where non-treated individuals might gain access to the AI mentor, and performance spillovers (Holtz et al., 2023), in which performance improvements (or declines) for one individual come at the direct cost (or benefit) of another.

### Treatment Access Spillovers

The AI mentor’s WhatsApp contact number is publicly available, allowing anyone to text in. Without strict controls, this raises the possibility that untreated participants could interact with the AI mentor. To address this, we developed our AI mentor in such a way that it only responds to messages from individuals on a pre-specified access list. Only members of the research team were able to modify this access list.

### Performance Spillovers

Another concern relates to performance spillovers within our experimental sample. For instance, the heterogeneous treatment effects we observe could potentially be explained by the high-performing entrepreneurs in our sample capturing profits/revenue from the low-performing entrepreneurs in our sample. However, we consider this unlikely for two reasons. First, our advertisement on Meta targeted a broad audience, drawing participants from across Kenya, a country of over 50 million people where Facebook has very high market penetration (Wamuyu, 2020). Consequently, our recruitment strategy yielded a geographically diverse sample. Table A1 illustrates the distribution of respondents over Kenyan counties (looking only at those counties with over 50 respondents). Second, negative spillovers are overwhelmingly more likely to occur between individuals who are located in the same geography *and who work in the same industry*. In Figure A3, we further stratify our sample by county and sector. Because our sample is drawn from all over Kenya, every sector-location combination has fewer than 40 participants (note that some participants have businesses in multiple sectors). Only two sector-location combinations have over 20 individuals: Nairobi × Food and Nairobi × Clothing. As a point of reference, Nairobi has a population of over

4,000,000 and the Nairobi metropolitan area spans over 250 square miles.

It *is* possible that performance spillovers occur between entrepreneurs in our sample and their competitors that are *not* in our sample. Keeping this in mind, the low level of technology saturation and infeasibility of the diffusion of our AI mentor are key to interpreting our results. If there were a greater level of overall generative AI saturation in Kenya, our results may not hold. For instance, it is conceivable that with high levels of generative AI adoption, firm practices could uniformly improve and/or converge; this could lead to greater price competition and lower firm profits. Conversely, widespread adoption of generative AI could drive positive performance spillovers stemming from the diffusion of best-use practices among businesses. While our experiment is unable to shed light on these dynamics, we consider this a fruitful area for future research.



## H Detailed Case Examples

### Example 1: Dairy Products Business Owner (Below Median)

In this conversation, a milk seller in Nairobi sought advice on various aspects of their business. Initially, they faced a dilemma when a price hike from their supplier forced them to increase their retail prices, leading to the loss of some customers. They receive advice from the AI mentor on methods to maintain customer loyalty during this period, including transparent communication about the price increases, adding value to their products, ensuring quality, engaging with customers, and introducing flexible pricing options like smaller quantities and bulk discounts.

The entrepreneur then expressed an interest in diversifying their product range to maximize profits. They were advised to consider selling items that complement milk, such as tea, coffee, cereals, bread, pastries, sweeteners, and other dairy products like cheese and yogurt. However, they faced challenges in finding reliable suppliers for these new products and received poor feedback from customers. In response, the AI mentor offered further suggestions, including online directories to find suppliers, attending trade shows, incentivizing customer feedback, and maintaining an open dialogue with customers to understand their preferences and improve product offerings.

Finally, the entrepreneur sought ideas for further expanding their business after their attempt to sell yogurt was not successful. They were advised to explore options like cheese making, starting a milk delivery service, selling milk-based snacks or desserts, expanding their wholesale business, and conducting training workshops on dairy products. Specific strategies for expanding into milk-based snacks and desserts were also discussed.

Q1. Hello, I am [REDACTED]. I sell milk both wholesale and retail, in the past 1 week the price hiked from the supplier, so..I also decided to hike my price too in order to get some reasonable profit but now some customers have already left. What will I do to make them understand the prices are high from the production level?

A1. Hello [REDACTED], it's a common challenge for businesses when costs increase. Here are some strategies to help your customers understand the situation:

1. **Transparent Communication**: Inform your customers about the increased prices from suppliers and explain that you had to adjust yours as well. This can be done through signage at your shop or via social media if you have an online presence. The key is to be open and honest about why prices have increased.
2. **Value Addition**: Enhance the perceived value of your milk products by offering something extra with each purchase such as loyalty points, discounts on bulk purchases, or small freebies like a packet of tea leaves or sugar.
3. **Quality Assurance**: Assure them that despite the price hike, the quality of your milk remains high. If possible, share information about how you ensure quality control in sourcing and storing your milk.
4. **Customer Engagement**: Engage more with your customers by asking for their understanding and support during these tough times while promising to review prices once things normalize at production level.
5. **Flexible Pricing Options**: Offer different pricing options where possible, such as smaller quantities at lower prices which may still be affordable for most of your customers.

Enter a number to learn more about one of these points on *customer retention strategies* or ask a new question.

Q2. 5

A2. Great choice, [REDACTED]. Implementing flexible pricing options can be a practical approach to retain customers during price hikes. Here are some additional tips on how you can do this:

1. **Small Quantity Pricing**: Offer smaller quantities of milk at lower prices. This could mean selling in half-liter or quarter-liter measurements for those who cannot afford a full liter due to the increased price.
2. **Bulk Discounts**: Provide discounts for customers buying in bulk. For example, if a customer buys 10 liters, they could get an extra liter free or at a reduced rate.
3. **Loyalty Program**: Establish a loyalty program where regular customers earn points with each purchase that can be redeemed for discounts or free products in the future.
4. **Payment Plans**: If feasible and applicable to your business model, consider offering payment plans for trusted regular customers who buy large quantities regularly but are struggling with the sudden increase in price.
5. **Promotional Offers**: Run occasional promotional offers such as 'buy one get one free' or 'price reductions on certain days' to keep customers interested and engaged despite the general price hike.

Enter a number to learn more about one of these points on *flexible pricing strategies* or ask a new question.

Q3. I'm [REDACTED], I sell milk both wholesale and retail but now, I want to add something else to the business in order to maximise my profit range. I don't know what will blend well with milk.

A3. Hello [REDACTED], it's great that you're thinking about diversifying your product range. Here are some suggestions of products that typically complement milk sales:

1. **Tea and Coffee**: These are commonly used with milk. You could consider selling various types of tea leaves or coffee beans.
2. **Cereal and Porridge**: Many people enjoy these with milk for breakfast. Offering a variety of cereals or porridge mixes could attract more customers.
3. **Bread and Pastries**: These items often go well with milk-based beverages for breakfast or snacks.
4. **Sweeteners**: Consider selling honey, sugar, or other sweeteners which are frequently added to milk.
5. **Dairy Products**: You can expand into other dairy products like cheese, yogurt, or butter which have a similar supply chain as milk.

Remember to research each potential addition thoroughly to understand the demand in your area, the cost implications, and how it might affect your operations.

Enter a number to learn more about one of these points on *product diversification* or ask a new question.

Q4. 5

A4. Excellent choice, [REDACTED]. Expanding into other dairy products can be a natural extension of your current business. Here are some actionable steps:

1. **Market Research**: Conduct surveys or informal chats with your customers to understand which dairy products they'd like to see in your store.
2. **Supplier Search**: Look for reliable suppliers who provide high-quality cheese, yogurt, and butter at competitive prices.
3. **Product Testing**: Initially introduce a small quantity of the new product to gauge customer response before fully stocking it.
4. **Promotion**: Inform your customers about the new products through signage, social media, or direct communication when they visit your shop.
5. **Feedback Loop**: Regularly ask for feedback from customers on these new products and adjust based on their responses - whether it's changing the brand, adjusting pricing or discontinuing if it doesn't meet expectations.

Remember that diversifying into dairy requires proper storage facilities due to perishability and quality control needs.

Enter a number to learn more about one of these points on *diversifying into other dairy products* or ask a new question.

Q5. 2

A5. Absolutely, finding the right suppliers is crucial when diversifying into other dairy products. Here are some steps to help you find reliable suppliers:

1. **\*\*Identify Potential Suppliers\*\***: Start by making a list of potential suppliers. You can do this by searching online, asking for recommendations from other business owners, or visiting local markets.
2. **\*\*Evaluate Product Quality\*\***: Request samples from these suppliers and assess their product quality. Remember, the quality of your products will reflect on your business reputation.
3. **\*\*Compare Prices\*\***: Ask for price lists from each supplier and compare them considering both the cost and quality of the products.
4. **\*\*Check Reliability\*\***: Find out about their delivery schedule, order minimums, return policy etc., to ensure they meet your specific needs.
5. **\*\*Build Relationships\*\***: Once you've chosen a supplier or two, build strong relationships with them as it can lead to better prices, more favorable terms and improved service over time.

Remember that a good supplier does more than just deliver products - they should be partners in helping your business succeed.

Enter a number to learn more about one of these points on *\*finding reliable dairy product suppliers\** or ask a new question.

Q6. *Hello, this is [REDACTED] I sell milk both in wholesale and retail I contacted you asking what I can add in my shop that blends with milk and decided to explore other dairy products like cheese and yogurt now the problems that am facing are: (1). Supplier search i have not yet got a reliable supplier. (2). I have not been getting good feedback on why the customers are not loving the new products*

A6. Hello [REDACTED], I understand your concerns. Let's tackle them one at a time:

1. **\*\*Reliable Supplier Search\*\***: Here are some actionable steps you can take: [1] Use online directories or social media groups for Kenyan businesses to find potential suppliers. [2] Attend local trade shows or farmers markets where you can meet potential suppliers in person. [3] Ask other business owners in your network if they have recommendations for reliable dairy product suppliers.
2. **\*\*Improving Customer Feedback\*\***: [a] Conduct a brief survey with customers who've tried the new products. Ask specific questions about taste, packaging, price, and what they'd like to see improved. [b] Offer samples of the products to customers before they buy - this could help identify any issues early on and also encourage more sales. [c] Consider introducing smaller sizes or trial packs that cost less so that customers can try the products without feeling like it's a big investment.

Remember that changes in business often require patience and iterative improvements based on feedback. Don't be discouraged by initial setbacks.

Enter a number to learn more about one of these points on *\*supplier search\** or *\*improving customer feedback\** or ask a new question.

Q7. 2

A7. You've chosen to explore improving customer feedback further. Here are some additional steps:

1. **Open Dialogue**: Encourage customers to share their thoughts openly about the new products. Make them feel that their opinion is valued and important for your business improvement.
2. **Incentivize Feedback**: Offer small incentives like discounts or free samples in exchange for completing a feedback form.
3. **Direct Observation**: Watch how customers interact with the new products in your store. Do they seem confused? Are they comparing it with other items? This can give you clues about any potential issues.
4. **Trial Periods**: Run short trial periods for different products, then ask for feedback specifically on those items at the end of each period.
5. **Transparent Communication**: If you make changes based on customer feedback, let them know! This shows that you value their input and are committed to improving their experience.

Remember, *feedback is an opportunity* to learn more about your customers' needs and preferences, which can guide your business decisions moving forward.

Enter a number to learn more about one of these points on *improving customer feedback* or ask a new question.

Q8. *I sell milk both wholesale and retail in Nairobi Kenya. .now I wanted to know what else I can add to my business in order to maximize my profits. I tried yoghurts but didn't work.*

A8. Thank you for sharing about your business. It's great to see your interest in diversifying and increasing profits. Here are a few suggestions:

1. **Cheese Making**: With milk as your primary resource, cheese can be an excellent addition. Cheese has a longer shelf life than milk and can be sold at higher prices. Start with simple types like cottage cheese or mozzarella, which require minimal equipment and skills.
2. **Milk Delivery Service**: Consider offering home delivery services for regular customers within Nairobi. This service can increase customer loyalty, bring in consistent revenue, and allow you to reach more customers who value convenience.
3. **Selling Milk-Based Snacks or Desserts**: Depending on your location and customer base, adding snacks or desserts such as ice cream, milkshakes, or custards could attract more retail customers.
4. **Expand Your Wholesale Business**: Identify other businesses that might need dairy products (like restaurants or bakeries) and offer them competitive prices for bulk purchases of your milk.
5. **Training Workshops**: Conduct training workshops on the benefits of dairy products or how to make simple dairy-based foods at home (like homemade yogurt). This not only promotes your products but also creates an additional income stream from workshop fees.

Enter a number to learn more about one of these points on *business expansion* or ask a new question.

Q9. 3

A9. Great choice! Selling milk-based snacks or desserts can attract more customers and increase your profit margin. Here are some steps to implement this strategy:

1. **Market Research**: Start by understanding what kind of milk-based snacks or desserts are popular in your area. You could do a quick survey with your current customers or observe what's selling well in nearby food businesses.
2. **Simple Recipes**: Choose simple recipes that require minimal additional ingredients and equipment. Puddings, custards, or simple ice creams could be good starting points.
3. **Pricing**: Price these items competitively while ensuring you still make a profit after considering the cost of ingredients, preparation time, and utilities.
4. **Promotion**: Use signage at your shop to promote these new products and consider offering samples to regular customers to get their feedback and generate interest.
5. **Quality Control**: Ensure the quality of your desserts is consistently high so that customers keep coming back for more.

Enter a number to learn more about one of these points on *milk-based snacks/desserts* or ask a new question.

Q10. 1

A10. Absolutely, conducting market research is a crucial first step. Here are some actionable steps:

1. **Surveys**: Create simple surveys asking your customers about their favorite milk-based snacks or desserts and if they'd be interested in buying them from your shop. This could be done informally when they visit your shop or through a more structured approach like questionnaires.
2. **Observation**: Visit other food businesses in your area that sell milk-based snacks or desserts. Note which items seem popular, how they're priced, and any unique selling points.
3. **Community Engagement**: Engage with local community groups or online forums to understand what types of desserts people in Nairobi enjoy and are currently trending.
4. **Trial Products**: Once you've gathered this information, select one or two products that seem promising and start offering them on a trial basis to gauge customer response.
5. **Feedback Collection**: Collect feedback from the customers who try these new products - did they enjoy it? Would they buy it again? How much would they be willing to pay for it?

Remember: The goal of market research is not just to identify what products you should offer but also to understand how you can differentiate yourself from competitors.

Enter a number to learn more about one of these points on *market research* or ask a new question.

## **Example 2: Fast Food Joint Owner (Above Median)**

In this conversation, the owner of a fast food joint located near a matatu terminus sought advice on differentiating their business in a competitive environment. The key strategies discussed included differentiating the menu with unique or special dishes, improving customer service, implementing a loyalty program, engaging in community activities, and maintaining high standards of cleanliness and hygiene.

The discussion delved into the specifics of establishing a loyalty program, with the AI mentor offering suggestions like a point-based system, special offers for regular customers, and birthday or anniversary rewards. The entrepreneur raised concerns about the cost implications of differentiating the menu and the complexities of community involvement. The AI mentor then suggested using affordable local ingredients, offering smaller portions, running specials during off-peak hours, using simple loyalty systems like punch cards, and engaging in low-cost community activities.

The entrepreneur was also concerned about the risks and customer reception related to changing the menu and implementing new strategies. The AI mentor recommended testing new dishes gradually and seeking customer feedback, especially from regulars. The importance of using both in-person and digital channels to collect reliable feedback was emphasized, considering that some customers are transient. The entrepreneur and the AI mentor also discussed the risks associated with implementing new business strategies, with the AI mentor suggesting thorough market research, pilot testing, financial analysis, risk assessment, and regular feedback review.

Q1. *I have fast food joint that I run just adjacent to a matatu terminus. There are several such food joints at that particular place and it's fair to say competition is stiff. How can I overcome the competitive business environment and be ahead of the rest of the pack?*

A1. Thank you for sharing about your business. Operating a fast food joint in a highly competitive environment like a matatu terminus can indeed be challenging, but there are several strategies you could consider to stand out:

1. **Differentiate Your Menu**: Offer unique or special dishes that aren't available at the other joints. This could be traditional Kenyan foods with a twist, or it could involve using locally sourced ingredients that others don't use. The benefit is that customers will associate your place with these special offerings and choose you over competitors.
2. **Improve Customer Service**: Prioritize excellent customer service to make people feel welcome and appreciated when they visit your joint. This might involve training staff on how to interact with customers positively, quickly serving orders, and handling any complaints promptly and professionally.
3. **Loyalty Program**: Implement a loyalty program where customers earn points for every purchase which they can later redeem for free meals or discounts. It encourages repeat business as customers will want to accumulate more points.
4. **Community Involvement**: Engage in local community events or sponsor local initiatives such as sports teams or school activities. This raises your profile within the community and makes people more likely to support your business.
5. **Cleanliness & Hygiene**: Ensure high standards of cleanliness both inside the kitchen and in the dining area because hygiene matters greatly in food businesses.

Enter a number to learn more about one of these points on *improving competitiveness* or ask a new question.

Q2. 3

A2. Great, let's delve into how you can implement a **Loyalty Program** in your fast food joint:

1. **Point-Based System**: Implement a simple point-based system where customers earn points for every shilling spent. Once they accumulate a certain number of points, they can redeem them for free meals or discounts. You could use simple tools like punch cards or digital apps that are inexpensive to manage.
2. **Special Offers for Regular Customers**: Identify your regular customers and offer them exclusive deals or discounts. This not only rewards their loyalty but also encourages them to keep coming back.
3. **Birthday/Anniversary Rewards**: Offer special treats or discounts to customers on their birthdays or anniversaries if they share this information with you. This personalized touch can make customers feel valued and appreciated.
4. **Referral Program**: Encourage your loyal customers to bring in new clients by giving them incentives such as a discount or free meal when someone they refer makes their first purchase.
5. **Feedback Reward**: Encourage customer feedback by offering small rewards for completing surveys about the quality of food and service at your joint.



Remember, the goal of any loyalty program is to make your customers feel valued so that they continue patronizing your business over others.

Enter a number to learn more about one of these points on *\*loyalty programs\** or ask a new question.

- Q3. 1. *\*Differentiating my menu\** means that I'm incurring a higher cost of preparing meals. This in turn pushes the menu prices upwards which may scare away the potential customers considering the fact that the potential customers are low or middle income earners. 2. About *\*loyalty programs\**, I'm not well conversant with that field. 3. *\*Community involvement\** may require adequate resources and may be capital intensive.

A3. Thank you for your detailed response. Let's delve into these topics a bit more:

1. **\*\*Differentiating Your Menu\*\***: You're correct that introducing unique dishes may increase costs. However, this doesn't always have to result in higher menu prices. Here are some tips: [1] Focus on dishes that use affordable local ingredients but are prepared in a distinctive way. [2] Consider offering smaller portions at lower prices for those who want to try something new without paying a lot. [3] Run specials during off-peak hours to attract customers and offset the cost of unique dishes.

2. **\*\*Loyalty Program\*\***: A loyalty program is essentially a reward system for frequent customers. Here's how you could implement one with minimal costs: [1] Use simple paper punch cards where each purchase gets a punch, and after a certain number of punches, the customer gets a free meal or discount. [2] Keep track of repeat customers manually and offer them discounts or free items after they've made several purchases.

3. **\*\*Community Involvement\*\***: While it can be resource-intensive, there are ways to engage with the community without spending much money: [1] Offer your venue as a meeting place for local groups during slow business hours. [2] Sponsor small-scale local events like neighborhood cleanups by providing refreshments - this helps build goodwill within the community.

Enter a number to learn more about one of these points on *\*cost-effective strategies\** or ask a new question.

- Q4. *If we focus on having a menu that stands out from what others are offering, by what margin may I lose, retain or increase my customer base. And what is the likelihood of having rewards for customer's referrals?*

A4. The impact of differentiating your menu on your customer base can be significant, but it's hard to quantify without specific data. However, here are some general insights:

1. **\*\*Potential Increase in Customers\*\***: Offering unique dishes can attract food lovers who are always looking for something new and exciting to try. If your new offerings resonate with the taste preferences of the local population, you could see a substantial increase in customers.

2. **\*\*Retention of Existing Customers\*\***: If you continue offering popular items while introducing new ones, you're likely to retain most of your existing customers. They might even appreciate the added variety.

3. **\*\*Possible Losses\*\***: There is always a risk that some customers may not like changes to the menu and choose other joints over yours. It's essential to introduce changes gradually and get feedback from customers before making any drastic alterations.

As for referral rewards:

4. Referral programs can be highly effective because people trust recommendations from friends or family more than advertising messages from businesses. If executed well, this strategy could lead to a significant increase in new customers without requiring large investments in marketing.

To implement these strategies:

A) For *\*Menu Differentiation\**, start by researching what foods or flavors are trending locally or globally that align with your capabilities and resources. Test these out as specials before adding them permanently to your menu based on customer response.

B) For *\*Referral Rewards\**, consider giving both the referring customer and the referred friend a discount or free item on their next purchase. Make sure it's easy for customers to share referrals by providing them with simple instructions when they make purchases.

Enter a number to learn more about one of these points on *\*menu differentiation\** or *\*referral rewards\** or ask a new question.

Q5. *I'll need to contemplate on this two strategies and evaluate the outcomes both on a short and long term basis.*

A5. Absolutely, taking the time to contemplate and evaluate potential outcomes is a crucial step in making strategic decisions for your business. Remember that both *\*menu differentiation\** and *\*referral rewards\** are strategies aimed at improving customer retention and attracting new customers, which are key aspects of business growth.

When evaluating these strategies:

1. Consider your resources: Do you have the capacity to introduce new menu items or manage a referral program effectively?

2. Listen to your customers: What do they want or need? Would they appreciate a more diverse menu or would incentives for referrals motivate them?

3. Monitor results: Once implemented, track the success of these strategies through increased sales, more repeat customers, or an increase in new customers.

4. Be ready to adjust: If something isn't working as well as expected, don't be afraid to make changes.

Remember that successful businesses are those that adapt and evolve based on their environment and customer needs.

Feel free to return if you have any other questions or need further clarification on any point related to improving your fast food joint's competitive advantage

Q6. *Customer feedback when venturing into new ideas is the key to monitor the reception of a new menu and also the trust built through referral programs may work well with the business and the projected profit margins.*

A6. Absolutely, you're on the right track. Customer feedback is invaluable when introducing new ideas like a different menu or a referral program. Here's how you can effectively use customer feedback and trust building:

1. **\*\*Feedback Channels\*\***: Establish easy ways for customers to give feedback such as suggestion boxes at your joint, conducting informal surveys, or simply talking to them about their experience.

2. **\*\*Respond to Feedback\*\***: Show customers that you value their opinions by acting on their suggestions where feasible and communicating changes back to them.
3. **\*\*Trust Building in Referral Programs\*\***: Make sure the process is transparent and rewards are delivered as promised. This will build trust not only with the referring customer but also with the new ones coming in through referrals.
4. **\*\*Evaluate Profit Margins\*\***: Regularly review your costs versus revenues after implementing these strategies to ensure they're contributing positively towards your profit margins.
5. **\*\*Pilot Test\*\***: Before rolling out any major changes, consider doing a small-scale pilot test to gauge reception and adjust based on feedback received.

Remember, open communication with your customers helps foster loyalty which can lead to increased profitability in the long run.

Enter a number to learn more about one of these points on *\*customer feedback\** and *\*trust building\** or ask a new question.

Q7. *Together with my team, we shall deliberate on few important tips I've come across here and decide the way forward in best way to implement them.*

A7. That sounds like a great plan. Collaborative decision-making often leads to more effective strategies and smoother implementation. Here are some tips for your deliberation process:

1. **\*\*Set Clear Goals\*\***: Clearly define what you want to achieve with each strategy, such as increasing customer retention, attracting new customers, or boosting profit margins.
2. **\*\*Assign Roles\*\***: Assign team members specific roles in the implementation of each strategy based on their skills and responsibilities.
3. **\*\*Plan for Feedback\*\***: Plan how you will collect and analyze customer feedback once the changes are implemented.
4. **\*\*Prepare for Adjustments\*\***: Be prepared to make adjustments based on the outcomes of your initial efforts.
5. **\*\*Schedule Follow-ups\*\***: Schedule regular follow-up meetings to assess progress and make necessary adjustments.

Remember that it's important to have everyone on board with these changes so they can be effectively implemented and managed over time.

Enter a number to learn more about one of these points on *\*team deliberation\** or ask a new question.

Q8. *Good insight. I'll come back here sooner with some more insights on the progress made if any.*

A8. That's great to hear! Remember, the process of implementing new strategies often involves learning and adjusting along the way. Don't hesitate to return if you have any questions or need further advice as you progress. Wishing you and your team all the best in enhancing your business performance and profitability.

Q9. *Hi... If I'm running a food joint near a matatu terminus, selling fast food, snacks and beverages, how can I diversify the services I offer*

A9. Hello! Diversifying your services can be a great way to attract more customers and increase revenue. Here are some ideas:

1. **Delivery Service**: You could start offering delivery service for customers who may not have time to visit your food joint in person but want a quick meal.
2. **Catering Services**: Consider providing catering services for local events or businesses, which can significantly boost sales.
3. **Meal Deals**: Introduce special meal deals during specific hours of the day, such as breakfast combos or late-night snacks.
4. **Seasonal Menu Items**: Offering seasonal menu items that align with holidays or local events can attract new customers and keep regulars interested.
5. **Loyalty Program**: Implement a loyalty program where regular customers earn points they can redeem for meals or discounts.

Each strategy has its own benefits and methods of implementation, so consider what would work best for your specific business situation and resources.

Enter a number to learn more about one of these points on *service diversification* or ask a new question.

Q10. *How do I increase the returns on my cafeteria?*

A10. Understanding your business needs is crucial. I'm assuming your cafeteria is in Kenya, but could you provide more details? What's the size of your cafeteria, and where is it located? What's the competition like? Any specific challenges you are facing?

Based on general information, here are some strategies to increase returns:

1. **Improve Menu**: Review your menu to ensure it appeals to local tastes and preferences. Make sure you're offering dishes that not only taste good but also have high-profit margins. Experiment with different dishes and keep track of which ones sell best.
2. **Cost Control**: Manage food waste by implementing inventory management systems and portion control measures. This can help reduce costs and increase profitability.
3. **Customer Experience**: Enhance the customer experience by training staff in customer service skills, improving café ambiance or cleanliness, or even offering free Wi-Fi if feasible.
4. **Promotions & Loyalty Programs**: Implement a loyalty program or offer special promotions during slow periods to attract more customers.
5. **Community Engagement**: Get involved with the local community through sponsorships or events which can enhance visibility and build a loyal customer base.

Enter a number to learn more about one of these points on *increasing cafeteria returns* or ask a new question.

Q11. *I have tried to offer a new special meal menu in my restaurant and I must admit that the returns have been quite fair. Is it okay if I do a whole menu overhaul and start offering some different special meals altogether, even though it would make the price of each plate to be higher than before. I'm stuck between giving new menu or staying with current ones for the fear of losing the current clientele.*

A11. That's a great question and it's normal to feel this way when considering major changes in your business. Here are some strategies you can consider:

1. **\*\*Test the Waters\*\***: Before overhauling the entire menu, consider introducing new special meals one at a time. This will allow you to gauge customer response without risking too much.
2. **\*\*Customer Feedback\*\***: Ask your customers directly for their opinion on potential new dishes or even higher prices. You could use surveys or informal conversations.
3. **\*\*Market Research\*\***: Look at what similar restaurants in your area are doing successfully, especially those with a similar clientele.
4. **\*\*Pricing Strategy\*\***: Consider if there's room to slightly increase prices of current dishes instead of introducing more expensive ones that might deter customers.
5. **\*\*Special Events\*\***: Host special events where only the new menu is available, like themed nights or tasting events, to introduce customers to these dishes and gather feedback.

Enter a number to learn more about one of these points on *\*menu overhaul\** or ask a new question.

Q12. 1

A12. Great, you're interested in the strategy of testing the waters with new special meals. Here are some additional tips on how to do that:

1. **\*\*Pilot Dish\*\***: Start by introducing one or two new dishes as a special offer and observe customer reactions.
2. **\*\*Promote\*\***: Make sure your customers know about the new dish through table tents, menu boards, or even verbally when they're ordering.
3. **\*\*Feedback\*\***: Ask for feedback directly from those who try the new dishes. This could be done informally by waitstaff or through a small comment card.
4. **\*\*Evaluate\*\***: Track sales of the new dishes and compare them to your regular items. If they perform well, consider adding them permanently.
5. **\*\*Adjust\*\***: Based on feedback and sales data, adjust the dish if needed before fully integrating it into your menu.

Enter a number to learn more about one of these points on *\*testing new special meals\** or ask a new question.

Q13. *As for the customer feedback, sometimes it may not be reliable since some of the clients we host are passengers on transit so some opinion they may give may not apply to everyday's consideration.*

A13. You're correct, transient customers may provide feedback that doesn't necessarily reflect the preferences of your regular clientele. Here are some strategies to ensure you're getting reliable feedback:

1. **\*\*Target Regular Customers\*\***: Make a point to solicit feedback from your regulars who understand your current menu and can provide insights into potential changes.
2. **\*\*Digital Feedback\*\***: If you have an online presence (e.g., social media), use these platforms to gather feedback as people might be more open and detailed in their responses.
3. **\*\*Feedback Cards\*\***: Leave these at tables or the checkout counter for customers to fill out before they leave. This will give you a wider range of opinions.

4. **Observation**: Watch what dishes get ordered most often and which ones come back with leftovers – this can be very telling about what’s working and what isn’t.
5. **Trial Periods**: As mentioned earlier, introduce new items slowly and see how they perform over a set period before making permanent decisions.

Enter a number to learn more about one of these points on *collecting reliable customer feedback* or ask a new question.

Q14. *A shift in business strategies may sometimes backfire. Implementing new ideas may fail the business often. How can I avoid the setbacks off trying new ideas and taking risks?*

A14. Trying new ideas and taking risks is a part of business growth, but it’s important to manage these risks wisely. Here are some strategies:

1. **Market Research**: Before implementing a new idea, conduct thorough market research to understand its potential impact on your customers and competitors.
2. **Pilot Testing**: Instead of implementing changes across the entire business, try them in a small controlled environment first to gauge their effectiveness.
3. **Financial Analysis**: Consider the financial implications of the new strategy. Calculate potential returns against costs and assess if it’s financially viable.
4. **Risk Assessment**: Identify potential pitfalls or challenges with your new strategy and develop contingency plans to address them.
5. **Feedback & Review**: Regularly review the performance of the new strategy, seek feedback from customers and staff, and be ready to make adjustments as needed.

Enter a number to learn more about one of these points on *risk management when trying new business strategies* or ask a new question.

# I Text Classification and Coding

This section describes the coding practices used to classify and rate interactions with the AI mentor. Two human RAs manually classified the thousands of messages sent by entrepreneurs to our AI mentor into one of three classes: {*Business messages*, *Not Business messages*, and *Other Questions/Not a Question*}. The human coders further assigned a quality rating score to each business question. Our text analyses focus on the 1,382 messages classified as business questions.

## Question Classification Protocol

The following definitions were used to manually code each message from an entrepreneur into one of three classes: Business Questions, Homework Questions, and Other Questions/Not a Question. Examples of messages that were assigned in each label can be found below.

Text	Label
hi AI Mentor. I've had a problem in my grocery business as money transfer companies have increased the transactions costs. usually my customers do not prefer cash transaction but <i>M-pesa</i> transactions. how can I deal with this please?	Business
write me a business proposal of a grocery store	Business
Discuss in detail the following privacy issues: (i) The key roles and responsibilities in risk management (ii) The Key Risk Indicators (KRI) in risk management (iii) The various risk management frameworks...	Homework
Vulnerability is defined as a known weakness or fault in a system that exposes information to attack or damage.Using the list below describe ten vulnerabilities associated with each (i) Hardware (5 Marks) (ii) Software (5 Marks)...	Homework
what is the relationship between the Australian and British flag?	Non-business
since I am a kenyan citizen what is it required of me to secure a place in one of the above mentioned universities	Non-business

### Business Questions

Human coder's subjective judgments were used to classify messages as "business" or "not business. When evaluating messages, coders read through each conversation in order so that

contextual information from the conversation could be used to improve the quality of the classification scheme. Broadly, messages were classified as “business” if they were related to an entrepreneur’s current or prospective business activities, or brainstorming ideas for a new business. General guidance for this classification includes the following:

1. The intent behind asking the question can be traced back to business needs.

Example Questions:

- a) *I own a business in Nairobi selling ladies bags. The sales are slow. How do I increase my sales?*
- b) *I have chicken they produce alot of eggs, hatching is not a problem but when the chicks finishes one week approximately they start to die in masses. What can I do to make them have a healthy life?*

2. The user mentioned an existing business or intent to start/ideation about another business.

Example Questions:

- a) *Hello business mentor, it's [REDACTED] from Nakuru and my question is how does hopeless thinking affect my finances?*
- b) *What do I do. I am broke?*

## **Homework Questions**

Homework questions are those questions that human coders consider (given the context of surrounding questions) to be answering an exam or assignment. Some of these questions have key identifying information that is characteristic of homework questions like the presence of points awarded.

## **Other Questions or Not a Question**

These include questions on non-business related issues and text that is not a question. For example, questions focused on personal life or general questions users ask about politics. It also includes text that appears to be accidentally sent to the AI mentor but is clearly not a question.



## Resolution Process for Question Category Label Discrepancies

The raters reconciled any discrepancies by re-classifying messages that received conflicting classifications. We provide examples of this reconciliation process below. In the first example, rater 1 classified “What is petty cash book?” as not a business question, while rater 2 classified it as a business question. When a discrepancy occurred, the raters re-classified questions collaboratively using the following ad-hoc approach: First, each rater gives the motivations behind their original classification. Then, to obtain a more comprehensive understanding of the question in dispute, the raters re-examined both the sequence of messages that preceded and those that superseded the focal message, as well as the corresponding AI mentor responses. With a clearer understanding of the surrounding messages and the circumstances, the resolution process ends with a consensus-based final message classification.

<b>Question</b>	<b>Rater 1</b>	<b>Rater 2</b>	<b>Resolution</b>
what is a petty cash book?	Non-Business	Business	Business
I had a customer today who paid half the money but did not say when they were going to finish the pay. How do I get a date or assurance of payment?	Business	Non-Business	Business
how often should you review and update your tone of voice to align with your evolving brand identity?	Business	Homework	Business
what are advantages of entrecomp in entrepreneurship	Non-Business	Business	Business
what is the best type of sawdust to use. is it from hardwood trees or softwood trees?	Business	Other	Business

## Quality Rating Protocol

Business messages were also annotated with a quality rating of {Low, Medium, or High}. As with the category rating described above, quality ratings were made holistically based on the quality of the question situated within the broader context of the conversation between the AI mentor and the participant. As a result, very short questions were not necessarily rated as low quality, and very long questions were not necessarily rated as medium/high quality. In the case of quality label discrepancies, the resolution process described above in detail was followed.

In what follows we provide examples of messages that were given different quality ratings, and outline common characteristics of Low, Medium, and High quality questions. Note that these are heuristic guidelines, as opposed to definitive rules that were used while making the classifications.

<b>Text</b>	<b>Rating</b>
how should I set price that can fit for all clients?	Low
maximize profit	Low
how to increase customer relations	Low
how can I improve my sales per day	Low
I want to get more yield from my small poultry farm of 10 chicken. what should I do?	Medium
I have been selling honey but the profits are going low due to more people doing the same business in my area. What else can I sell together with honey to get more profits and attract more customers?	Medium
what is the best business to start with a capital of 10,000?	Medium
which species of maize can be grown in low rainfall areas?	Medium
I own a small Tailoring shop in Nairobi area with a few clients in a day. I am looking on ways to promote my business. I have talked to a few friends about the business. What are some ways that can help me grow my business??	High
I own a hardware shop in Nakuru town. I serve customers with wide range of building materials. I have done delivery services in an attempt to attract more customers. What are the other ways that I can do to attract more customers into my hardware shop?	High
I have capsicum bell pepper which I am planning to plant on my 50×20 very soon as it matures from my seedbed. How do I plant capsicum bell pepper and how do I make high yields?	High

## Low Quality

Low-quality questions generally had the following features:

- The message is not coherent and logical.
- No information about the business context and setting is provided.
- The AI Mentor will be unlikely to understand and effectively answer the question.

## Medium Quality

Relative to a low-quality message, medium-quality messages tended to have the following characteristics:

- The question is slightly more coherent and logical.
- Some information about the business/setting is provided. Contextual information about the problem the entrepreneur is facing may be provided, but with limited detail.
- The AI Mentor will be more likely to understand and effectively answer the question.

## High Quality

Relative to low and medium-quality questions, high-quality questions had following characteristics.

- The message is comprehensive, i.e., it is self-sufficient and does not require additional information for contextual understanding.
- Detailed information about the business and setting is provided.
- When relevant, messages may provide information on what the entrepreneur has already tried.
- The AI Mentor is very likely to understand and effectively answer the question.

Note again that high-quality questions may be short and well-defined conceptual questions; they are not necessarily longer than low or medium-quality questions.

# J Word Embedding Analysis of Question Challenge Focus

To generate our “challenge-focused” measure, we first generated a 1,536-dimensional word embedding vector for each question sent to the AI mentor using OpenAI’s ada-002 model. While these vectors tell us where each question sits in semantic space, they do not reveal if the question is focused on fundamental business challenges or not. To measure the extent to which any particular question is focused on difficult-to-fix business tasks, we first calculate the word embedding vectors corresponding to two benchmark questions covering similar topics, one of which is written from the perspective of a business facing difficult questions and one of which is written from the perspective of an business that is experiencing success. The benchmark question for struggling businesses is:

My business is really struggling and facing major challenges. There is lots of competition and its hard to raise capital. Everything is really tough and there are lots of constraints. I need help trying to fix these major problems from financing constraints to having no time to no one wanting to buy my products in order to turn my business around and hopefully find some success. I am not getting paid, my profits are less than my expenses, and I feel stuck. I have basically no customers and have a hard time finding more clients.

whereas the benchmark question for successful businesses is:

My business is doing well but I want to start growing and improving even more. I want to expand and raise more capital, it could be debt equity or microfinance, to make my business thrive. It is hard work, but I think there is a lot of possibility for my business. I need help trying to hire more people, improve my prices, costs and budgeting, and market my business and get some financing to become an even bigger success. I am making money but think I have the potential to make even more. I have some customers but think I can get even more.

We proceed to project the vector representing each business question in our sample onto the line connecting the pair of vectors representing each benchmark question. Since both

benchmark questions cover similar topics, their corresponding vectors should occupy similar positions in semantic space, making it possible for us to isolate the extent to which each question in our data is about challenging tasks and circumstances. Table A6 and Table A7 show examples of questions that were rated as above- and below-median on our *challenge-focused* measure, respectively. It is apparent that this measure is not merely capturing differences in, e.g., how finance or customer focused a question is; there are examples on both ends of the spectrum covering each topic. This fact suggests that our *challenge-focused* measure is indeed capturing differences in whether a question is focusing on fundamentally challenging and difficult business tasks.

Using this *challenge-focused* measure, we are able to run regressions that test whether low performers are more likely to ask challenge-focused questions. In Table A8 we report four regressions that are estimated on the subset of questions that are above-median-length.<sup>20</sup> In all models the dependent variable is our *challenge-focused* variable. In Model 1 we run the regression at the message-level and cluster standard errors at the entrepreneur-level. We find high performers (above median) asked questions that were -0.247 standard deviations less challenge-focused; this relationship is statistically significant. Model 2 collapses the data down to the entrepreneur-level by focusing on the least challenging question each entrepreneur asked.<sup>21</sup> Model 2 yields similar results to Model 1; high performers asked questions that were -0.215 standard deviations less challenging; this relationship is also statistically significant. Models 3 and 4 use a continuous measure of baseline performance and yield similar results. All models control for the logged number of words in the question.

In Table A9, we show that the findings in Table A8 hold when we use questions of all lengths, as opposed to only questions that are above-median-length. While in Models 1 and 2, the relationship between binarized baseline performance and our *challenge-focused* measure is no longer significant, the sign is still negative. Furthermore, the relationship

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<sup>20</sup>Many questions in our data are quite short, often because they are following up an earlier, longer question. Because of this, we initially focus our analysis on questions of length greater than or equal to 14 words, the median question length in our data. These longer questions provide enough semantic context to generate reliable embedding vectors.

<sup>21</sup>Given that entrepreneurs can ask multiple questions, it is possible that they ask an especially hard question, realize it is beyond either their or the AI mentor’s capabilities, and then turn to an easier question where the AI mentor can provide useful advice. This suggests focusing on each entrepreneur’s least challenging question is appropriate.

between baseline performance and our *challenge-focused* measure becomes significant again in Models 3 and 4 when we use the continuous, rather than binarized measure of baseline performance. Unlike the models reported in Table A8, in these models the coefficient on the logged number of words is negative and extremely significant. In other words, shorter questions are more likely to be marked as more challenging. While potentially concerning, the fact that the relationship between baseline performance and question difficulty is consistent across the models reported in Table A8 and Table A9 suggests that our results are not simply an artifact of question length.