The Good Wife? Reputation Dynamics and Financial Decision-Making Inside the Household*

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Abstract

We study the dynamic relationship between women's intra-household reputation and investment decisions. We consider household investments delegated to the wife in settings where wives perceived to be savvy investors by their husbands are entrusted with a larger budget share. We show, first theoretically, then empirically in a series of experiments in Malawi, that a signaling game can result, in which wives, in order to maintain control over a larger share of the budget, (a) under-invest in novel goods with unknown but high expected returns; and (b) knowingly over-use low-return goods in order to hide bad purchase decisions—we call this the *intra-household sunk cost effect*. These dynamics have important implications for women's well-being as well as for the design of poverty alleviation programs.

Keywords: Intra-household model, Signaling, dynamic games, experiment, technology adoption. JEL code: D13, J16, O12.

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1 Introduction

Many women worldwide rely on spousal transfers for general household expenditures. This is especially true for women in low-income countries, where women's earnings are limited by a number of factors such as labor-intensive home production (Jayachandran, 2015). Little is known about what drives the size of such transfers and women's discretion over how to spend them. The literature attributes differences in transfers to differences in the spouses' outside options (Manser and Brown, 1980; Chiappori, 1988, 1992). This paper studies the role of information asymmetries and women's intra-household reputation. In particular, we examine whether the size of discretionary transfers is driven in part by the husband's beliefs that the wife will utilize their allowance wisely, and how this creates incentives for wives to maintain their reputation as expert investors—even at efficiency costs to the household.

We study the role of women's intra-household reputation both theoretically in a signaling model and empirically in a series of experiments involving over 2,600 spouses in rural Malawi. The key intuition for the reputation dynamics we study is the following. If the husband only gives an allowance to his wife if he believes her to be a savvy investor, then the wife has the incentive to distort information about her real investment expertise. In particular, the wife may: i) under-invest in risky but potentially high-return goods to avoid non-savvy purchases of unproductive goods ("lemons"), and ii) exert costly effort to hide that she has purchased a lemon. Thus, women's reputation concerns may limit their willingness to try out new technologies or abandon non-productive technologies. This has important implications for understanding women's agency and well-being, as well as for designing effective anti-poverty programs such as technology adoption campaigns.

We propose a signaling game in which the husband decides whether to make a discretionary transfer ("allowance") to the wife, and the wife decides on which household goods to spend these funds and whether to exert effort to use the goods after purchase. The wife can purchase either a safe good or a risky good. The safe good has a known usage return. The risky good can have either high or zero usage return—for example, a new cookstove advertised as more efficient could truly be more efficient, or it could be no better than the existing one; likewise, a crop advertised as drought resistant could truly withstand adverse weather conditions or not. Wives vary in their expertise at assessing the return of risky goods: Expert wives are able to discern the return of a risky good before purchasing it; non-expert wives only learn the return of the risky good after purchasing it. The husband's outside options are such that he is better off giving an allowance to his wife only if she is an expert wife. However, he does not directly observe the return on the investments and thus cannot directly detect investment mistakes. Instead, he learns about his wife's expertise by observing his wife's investment and usage decisions.

We show that two distortions may arise in this environment: under-investment in potentially high-return goods and over-use of zero-return goods (lemons). The first distortion is that non-expert wives under-invest: even if the risky good has a higher return in expectation than the safe good, non-experts do not systematically invest in it, because such an investment pattern would reveal that they are not able to discern high-return goods from lemons. The second distortion is that non-expert wives pay effort costs to use zero-return goods and hide that they purchased a lemon. This rationalizes a behavior empirically equivalent to the sunk cost fallacy, the tendency to follow through on an endeavor after having invested time, effort, or money into it. The relative importance of these two distortions depends on the cost of hiding the purchase of a lemon. If the cost of hiding is low (for example, it is possible to pretend a new stove is efficient by hiding how much firewood is collected and used), non-experts under-invest and hide their investment mistakes. If the cost of hiding is high (for example, it is quasi-impossible to hide that a manual irrigation pump does not have enough suction depth to be useful on one's land), non-experts under-invest even more (completely shying away from risky investments) but do not hide investment mistakes.

To test the model, we run three experiments in Southern Malawi to first examine the basic mechanisms of the model, and then show that these mechanisms impact real-world behavior.[1] The *transfer experiment*, a lab-in-the-field experiment with 1,093 husbands, shows that husbands take into account their wives' level of expertise when deciding how much money to allocate to them. The *signaling experiment*, a lab-in-the-field-experiment with 1,093 wives, shows that wives are willing to incur substantial financial losses in order to preserve their reputation inside the household. The *market experiment*, a field experiment with a new sample of 675 wives shopping at local markets, shows that wives are less willing to invest in novel goods that could damage their intra-household reputation.

The *transfer experiment* is designed to test whether husbands' transfer decisions are influenced by their perceptions of their wives' expertise. In the experiment, husbands play a dictator game with a multiplier with their wives. We randomly assign husbands to either a "salience" or control treatment. Husbands in the salience treatment are asked to recall examples of their wife's (potential lack of) market expertise right *before* the transfer decision and husbands in the control treatment right *after* the transfer decision. Consistent with the model premise, we find that the salience treatment substantially decreases transfers to wives perceived as non-experts.

The *signaling experiment* is designed to test whether women internalize reputation concerns in their decisions. We ask wives to first play a quiz discerning high- from low-quality goods (e.g., natural sponge vs. plastic sponge) and then to decide (without knowing their actual score) i) whether to share their quiz scores with their husbands in

[1] All experiments were pre-registered in the AEA RCT Registry (#4069).

exchange for additional survey compensation ("investing"), and ii) how many quiz answers to correct at a given hiding fee before sharing the score ("hiding"). We randomly assign wives to different hiding cost treatments before making their investment decision. Consistent with the model predictions, we find that wives expecting a lower score ("non-experts") invest as often as experts but pay to hide mistakes when the cost of hiding is low; and invest significantly less and do not hide mistakes when the cost of hiding is high. The resulting inefficiency cost is quite large: Non-expert wives forgo 125 MWK in experimental earnings on average—about 36% of daily income. Specifically, 35% of non-expert wives do not invest at all (i.e., they request that we do not share their score with their husband, and thus forgo the additional compensation), and 24% invest but pay to hide mistakes.

The *market experiment* is designed to test whether real-life investment decisions of non-expert wives are influenced by reputation concerns. In a field experiment with a new sample of married women shopping alone at local markets, we elicit women's willingness to exchange some of their experiment compensation for an unfamiliar good with high returns—which we explain to the women using scientific evidence. We experimentally vary whether the husband will know that the good is high-return, by attaching an "effectiveness" sticker to the good, and whether the husband will know that the wife received the good for free, by attaching a "donated" sticker to the good. Consistent with the model predictions, non-expert wives, when compared to expert wives, have a 25% lower willingness to pay for the good absent any sticker; but this gap disappears if either of the two stickers removing the reputation risk is attached.

The behaviors observed in the experiments appear to be driven by real-life concerns about resource allocation, rather than experimenter demand effects. The model predicts that reputation concerns only affect behavior in households in which the wife's reputation is still above the threshold above which discretionary transfers occur. Consistently, across all three experiments, the patterns predicted by the model are observed only in couples in which monthly transfers from the husband to the wife are still high (above median), that is, couples where reputation dynamics are still at play.

Our experimental results show that women's reputation within the household matters. Transfers from husbands are influenced by their wives' reputations, and women forgo substantial payments as well as valuable investments to maintain their reputations. Our empirical evidence comes from a specific setting, but the mechanism in the model could be at play in rich and poor households alike. For instance, a California husband might continue using the yogurt maker that produces tasteless yogurt in order to maintain his reputation as an investor—and be able to buy a Sourdough bread maker in the future. The model could also apply to parents and teenage children, or international migrants and those receiving their remittances. We see the dynamics we model as particularly consequential for poor households in low-income countries, however, where the subordinate position and financial dependence of one spouse relative to the other is still common and exacerbates the issue.

The intra-household dynamics we bring to light theoretically and empirically may be one of the factors behind the low take-up of new technologies targeted at women, such as preventative health products (Cohen and Dupas, 2010; Meredith et al., 2013), improved cookstoves (Berkouwer and Dean, 2021), and so on. They could for example explain the experimental finding that marketing antimalarial bednets in the presence of both spouses increases the purchase rate by 7ppts (+20%) compared to targeting either the wife or the husband alone (Dupas, 2009). Understanding the extent to which intra-household dynamics influence the ability of women to experiment with new technologies is an important step towards understanding the types of policies and programs that can influence adoption. In particular, our findings suggest that marketing campaigns promoting new technologies specifically to women, as many non-governmental organizations do, may generate negative consequences for women who face reputation risks when asked to make investment decisions on behalf of their household.

The paper studies the impact of information asymmetries on the allocation of resources within the household. As such, it connects to the vast literature on bargaining within the household started by Manser and Brown (1980) and Chiappori (1988, 1992). The main friction considered to date in this literature is limited commitment, with transfers within the household determined by the outside options of both spouses. As Doepke and Tertilt (2016) wrote, "An alternative friction that so far has received much less attention is private information within the household." Hiding of income (Hoel, 2015; Boltz et al., 2016), spending (de Laat, n.d.), and savings (Anderson and Baland, 2002; Ashraf, 2009; Dupas and Robinson, 2013; Schaner, 2015) have by now been well documented. A nascent literature has considered the implications of different preferences on information diffusion within the household (Apedo-Amah et al., 2020; Ashraf et al., 2022). Our paper focuses on private information about *skills*, and ensuing reputation dynamics inside the household. Reputation concerns within the family have previously been proposed in the interaction between parents and children: parents can have a strategic incentive to act "tough" with older children in order to build a reputation as non-lenient, and thereby dissuade later-born children from misbehaving, for example, studying too little (Hao et al., 2008; Fu and Pantano, 2015; Hotz and Pantano, 2015). We bring to the fore the fact that reputation mechanisms between spouses can affect decision-making and behavior, and may matter for the design of social policies.

By considering information asymmetries and reputational dynamics, this paper also connects to the literature on dynamic signaling (Noldeke and van Damme, 1990; Swinkels, 1999; Kremer and Skrzypacz, 2007) as well as to the one on incentives in organizations and markets (Dewatripont et al., 1999; Bar-Isaac, 2003).

In addition, the model rationalizes a behavior that is observationally equivalent to the sunk cost fallacy—the greater tendency to continue an endeavor once an investment in money, effort, or time has been made (Arkes and Blumer, 1985). Under standard economic models, this behavior is irrational: once the expense has been incurred, it should be irrelevant to the decision to go on or not. The idea that such behavior may be driven by the rational need to save face when future payouts are at stake has been previously modeled in the context of firm managers by Kanodia et al. (1989) and Prendergast and Stole (1996). To our knowledge, we are the first paper to show the existence of such a phenomenon in a setting where the cost of hiding private information is borne by the agent (the wife)—while in the firm setting, the escalation costs are borne by the principal (the firm).

The remainder of this paper is structured as follows. Section 2 presents the existing evidence that motivated the paper. Section 3 presents the model and derives a set of testable predictions. Section 4 presents the empirical setting. Sections 5, 6, and 7 describe the transfer, the signaling, and the market experiment, respectively, each testing different theoretical premises or predictions. Section 8 tests for heterogeneity by the size of the discretionary transfers from the husband to the wife, and section 9 concludes.

2 Motivating Evidence: Intra-Household Dynamics and Technology Adoption

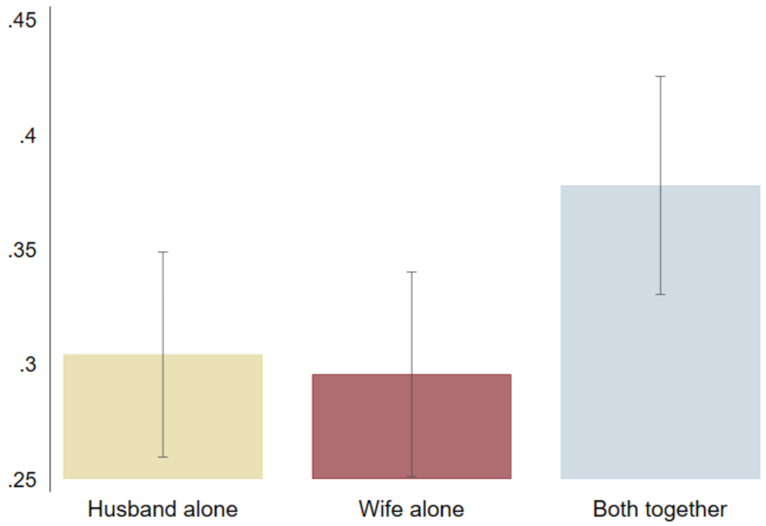
Low adoption of technologies that can help improve health (e.g., bed nets or water treatment products), reduce effort costs inside the household (e.g., efficient cookstoves), or increase agricultural yields (e.g., high-yield seed varieties) has been well documented in resource-constrained settings.[2] The literature so far has focused on a number of explanations for why adoption of these products is low despite their returns seemingly far outweighing their costs: lack of information (Hussam et al., 2021), liquidity constraints (Cohen and Dupas, 2010; Tarozzi et al., 2014; Berkouwer and Dean, 2022), inattention (Berkouwer and Dean, 2022) and procrastination (Banerjee et al., 2010). These explanations treat the household as a unit. However, in many contexts, it is actually the case that *husbands* are responsible for income generation for the household while *wives* are responsible for adoption decisions for the household. These intra-household dynamics may contribute to the low adoption of certain household production technologies. In this section, we revisit patterns from two randomized experiments that suggest the plausible importance of these intra-household dynamics in explaining low technology adoption.

The first experimental study we revisit is Dupas (2009), which investigates the willingness to pay for a new type of antimalarial bed nets. In the experiment, households were randomly assigned to a given price (the focus of Dupas (2009)'s analysis). In addition, either the wife

[2]See Dupas and Miguel (2017) and Magruder (2018) for reviews in health and agriculture, respectively.

alone, the husband alone, or both spouses together were randomly selected to receive the opportunity to buy the bednet at the randomized price. Specifically, the household received a visit from an NGO officer who asked to speak to the pre-selected spouse(s). That spouse was administered a detailed survey, then received information about a new type of antimalarial bed net not yet available in the market, a long-lasting insecticide-treated net branded as "Olyset®," described as more effective than older generation bed nets. Finally, a voucher for a subsidized Olyset® was then given to the spouse. For households sampled to the "both spouses together" treatment, each spouse was administered a survey in turn, then they were brought together to discuss the Olyset® and jointly receive the voucher.

Figure 1: Bed Net Investment Decision in Kenya (2007)

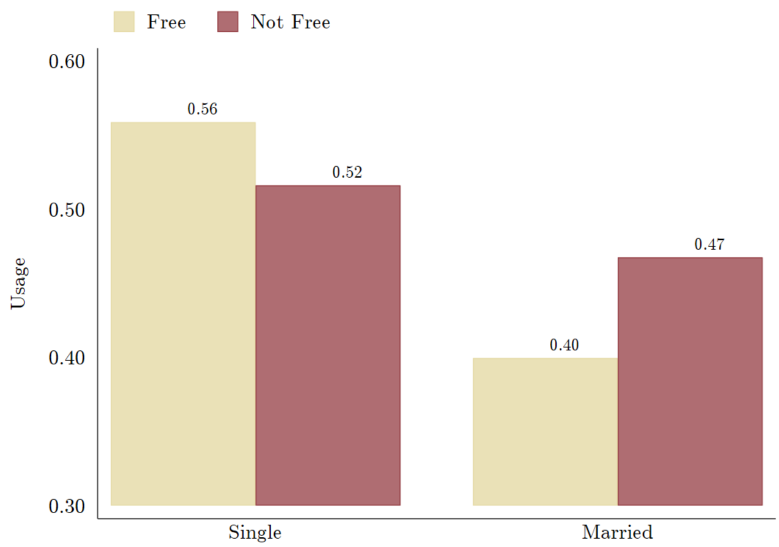


Notes: Data from Dupas (2009). The experiment took place in Kenya in 2007. The sample is limited to households who had to pay a non-zero price for the bed net (N=1,222). The spouse offered the voucher was randomized.

Figure 1 shows how take-up of the bednet was significantly higher (by 7 percentage points, or 20%) among households randomized to the "both spouses together" treatment. This is despite the fact that all households had three months to redeem their voucher, i.e., there was plenty of time for those in the "wife alone" or "husband alone" treatment groups to inform their spouse of the opportunity. In particular, women in the "wife alone" group had ample time to attempt to convince their husband to give them money for the new product, and men in the "husband alone" group had ample time to ask their wife if this was something she thought he should invest in. The fact that take-up is higher only when *both spouses* were present at the time the NGO representative delivered the voucher and endorsed the product (hence both received the same information) is consistent with a model in which wives face a reputation risk when returns are uncertain for either of the two spouses and wives are expected to cast the deciding vote.

The second experimental study we revisit is Ashraf et al. (2010), which investigates the usage of a water treatment product (called 'Clorin'). In the experiment, female heads of households who were willing to purchase Clorin were randomly offered a discount for the product. As a result, holding constant their initial willingness to pay, some women got the product for free while others had to pay a positive amount. Ashraf et al. (2010) use this design to test for the sunk cost fallacy and fail to find any evidence that those who ultimately had to pay more were more likely to put the product to use. In Figure 2, we focus on women for whom Clorin was a new product they had never used before and perform the sunk cost fallacy test separately for single and married women. A striking contrast emerges, with evidence consistent with the sunk cost fallacy for married women (they were more likely to put the product to use if they had to pay some non-zero price for it). This could be suggestive that the sunk cost fallacy operates *at the household level*: married women feel compelled to use the Clorin for which they paid in order to "justify" their purchase, even if the product appears not well suited for their household. Indeed, more than half of married women who got the Clorin for free report *not* using it at the follow-up visit—this is consistent with the finding that many households dislike the chlorinated taste that can result from water treatment (Dupas et al., 2023). The fact that the usage rate increases by 7 percentage points when married women paid a positive price for the product suggests that these women use Clorin despite disliking the taste. There is no such effect of the price on single women—in fact, single women are somewhat less likely to use Clorin they received for free.

Figure 2: Clorin Usage in Zambia, by Final Price paid



Notes: Data from Ashraf et al. (2010). The graph shows adjusted means from OLS regressions with Huber-White robust SEs. The experiment took place in Zambia in 2006. The sample is limited to women with no prior experience using Clorin and who expressed willingness to pay the initial price quoted (N married=388, N single=88). The final price was randomized.

Of course, single and married women may differ in many dimensions. Hence the finding that price has a differential impact on their usage patterns, while suggestive of a potential intra-household sunk cost fallacy, could reflect some other differences between these two types of households. In the next section, we generate testable predictions for a formal model, and in the rest of the paper, we describe experiments specifically designed to test these predictions.

3 A Signaling Model with Endogenous Budget Allocations

We consider a set-up with two spouses (we call them "husband" and "wife"). Each period, the husband chooses whether to make a transfer to the wife, which she uses to buy goods for shared consumption.[3] If the wife receives a transfer, she chooses whether to buy a safe good or a risky good. The safe good has a fixed return, while the return of the risky good may be high (productive good) or low (unproductive good). The wife is one of two private types: expert and non-expert. The expert wife observes the productivity of the risky good before purchasing it. The non-expert wife observes the productivity only after the purchase. After buying the good, the wife decides whether to use it or not. Using an unproductive risky good entails a cost for the wife—this is the hiding cost (for example, pretending a new stove is efficient by hiding how much firewood is collected and used). The husband observes the purchasing and usage decisions of the wife, but not the productivity of the good. He updates his beliefs about the wife's type—her reputation—and the game moves to the next period. To keep the intuition as clear as possible, the model has only two periods.[4]

3.1 Setup

Wife Types As investors, wives can be either experts or non-experts, $\theta \in \{E, NE\}$. A wife's expertise is private information to the wife (she learned it through experimentation before marriage).[5] The husband's prior belief that the wife's type is E is $P_1 \in (0,1)$.

Game Structure There are two periods: $t \in \{1,2\}$. The timing in each period is:

1. The husband decides whether to make a transfer or not, $T_t \in \{0,1\}$.

[3] We consider this transfer as an allowance the wife receives *in addition* to the consumption share of the wife determined by outside options. However, our model also generalizes to a model of altruistic preferences, in which the husband makes a transfer to the wife, which she uses to buy goods for private consumption.

[4] An alternative modeling choice in games that are played so frequently that the horizon approaches only very slowly and is thus ignored (i.e., it does not enter people's strategic calculations) is an infinite horizon (see section 4.1. in Mailath and Samuelson (2007). We sketched an infinite-horizon model (available upon request) that we conjecture generates identical predictions.

[5] With many different types of goods, wives might be experts in some domains and non-experts in others, e.g., a wife could be an expert in farming investments but not in health investments. Thus, one should think of the model as applying to each domain separately, i.e., the husband decides independently whether to make transfers for farming purchases and whether to make transfers for health purchases.

2. If $T_t = 0$, the period ends.

3. If $T_t = 1$, the wife decides whether to buy the risky good, $g_t \in \{0, 1\}$.

4. If $T_t = 1$ and $g_t = 1$, the quality of the good is revealed to the non-expert wife.

5. If $T_t = 1$ and $g_t = 1$, the wife decides whether to use the good that she bought $e_t \in \{0, 1\}$.

6. The husband observes the wife's choices and updates his belief about her type, P_{t+1}.

Beliefs are updated using by Bayes rule whenever possible.

Choices In each period, the husband chooses between making a transfer $T_t \in \{0, 1\}$ to his wife and investing himself in a project that has value ω for himself and 0 for the wife.[6] This transfer is in addition to a basic transfer determined by outside options as in the bargaining literature, which we normalize to zero.

If the wife receives the transfer, she makes two binary choices: an investment choice, and an effort choice. Specifically, the wife decides whether to invest in a safe good, $g_t = 0$ (e.g., a well-known grain, medicine, or food, or possibly even just savings), or a new risky good, $g_t = 1$ (e.g., a new grain with potentially higher returns, a new medicine advertised to have fewer side effects, or a new food advertised to be more nutritious).[7] The safe good has a fixed value (productivity) η^S. The risky good has a value $\eta_t^R \in \{0, \eta^R\}$. η_t^R is independent across periods, and $\eta_t^R = \eta^R$ with probability $\lambda \in (0, 1)$. The husband observes η_t^R only at the end of the two periods.[8] The expert wife observes η_t^R before the purchase decision, while the non-expert wife observes η_t^R after the purchase decision. We denote the value of the purchased good η_t, so $\eta_t = \eta^S$ if $g_t = 0$ and $\eta_t = \eta_t^R$ if $g_t = 1$.

The final returns of the investment of the wife are: $y_t = \eta_t e_t$. This means that the final return of investing in the safe good or in the risky good with high productivity ($\eta_t = \eta^R$) is equal to $y_t = \eta_t$ only if the wife uses the good, while a risky good with low productivity ($\eta_t = 0$) has a return equal to 0 regardless of whether the wife uses it or not.

The utility of the good depends on its value and on the wife's usage decision. Using the safe good or the productive risky good does not entail any costs. Using the unproductive risky good requires the wife to bear a cost $c > 0$.

[6]The investment of the husband if he keeps the transfers can be either in a public or in a private good. The evaluation of the value for the wife being 0 is a normalization. The key assumption is that the value of not receiving the allowance is *lower* for the wife than that of receiving the allowance. This assumption reflects the substantial evidence that husbands and wives make different public goods investments (e.g., children's education,Thomas (1990, 1993); Duflo (2003) and, thus, the wife prefers to have direct control over the allowance (see Afzal et al. (2022) on demand for agency in the household).

[7]We assume that the types of goods for which wives receive transfers relate to specific purchases/types of investment for which women have a comparative advantage (due to, e.g., differences in information or differences in the opportunity cost of time). This implies that husbands never purchase such goods themselves.

[8]The assumption that the productivity of the good is not immediately observable to husbands is not as extreme as it may seem: as will become clear later, goods whose low productivity can be observed over time are considered to have very high hiding cost, i.e., they are too costly to hide, so they will not be purchased in equilibrium.

Payoffs We present here the pay-offs of the complete information benchmark. Both spouses enjoy the utility of the goods, but only the wife bears the cost of usage. The husband's utility in each period is

$$U_t^H = \begin{cases} y_t \text{ if } T_t = 1 \\ \omega \text{ if } T_t = 0 \end{cases}$$

where ω is the husband's outside option.[9] The wife's utility each period is

$$U_t^W = \begin{cases} y_t \text{ if } T_t = 1, \eta_t \neq 0 \\ -ce_t \text{ if } T_t = 1, \eta_t = 0 \\ 0 \text{ if } T_t = 0 \end{cases}$$

The total utility is a discounted sum of period utilities:

$$U^i = U_1^i + \beta U_2^i$$

Finally, although the husband receives utility in each period, we assume that he only observes the total utility at the end of the game. As a result, the husband learns about the wife only through her choices and not through his experiences with the purchased goods.

Strategies We formally define the strategies of the husband and both types of wives in appendix A.1. We focus on Perfect Bayesian Equilibria, which require sequential rationality and the beliefs to be determined by Bayes' rule whenever possible. We solve the model by deriving optimal strategies for all possible starting priors.

Assumptions We impose the following assumptions on the parameters of the model:

1. $\beta \geq \frac{\lambda\eta^R - \eta^S}{\lambda(\omega - \lambda\eta^R)}$
2. $\lambda\eta^R > \eta^S > 0$
3. $\omega > \lambda\eta^R$, $\omega < \lambda\eta^R + (1-\lambda)\eta^S$

These assumptions ensure that the model captures the empirical context. Assumption 1 states that the wife is sufficiently patient and hence has reason to care about her reputation.[10] It also ensures that the husband always prefers to have a wife with a higher reputation. Assumption 2 states that the risky good is better than the safe good in expectation, and both are useful.

[9] To focus on the role of reputation concerns, we assume that the outside option of both spouses is constant. This assumption implies that the bargaining power of the two spouses is constant apart from the reputation dynamics analyzed in the paper.

[10] It implies that $\beta\lambda\eta^R(1-\lambda) \geq \lambda\eta^R - \eta^S$, which affects the wife's strategy at intermediate levels of costs, as we discuss below.

[11] Assumption 3 states that the husband's outside option is better than the safe or the risky good in expectation, but worse than buying the risky good if and only if it is productive. As a result of this assumption, the husband prefers to make the transfer if he knows that the wife is an expert and not to make the transfer if he knows that the wife is not an expert.

3.2 Analysis

Optimal Strategies Without Reputation Concerns and Household Optimum We first consider the strategies that must be played in any equilibrium at $t = 2$. This will be useful for further analysis. These strategies also serve as a benchmark for the behavior of spouses when there are no reputation concerns. Since this is the last period of the game, the wife does not care about her future reputation.

Lemma 1. *For any hiding cost, in any equilibrium, at $t = 2$, the expert wife invests in the risky good if and only if it is productive; the non-expert wife always invests in the risky good; the husband makes a transfer if the reputation is above a threshold, does not make a transfer if it is below that threshold, and is indifferent if it is exactly at the threshold.*

The proof is provided in appendix A.2. Intuitively, without reputation concerns, everyone plays their static optimal action. The expert wife buys the risky good whenever it is productive. The non-expert wife always buys the risky good because it gives a higher payoff in expectation. The husband compares the expected payoff from making the transfer with the outside option. The expected payoff depends on the wife's reputation. The reputation level that equalizes the expected payoff and the outside option is the threshold.

Finally, we consider the spouses' first-best actions that maximize household welfare (the weighted sum of the utilities of both spouses) without reputation concerns or uncertainty about the wife's type. As discussed above, the equilibrium strategies of both types of wives without reputation concerns correspond to their first-best actions as they maximize household welfare conditional on the transfer. The first-best action of the expert wife (investing in the risky good if and only if it is productive) implies that transfers to the expert wife maximize household welfare for any welfare weight placed on the wife as $\lambda\eta^R + (1-\lambda)\eta^S > \omega$ by assumption. The first-best action of the non-expert wife (always investing in the risky good) implies that transfers to the non-expert wife maximize household welfare for any welfare weight $\geq \frac{\omega-\lambda\eta^R}{\omega}$ (in which case the household welfare with the transfer, $\lambda\eta^R$, is at least as large as the household welfare without the transfer, $\leq \left(1-\frac{\omega-\lambda\eta^R}{\omega}\right)\omega$).

[11] We impose assumption 2 because it fits the low take-up of high returns goods discussed in section 2 and because, for ethical concerns, we wanted to offer only high-return goods in our experiments. However, the reputation dynamics we highlight are at play even in the opposite scenario (i.e., if this assumption is reversed). Assumption 2 also implicitly assumes risk neutrality in order to study a new mechanism that is unrelated to risk preferences. However, we control for risk preferences across all three experiments.

Optimal Strategies Under Reputation Concerns Next, we consider equilibrium strategies at $t = 1$. These strategies incorporate reputation concerns, so they serve as the basis for testable predictions. The strategy of the expert wife is straightforward because she does not face the risk of losing her reputation from buying the unproductive good. She always buys the risky good if it is productive and the safe good if it is not, which happens at rate λ. Then, she always uses the purchased good on the equilibrium path. The husband's strategy in the first period is also intuitive. He compares the expected payoff from making the transfer with the outside option. The expected payoff from the transfer depends on the wife's reputation. Thus, the husband makes the transfer if and only if the wife's reputation is sufficiently high. The equilibrium strategy of the non-expert wife is more complicated, and it depends on the hiding cost c.

Proposition 1. *Suppose the hiding cost is low. The expert wife buys the risky good if and only if it is productive (this happens at rate λ). She always uses the good. The non-expert wife buys the risky good at a rate of at least λ but less than 1 unless her reputation is very high. She only uses the good if it is productive or if it is unproductive and her reputation is not too low. The husband uses a threshold strategy.*

The proof as well as the formal definition of low hiding cost and of the husband threshold are provided in appendix A.3. When the hiding cost is sufficiently low, the non-expert wife prefers to use the unproductive good even though she bears the hiding cost. She chooses to use the unproductive good because it allows her to maintain a high enough reputation and receive a transfer in the second period. The only exception is when the wife's initial reputation is very low. If using the unproductive good does not help improve the reputation sufficiently, the non-expert wife does not use the unproductive good. When choosing the good, the non-expert wife purchases the risky good at a higher rate than the expert wife. Thus, the purchase of the risky good is a negative signal about the wife's type. In the equilibrium, the non-expert wife balances the cost of lowering her reputation with the benefit of a higher payoff in the first period. She thus does not invest in the risky good with probability 1 unless her reputation is very high. If the non-expert wife was investing in the risky good at a lower rate than λ, then purchasing the risky good would be a positive signal about the wife's type. Coupled with a higher first-period payoff, this would make buying the risky good a strictly better action for the non-expert wife. Thus, non-expert wives would have the incentive to deviate by increasing their investment rate, which would make investing in the risky good again a negative signal about the wife's type. Thus, it is not an equilibrium that the non-expert wife invests in the risky good at a lower rate than λ.

Next, we consider the opposite case of a high hiding cost.

Proposition 2. *Suppose the hiding cost is high. The expert wife buys the risky good if and only if it is productive (this happens at rate λ). She always uses the good. The non-expert* *wife buys the risky good at a rate less than λ unless her reputation is very low. She only uses the good if it is productive. The husband uses a threshold strategy.*

The proof as well as the formal definition of high hiding cost and of the husband threshold are provided in appendix A.4. When the hiding cost is sufficiently high, the non-expert wife does not use the unproductive good, because the cost of using it would outweigh the reputation benefit. As a result, buying the risky good involves a high risk of losing all reputation if the good turns out to be unproductive. Therefore, the non-expert wife prefers to always buy the safe good, when her reputation is high enough.

However, buying the safe good now sends a negative signal about the wife's type and decreases her reputation. As a result, in equilibrium, as the initial reputation decreases, the non-expert wife starts buying the risky good with an increasing probability to ensure that her reputation is high enough to receive the second-period transfer.

Lastly, we consider the case of an intermediate hiding cost.

Proposition 3. *Suppose the hiding cost is intermediate. The expert wife buys the risky good if and only if it is productive (this happens at rate λ). She always uses the good. The non-expert wife buys the risky good at a rate less than λ unless her reputation is very low. She only uses the good if it is productive or if it is unproductive and her reputation is not too low. The husband uses a threshold strategy.*

The proof is provided in appendix A.5. The equilibrium strategies in this case involve the purchasing strategies from proposition 2 (high cost) and the usage strategies from proposition 1 (low cost). As the hiding cost increases from low to high, the purchasing strategies change first and the usage strategies change second: Non-expert wives start shying away from risky investments with costly hiding and ultimately also stop hiding.

3.3 Testable Predictions

In the previous subsection, we showed how in an environment in which husbands observe usage only and hiding is possible, wives' optimal investment strategies vary with the cost of hiding investment mistakes. These results give us predictions that we empirically test through a series of experiments in Malawi. We test the following key premise and predictions for wives whose reputation is not unambiguously high (i.e., whose reputation is not very far away from the threshold across all domains):

Premise 1. *Husbands' financial transfers to their wives respond to their beliefs about their wives' expertise as investors.*

Prediction 1. *When the hiding cost is low, non-expert wives invest no less than expert wives but less than what would be optimal in the absence of reputation concerns (under-investment). When the hiding cost is intermediate or high, non-expert wives invest less than expert wives.*

Prediction 2. *Non-expert wives, conditional on investing, hide investment mistakes when the hiding cost is low or intermediate (over-use of lemons).*

Prediction 3. *The investment rates of all wives maximize present payoffs when reputation is not at stake, i.e., if the wives do not use the husband transfer for the investment or there is no uncertainty about the quality of the risky good.*

Prediction 4. *The husband's transfer choice is not affected by the wife's reputation once the wife's reputation is too low. Non-expert wives whose reputation is below the threshold at which transfers occur in the second period do not invest less when the hiding cost is intermediate or high and do not hide investment mistakes.*

The rest of the paper tests these predictions. We present the empirical setting in section 4. In section 5, we test premise 1 in a lab-in-the-field experiment in which husbands transfer money to their wives and we randomly vary the salience of the wife's market expertise reputation. In section 6, we use a complementary lab-in-the-field experiment to test predictions 1 and 2. We do so by randomly varying the hiding cost and studying investment and hiding for wives. In section 7, we test predictions 1 and 3 in a field experiment involving a real-life purchase decision: we offer an unfamiliar good to women while they are running errands at the market, randomly varying the hiding and reputation costs of the good. Finally, in section 8, we test prediction 4 by testing whether results across all three experiments are driven by couples with high transfers from husband to wife. This also allows us to verify that behaviors in the experiments are driven by concerns over real-life transfers, and not merely experimenter demand effects.

4 Empirical Setting: Couples in Rural Malawi

The transfer experiment and the signaling experiment were done side-by-side with 1,093 married monogamous couples between May and July 2019. The couples were sampled from 36 villages in Neno district, in Southern Malawi. We selected dwellings randomly and enrolled households in which both spouses were available to participate in an hour-long survey administered separately to the husband and the wife.[12] The husband survey embedded the *transfer experiment*. The wife survey embedded the *signaling experiment*. Everything took place at the couples' homes, with one surveyor speaking with the husband while the other spoke with the wife. Interviews were held outdoors and far enough apart to respect complete confidentiality for both spouses.

Table 1 provides some summary statistics on the couples surveyed. The surveys administered included standard questions on household demographics, schooling, and

[12] Enumerators used the "left-hand" rule to sample dwellings, as described in online appendix A.1.

employment, as well as a module on expenditures and budget decisions inside the household, recent transfers from the husband to the wife, and financial literacy. In addition, we elicited respondents' performance on six math questions to test respondents' ability to solve everyday math problems, and on 12 Raven's Progressive Matrices (Cattell, 1963) to measure respondents' reasoning ability.

The couples in our sample have been married for an average of 10 years and have 2.6 children. Husbands are an average of 36 years old, have 6.8 years of education, and have earned an average of Malawian Kwacha (MWK) 29,770 (approx. USD 42) per month in the preceding two months (conditional on working). Wives are an average of 30 years old, have 5.7 years of education, and have earned an average of MWK 10,660 (approx. USD 15) per month in the preceding two months (conditional on working). Husbands report transferring an average of MWK 8,452 (approx. USD 12, 28% of their income) per month to their wives in the preceding two months.[13] Interestingly, both wives and husbands substantially underestimate their spouses' income, suggesting that there are indeed substantial information frictions inside the household.

Table 1: Summary statistics

Variable	Obs	Mean	Std. Dev.
Years married	1092	9.91	8.48
N of Children	1093	2.63	1.56
Husband's age	1093	35.83	10.16
Husband's education	1093	6.77	3.54
Husband's avg. income last two months (MWK, H's report)	1093	29770.05	33075.29
Husband's avg. income last two months (MWK, W's report)	1093	15506.03	23030.8
Wife's age	1091	30.37	8.93
Wife's education	1093	5.68	3.27
Wife's avg. income last two months (MWK, W's report)	1093	10659.82	17556.52
Wife's avg. income last two months (MWK, H's report)	1093	4967.04	10458.39
Avg. transfers (H to W) last two months (MWK, W's report)	1092	4911.73	8097.11
Avg. transfers (H to W) last two months (MWK, H's report)	1093	8451.97	11411.97

Notes: Kwacha values are winsorized at 3SDs. They represent averages over the preceding two months.

[13] Wives report transfers that are half in magnitude, suggesting that they might omit substantial transfers that husbands considered. We thus use husbands' reports of transfers whenever available.

5 Does Reputation Matter for Budget Shares? The Transfer Experiment

5.1 Measuring Market Expertise Reputation

During the survey with the husband, we elicited his beliefs about his wife's market expertise. From this, we construct the wife's Market Expertise Reputation (MER) index, which takes the values 0 to 4, depending on how many of the following questions the husband affirmed: i) his wife has never bought anything that did not work as advertised ("Purchases", 86%), ii) his wife is never tempted by marketing advertisement ("Tempted", 80%), iii) his wife can manage money well compared to other women in the community ("Manage", 70%), and iv) his wife can do calculations correctly in her head when she requests change in the market ("Change", 95%). The distribution of the MER index is as follows: 0.6% of women have an MER of 0, 3.5% have an MER of 1, 13% have an MER of 2, 31% have an MER of 3, and 52% have an MER of 4.

When asked to recall their wife's purchase behavior, husbands were asked to provide examples of instances when the wife was tempted by marketing advertisements and instances when a good purchased by the wife did not work as advertised. Online appendix table B.1 lists 50 randomly selected answer choices for each of those questions. The main "flaw" of non-expert wives appears to be gullibility, in the sense that they get easily fooled by vendors. Examples of direct quotes from the husband surveys include: "She bought a drug that wasn't effective at all. She got carried away by what the vendor was telling her"; "She bought a pair of shoes that were not of the required foot size because a vendor told her it will fit"; "She bought atelic 'super dust' that didn't work"; "She bought second-hand burglar bars, which were painted to conceal the rust"; "She was given short trousers by the vendor instead of a skirt."

Our model predicts that the amount of money a wife receives from her husband is positively correlated with her intra-household reputation as an expert. This appears to be the case observationally, as shown in Table A.1: controlling for husband and wife characteristics, reported average transfers in the previous two months are monotonically increasing in the wife's MER. On average, women with an MER of 0 or 1 receive MWK 8,187, women with an MER of 2 MWK 8,198, women with an MER of 3 MWK 9,031, and women with an MER of 4 MWK 9,497 (column 1). To verify that men transfer discretionary funds to their wives according to a threshold strategy, we define women as "Low MER" if they have an MER of 0, 1, or 2 (17%). Indeed, having a low MER is associated with a decrease in reported average transfers in the previous two months by MWK 1,086 (13%, column 2). These results are unchanged when we control for an indicator that is 1 if the wife has a below-median "General Ability Reputation" (GAR), a mean effects index (see Kling et al. (2007)) of the husband's beliefs of the wife's scores on six math questions and 12 raven matrices (columns 3-4). In column 5, we consider another measure of budget control: whether the husband reports that his wife has access to cash and savings. Here we find a significant, negative, and large correlation with low MER.[14]

The fact that most husbands (83%) believe their wives are experts suggests that either the share of experts in the population is very high, or that men perceive some non-experts as experts as predicted by the model. Nevertheless, the MER as reported by husbands seems correlated with true types: 73% of wives with a low MER report that the statement "I buy things that I later regret because I bought them on impulse" applies to them. This share falls to 61% among wives with a high MER (the p-value of the difference is <0.01).[15]

5.2 The Transfer Experiment - Experimental Design

The observational results above are suggestive but do not nail causation. The correlation between reputation and transfers could be driven by, e.g., recall bias: men who hold their wives in high esteem could be more likely to remember a transfer to their wives. For a clean test of premise 1, we implemented a "transfer experiment" in which we asked husbands to play a dictator game with a multiplier (with their wife as the counterpart), and experimentally varied the salience of the wife's reputation at the time the husband made his choice.

Specifically, in the transfer experiment, husbands were offered to choose what share of their experiment compensation of MWK 600 would be doubled and transferred to their wives. We randomly assigned husbands to either of two versions of the experiment:

- *Salience Treatment:* Husbands played the game at the end of the survey, immediately following the MER module asking them to recall their wife's purchase behavior.
- *Control:* Husbands played the game early in the survey, before the MER module asking them to recall their wife's purchase behavior.

Husbands were explained the dictator game as follows:

"*As promised, we are going to give you 600 kwacha for participating in the survey. Here is the 600, please count it to make sure it's correct. But before you pocket it, I am going to offer you a chance to give some of this 600 to your wife. Here is how it will work. You will choose how much of the 600 you want to give to your wife. Whatever you choose to give her, we will double. So if you give 20 to your wife, we will give her 40 and you keep 580. If you give 400, we will give your wife 800 and you keep 200. [...] If you choose to give money to your wife, she will get it right away. We will not tell her where this money is coming from: We will only tell her that this is part of the survey. If you choose to give 0, we will not tell her anything at all.*"

[14] As we show in the next subsection, our results in the *transfer experiment* are also consistent with an equilibrium in threshold strategies with a threshold MER of 3.

[15] The correlation between high MER and risk-aversion of the wife is close to 0, suggesting that high MER does not simply proxy risk aversion. The results are robust to controlling for a measure of risk aversion.

To reduce the risk of experimenter demand effects, the husband's decision was not observed by the surveyor toward whom demand effects might be largest: husbands privately placed the transfer to the wife in an envelope, which was then handed (with the husband bearing witness) to the surveyor speaking with the wife (without the wife bearing witness).

While our model primitives predict that husbands should transfer less to women with a non-expert reputation in a standard dictator game (as we have already shown they do observationally), we multiply all transfers to the wife to give all husbands an incentive to transfer to their wives. By randomizing how "top of mind" the wife's (potential lack of) market expertise is at the time the husbands make their transfer choice, we can then obtain a causal estimate of the importance of reputation in the husband's allocation decision.

To test this, we estimate the following equation:

$$T_i = \alpha + \beta_1 LowMER_i + \beta_2 S_i + \beta_3 (LowMER_i \times S_i) + \beta_4' X_i + \mu_e + \delta_c + \lambda_v + \epsilon_i \qquad (1)$$

where T_i is the dictator game transfer of husband i to his wife, $LowMER_i$ is a binary variable equal to 1 if the wife's MER score is below 3, and S_i is the assignment of husband i to the salience treatment. ϵ_i are Huber-White robust standard errors. We include enumerator fixed-effects μ_e, compensation fixed effects δ_c, and version fixed effects λ_v (see technical online appendix A.2 for details on what the different compensations and versions are). We show results both without and with a vector of predictive individual controls X_i.

Since we elicited the MER at the same time as we implemented the experiment, we could not stratify the salience treatment by MER level. Nevertheless, within each MER group, treatment and control groups appear balanced (online appendix table B.2).

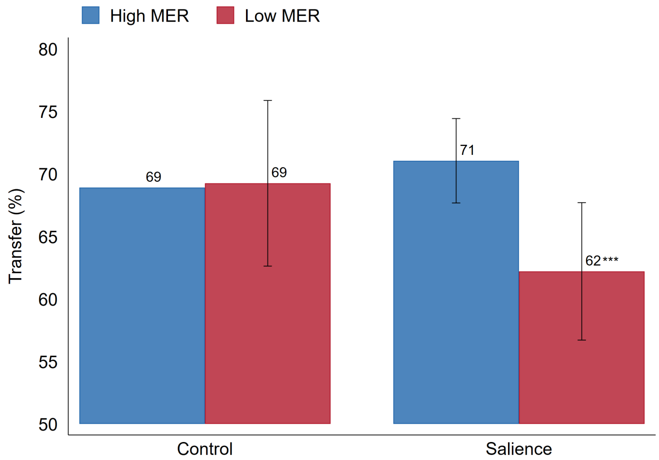
5.3 The Transfer Experiment: Results

Figure 3 presents the results of the transfer experiment. Results in table form are presented in Table A.2. Husbands transfer 69% of the funds to their wives on average—a relatively large share compared to the outcomes of similar games in most other contexts, which are usually not played within couples (Andreoni and Vesterlund, 2001; Andreoni and Miller, 2002; Jakiela, 2013). Making the wife's lack of market expertise salient just before the transfer reduces transfers: the salience treatment decreases the transfer share by 9ppts (13%) among women with a low MER, but it does not change anything for women with a high MER. In other words, the salience module made husbands of low-MER wives think twice and adjust their transfer downward from what it would have been.

We conduct robustness analysis in Table A.2. First, we test for robustness to including controls. Second, we rule out experimenter demand effects by verifying that the salience treatment did not reduce transfers to low-GAR wives. Third, we rule out that anger about their wives' previous investment mistakes caused husbands to reduce their transfers by verifying that husbands who may have gotten angry due to another section of the survey (those who scored poorly on the math and raven's quiz) did not reduce transfers.

The experimental results demonstrate that transfers to the wife respond substantially to increasing the salience of the wife's reputation. This, together with the fact that real-life transfers are also correlated with the wife's reputation, is consistent with premise 1 of the model: Husband transfers respond to their beliefs about their wives' expertise as investors.

Figure 3: Transfer experiment: Effect of reputation salience on amount (%) transferred



Notes: The graph shows adjusted means from OLS regressions with Huber-White robust SEs. The "Salience" treatment was randomized. Low MER is an indicator that takes the value 1 if the wife has an MER of 0, 1, or 2 (see main text). Each bar is the sum of the control mean and the relevant regression coefficients, i.e., control mean, control mean+β_{LowMER}, control mean+$\beta_{Salience}$, and control mean+β_{LowMER}+$\beta_{Salience}$+$\beta_{Salience \times LowMER}$. We show 95% confidence intervals based on the estimated standard errors of β_{LowMER}, $\beta_{Salience}$, and β_{LowMER}+$\beta_{Salience}$+$\beta_{Salience \times LowMER}$, respectively. Significance from testing equal transfers to high-MER and low-MER wives in control ($\beta_{LowMER} = 0$) or in salience (β_{LowMER}+$\beta_{Salience \times LowMER} = 0$). $p < 0.10^{*}, p < 0.05^{**}, p < 0.01^{***}$.

6 Are Women Strategic? The Signaling Experiment

Having shown that husbands act on their beliefs about their wife's expertise as a buyer, we now turn to test prediction 1—*under-investment*, and prediction 2—*over-use of lemons*. We do this through a signaling experiment implemented with the wives of the men who participated in the transfer experiment.

6.1 Experimental Design

At the end of a survey for which they were paid a compensation of MWK 400 (approx. USD 0.60), wives were asked to complete a "quality quiz". The quiz was designed to mimic a situation in which a person has to assess the quality (productivity) of a good in order to decide whether to purchase it. In each of six rounds (and two practice rounds) wives were shown a high- and a low-quality version of a good (as determined by our local research team: on several occasions, the low-quality good was a counterfeit good), and asked to identify the high-quality version among the two. The six goods were a sponge, a water bottle, a razor, a toothbrush, flour, and a candle, and the order in which the goods were presented was randomized. On average, both women and men identified 4.2 high-quality goods correctly.

After they had completed the quiz, we elicited wives' prior distributions about their score on the quiz, using beans to represent probabilities and visual aids to represent the support (Delavande et al., 2011). That is, for every possible score between 0 to 6, we asked the wife to state her perceived probability that she had received that score using the beans. The wives were then given the option to participate in an extra activity for an additional compensation of MWK 200 (approx. USD 0.30, 50% of the original survey compensation). This extra activity was as follows. The wife would first be given the opportunity to improve her score by choosing the number of potential mistakes she would want to correct against a fee, and then we would inform her husband (at the end of the survey) about her corrected score on the quality quiz. For the score to be meaningful to the husband, he was administered the same quiz as part of the survey he did during the transfer experiment.[16] Husbands, however, were not told that the wife had a *choice* to participate in the activity or to hide mistakes. If the wife chose to participate, the husband received the wife's final (post-hiding) score on the quiz (not knowing she had the option to pay to improve her score first). To ensure that the experiment did not cause any conflict between the husband and the wife, the husband did not receive any information about the wife's survey if the wife chose not to participate in the activity. This differs from the theoretical set-up in which investing in the safe good does send a signal about the wife's type.[17]

We elicited wives' decisions in the following order: First, we provided the wife with the unit price she would have to pay to correct a mistake in the quality quiz. We clearly spelled out how many answers she could afford using the experimental payments (the participation fee for the extra activity itself + the participation fee for the survey). We also made it very clear to the wife that she could not purchase answers with her own funds. Second, we asked the wife to decide if she wanted to participate in the activity (i.e., whether she would let us tell her final (post-hiding) score to her husband), given her prior about her score and the hiding cost. Third, if the wife was willing to participate in the activity for money, we elicited how many mistakes she wanted to correct under each possible scenario (i.e., in case she had

[16] Men and women performed equally well on the quality quiz. See detailed scores in online appendix table B.4. Also, consistent with the idea that some non-experts are able to hide their type, we find that husbands whose wives have a high MER are more likely to overestimate their wife's score on the quiz, compared to husbands whose wife has a low MER (55% vs. 43%, $p<0.001$).

[17] Ethical concerns are also the reason why we did not simply market "lemons" to wives in order to directly test the over-use of lemons prediction. We believe that our experimental design is the best possible test of the model predictions that respect the Belmont Report principle of beneficence.

0, 1, 2, ... questions correct). Since the hiding cost was deducted from the compensation fee yet to be paid out, the elicitation was incentive-compatible (the wife could not renege on her correction choice after seeing her score). Finally, after deciding whether to participate and how many mistakes to correct, wives were informed about their initial score as well as the final score to be given to their husbands.

We randomly assigned wives to one of the following hiding cost treatment arms:

- *Low hiding cost:* The low cost of MWK 100 (approx USD 0.15) per corrected question allowed wives to correct up to two mistakes when using the additional compensation from participating in the activity and up to six (i.e., all possible) mistakes when using the additional compensation from the activity as well as their survey compensation.
- *Intermediate hiding cost:* The intermediate cost of MWK 200 (approx. USD 0.30) per corrected question allowed wives to correct up to one mistake when using the additional compensation from participating in the activity and up to three mistakes when using the additional compensation from the activity as well as their survey compensation.
- *High hiding cost:* The high cost of MWK 300 (approx. USD 0.45) per corrected question allowed wives to correct no mistake when using the additional compensation from participating in the activity and up to two mistakes when using the additional compensation from the activity as well as their survey compensation.

In addition, we classified wives according to their prior distributions about their scores:[18]

- *"Self-Identified Expert"*: Women with a mean prior (averaged across the 7 possible scores) of 5 or 6 (61% of the sample). These are women at lower (perceived) risk of sending a "bad" signal to their husbands if they choose to participate without hiding.[19]
- *"Self-Identified Non-Expert"*: Women with a mean prior (averaged across the 7 possible scores) of below 5 (39% of the sample). These are women at greater (perceived) risk of sending a "bad" signal to their husbands if they choose to participate without hiding.[20]

The experiment was designed to test predictions 1 and 2 of the signaling model. Specifically, given that participating in the game generated a non-negative payout with certainty, the only rational reason for a wife to *not* participate in the activity for

[18] Since we did not tell women their scores before eliciting their choice, a wife's belief about her own score is the signal she thought the husband would likely receive.

[19] This is smaller than the share of wives *perceived* as experts by their husbands (wives with high MER) in section 5, further suggesting the presence of information frictions: husbands perceive some non-expert as expert wives.

[20] Self-identified non-expert wives have a significantly lower score than self-identified expert wives (3.9 vs. 4.1, p<0.10). Note that this is not mechanical—women could be off about their own expertise, but the data suggests they are not. Results of the signaling experiment are almost identical when using the modal, minimum, or maximum prior.

compensation or to participate but pay to hide mistakes is to avoid sending a bad signal about her market expertise to her husband. By observing non-zero rates of non-participation and hiding, we can already assert that women are concerned about their reputation. By varying the hiding cost randomly, we are able to test specific predictions from the model. Specifically, whether

- Prediction 1: non-expert wives invest no less than expert wives when the cost of hiding is low but less when the cost of hiding is intermediate or high (*under-investment)*.
- Prediction 2: non-expert wives, conditional on investing, hide more than expert wives (*over-use of lemons*) when the hiding cost is low or intermediate.

In the experiment, "investing" consists of participating in the activity in which a signal is sent to the husband and "hiding" consists of correcting mistakes before the signal is sent.

We estimate the impact of the intermediate and high hiding cost on the participation and hiding behavior by self-identified expertise using the following equation:

$$Y_i = \alpha + \beta_1 NE_i + \beta_2 IC_i + \beta_3 HC_i + \beta_4 (NE_i \times IC_i) + \beta_5 (NE_i \times HC_i) + \beta_6' X_i + \mu_e + \delta_c + \epsilon_i \quad (2)$$

where Y_i is outcome for wife i. NE_i is an indicator that is 1 if the wife self-identifies as non-expert (her average prior about her performance is at most 4 out of 6) and IC_i and HC_i are indicators that are 1 if wife i is assigned to the intermediate or high hiding cost. ϵ_i are Huber-White robust standard errors. As above, we include enumerator fixed-effects μ_e, and compensation fixed effects δ_c.[21]

To address the potential concern that results in the experiment are driven by the endogeneity of the wife's self-identified expertise (for example, non-experts forgo more because they are worse at math), we created exogenous variation in performance on the quiz by further randomizing wives into two groups as follows:

- *Hard version*: Wives did the quality quiz without hints.
- *Easy version*: Wives were provided hints to help them discern the high-quality good during the quiz.

Online appendix table B.4 documents that the hints succeeded in increasing wives' performance in the quiz: the hints significantly increased the share of wives who correctly discerned the high-quality good for each of the six pairs, thereby increasing the average score by 1.1 points from 3.6 points (out of 6) in the hard version to 4.7 points in the easy version. In addition, the hints also significantly increased wives' priors about their performance. To verify that this also reduced wives' perceived risk of sending a bad signal,

[21] Controlling for whether the husband was assigned to the salience treatment in the transfer experiment described in section 5 does not change the results, as expected since the flow of the wife survey and embedded experiment were completely independent of that of the husband's.

we elicited their second-order beliefs (beliefs about their husbands' beliefs about the wife's score in the quiz), using the visual handouts shown in online appendix figure B.1. As intended, the hints substantially reduced the share of wives whose first-order prior was *lower* than their second-order prior, i.e., who believed their husband would update his belief about his wife's market expertise *downward* if she participated in the signaling activity: 31% of wives playing the hard version vs. 22% of wives playing the easy version.

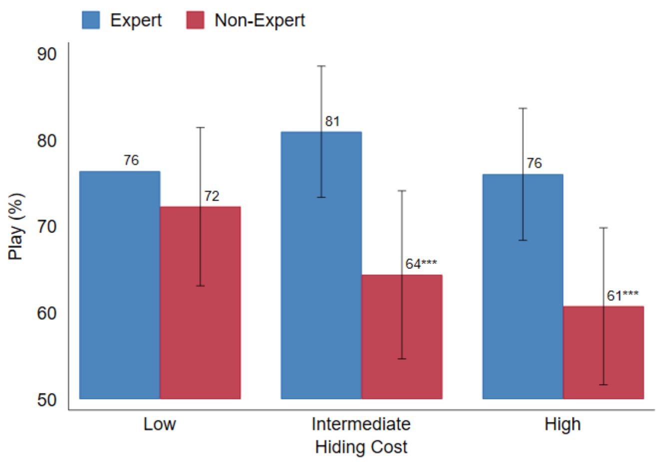
This randomization allows us to test whether wives with an exogenously lower performance participate *less* in the signaling activity when hiding is costly, and pay to hide their mistakes when hiding is cheap. We do so by estimating the following equation:

$$Y_i = \alpha + \beta_1 Hard_i + \beta_2 IC_i + \beta_3 HC_i + \beta_4 (Hard_i \times IC_i) + \beta_5 (Hard_i \times HC_i) + \beta_6' X_i + \mu_e + \delta_c + \lambda_s + \epsilon_i$$

where $Hard_i$ is an indicator that is 1 if the wife was assigned to the hard quiz and IC_i and HC_i are indicators that are 1 if the wife was assigned to the intermediate or high hiding cost. ϵ_i are Huber-White robust standard errors.

6.2 Results

Figure 4: Game participation in the signaling experiment



Notes: The graph shows adjusted means from OLS regressions with Huber-White robust SEs. Each bar is the sum of the control mean and the relevant regression coefficients, i.e., control mean, control mean+β_{NE}, control mean+β_{IC}/β_{HC}, and control mean+β_{NE}+β_{IC}/β_{HC}+$\beta_{IC/HC \times NE}$. We show 95% confidence intervals based on the estimated standard errors of β_{NE}, β_{IC}/β_{HC}, and β_{NE}+β_{IC}/β_{HC}+$\beta_{IC/HC \times NE}$, respectively. Significance from testing equal participation of expert and non-expert wives when the hiding cost is low ($\beta_{NE} = 0$), intermediate ($\beta_{NE} + \beta_{IC \times NE} = 0$), or high ($\beta_{NE} + \beta_{HC \times NE} = 0$).
$p < 0.10^{*}, p < 0.05^{**}, p < 0.01^{***}$.

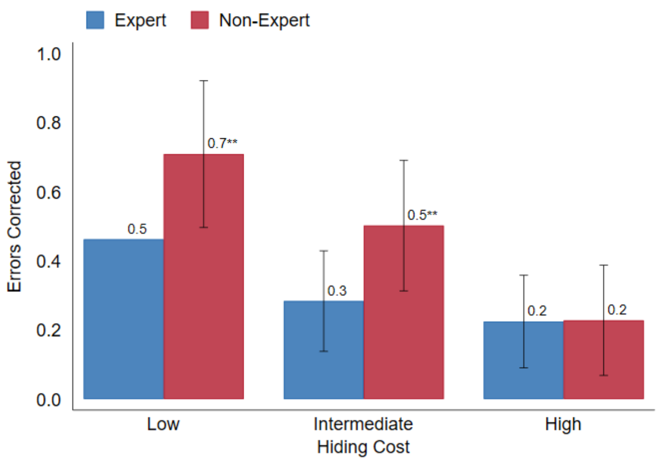
Figure 4 presents participation rates by hiding cost and self-identified expertise. To start, only around 75% of women decide to participate even if the hiding cost is low.[22] Non-expert

[22] Online appendix figure B.2 documents that participation rates are increasing substantially in the women's reported risk preferences. All our results are robust to controlling for risk preferences (we show results with

wives participate as much as expert wives if the hiding cost is low. However, the intermediate and high hiding costs decrease the participation rate of non-expert wives by 12.5ppts (-16%) and 11.2ppts (-15%) respectively (table A.3, panel A, column 2). This is consistent with our theoretical prediction 1: non-experts do not participate less when the hiding cost is low but participate less when the hiding cost is intermediate or high. Overall, self-identified non-experts forgo 71 MWK in participation fee on average (about 50% more than self-identified experts, table A.3, panel A, column 3).

Figure 5 presents the number of errors corrected by self-identified expertise and hiding cost. Conditional on participating, non-expert wives still have a significantly lower score than expert wives (-0.36 points, table A.3, panel A, column 4).[23] As expected from theoretical prediction 2, non-expert wives who participate hide significantly more than expert wives who participate when the hiding cost is low or intermediate: they correct 0.25 more errors when the hiding cost is low and 0.22 more errors when the hiding cost is intermediate, thus paying substantially more in hiding fees (table A.3, panel A, column 6).[24] Ultimately, final scores (sent to husbands) are statistically indistinguishable between non-expert and expert wives (table A.3, panel A, column 7).

Figure 5: Hiding in the signaling experiment



Notes: Sample restricted to wives who choose to participate in the activity. The graph shows adjusted means from OLS regressions with Huber-White robust SEs. Each bar is the sum of the control mean and the relevant regression coefficients, i.e., control mean, control mean+β_{NE}, control mean+β_{IC}/β_{HC}, and control mean+β_{NE}+β_{IC}/β_{HC}+$\beta_{IC/HC\times NE}$. We show 95% confidence intervals based on the estimated standard errors of β_{NE}, β_{IC}/β_{HC}, and β_{NE}+β_{IC}/β_{HC}+$\beta_{IC/HC\times NE}$, respectively. Significance from testing equal hiding of expert and non-expert wives when the hiding cost is low ($\beta_{NE} = 0$), intermediate ($\beta_{NE} + \beta_{IC\times NE} = 0$), or high ($\beta_{NE} + \beta_{HC\times NE} = 0$). $p < 0.10^{*}, p < 0.05^{**}, p < 0.01^{***}$.

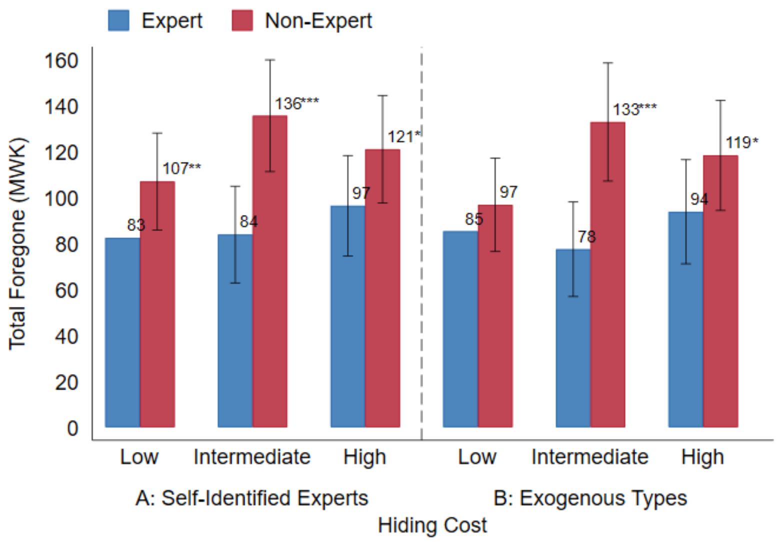
controls in online appendix table B.5).

[23]Note that the difference in scores between experts and non-experts is smaller when the hiding cost is high since, as predicted, fewer non-experts decide to participate in the game for money.

[24]We focus on binary types in our analysis to match our proposed model. However, we show in online appendix figure B.3 that foregone earnings are decreasing close to linearly in women's mean prior score.

Note that this set of findings makes it unlikely that our results are explained by experimenter demand effects. In the presence of experimenter demand effects, we would expect non-expert wives (who would have to be responding more to experimenter demand effects than expert wives) to react similarly (at least in direction) to the intermediate and high hiding costs for both participation and errors corrected. That is, non-expert wives would pay attention to the prices and stop correcting and participating either when the cost of hiding is intermediate or the cost of hiding is high. It is implausible that they would change their behavior in response to the prices consistent with the specific pattern that is predicted by our theory, i.e., they participate less when the hiding cost is intermediate or high but hide less only when the hiding cost is high.

Figure 6: Total foregone earnings in the signaling experiment



Notes: The graph shows adjusted means from OLS regressions with Huber-White robust SEs. Non-Expert is an indicator that takes the value 1 if the wife reports an average weighted score that is at most 4 out of 6 (see main text) in Panel A and an indicator that takes the value 1 if the wife was randomized into the hard quiz in Panel B. Each bar is the sum of the control mean and the relevant regression coefficients, i.e., control mean, control mean+β_{NE}/β_{Hard}, control mean+β_{IC}/β_{HC}, and control mean+β_{NE}/β_{Hard}+β_{IC}/β_{HC}+$\beta_{IC/HC\times NE/Hard}$. We show 95% confidence intervals based on the estimated standard errors of β_{NE}/β_{Hard}, β_{IC}/β_{HC}, and β_{NE}+β_{IC}/β_{HC}+$\beta_{IC/HC\times NE/Hard}$, respectively. Significance from testing equal foregone earnings of expert and non-expert wives when the hiding cost is low ($\beta_{NE}/\beta_{Hard} = 0$), intermediate ($\beta_{NE}/\beta_{Hard} + \beta_{IC\times NE/Hard} = 0$), or high ($\beta_{NE}/\beta_{Hard} + \beta_{HC\times NE/Hard} = 0$). $p < 0.10^{*}, p < 0.05^{**}, p < 0.01^{***}$.

Wives forgo experimental earnings on both the extensive (participation) and intensive (hiding) margin in order to avoid sending what they think will be a bad signal. Self-identified non-experts forgo 30% more earnings (MWK +25, from a base of 83) than experts when the hiding cost is low, 63% more (MWK +53, from a base of 84) when the hiding cost is intermediate, and 40% more (MWK +39, from a base of 97) when the hiding cost is high (Figure 6, Panel A, and Table A.3, column 8).[25]

Table A.3, panel B presents the results by exogenous variation in performance. The harder version of the quiz succeeded in exogenously lowering women's scores from 4.6 points to 3.5 points (column 1). Wives in the hard quiz participate as much as wives in the easy quiz if the hiding cost is low. However, the intermediate and high hiding costs decrease the participation rate of wives in the hard quiz by 11.8ppts (-16%) and 6.3ppts (-9%) respectively (table A.3, panel B, column 2). In addition, wives in the hard quiz who participate hide significantly more than wives in the easy quiz who participate when the hiding cost is low or intermediate (table A.3, panel B, column 5). Overall, wives in the hard quiz forego 14% more earnings (MWK +12, from a base of 85) when the hiding cost is low, 62% more (MWK +48, from a base of 78) when the hiding cost is intermediate, and 35% more (MWK +33, from a base of 94) when the hiding cost is high (Figure 6, Panel B, and Table A.3, Panel B, column 8). This is consistent with wives in the hard quiz being more likely to believe that their husbands will update their beliefs downwards and wanting to avoid sending this bad signal.[26]

Financial or Non-Financial Reputation Incentives? Through the lens of the model we propose, wives in the signaling experiment are willing to forgo experimental earnings to protect their reputations in order to maintain access to financial transfers. This is also consistent with the finding that reputation matters for transfers in the transfer experiment. An alternative explanation is that wives protect their reputations in order to avoid other negative consequences of a low reputation, such as domestic violence or emotional abuse. The model encompasses such an alternative: it can be thought of as a version of the model where transfers are not only financial but also in-kind (with abuse being a negative transfer). We, therefore, see the results from the signaling experiment as supportive of the model in any case. From an ethical standpoint, however, the implications of our experimental design are quite different across the two interpretations. Specifically, if the risk of abuse increases in response to poor investment choices, could our signaling experiment have put our participants at risk? We piloted the protocols extensively in settings where women could freely share with us their concerns, and abuse was never brought up.[27] Our enumerators, after sharing the wife's

[25] Since our predictions and key estimations concern the interaction between expertise status and the randomly assigned hiding cost, the relevant "balance check" is within each expertise group. We show this in online appendix table B.6.

[26] Overall, our results using the exogenously varied scores are slightly noisier, which might be due to some random imbalances. For example, wives in the hard quiz with intermediate or high hiding costs have a higher market expertise reputation, have been married for fewer years, and have a lower math score and education (see online appendix table B.7.)

[27] Domestic abuse is present but not widespread in our study setting: The share of adult women in Neno District who reported experiencing physical or sexual intimate partner violence in the past 12 months is 12% (NSO and ICF, 2017), compared to 25% in Kenya (KNBS, Ministry of Health and ICF, 2017), 27% in Bangladesh (Bangladesh Bureau of Statistics, 2016), 9% in Guatemala (MSPAS, INE and ICF, 2017) and 5%

performance with the husband (with the wife present), systematically witnessed husbands congratulating their wives on their good performance (the wife's final reported score was 4.6 out of 6 on average, higher than the husbands' average of 4.2). Furthermore, the results of our heterogeneity analyses are much better aligned with the hypothesis that women attempt to maintain their reputation to receive financial transfers (rather than, for example, to avoid abuse): We find strong heterogeneity by transfers, suggesting that women who could lose more financially also respond more to our experiments (see section 8).

7 The Market Experiment

Following the completion of our lab-in-the-field experiments, we conducted short surveys and a field experiment with 675 married women in monogamous relationships, recruited while they were shopping at one of six local markets in Zomba district in July 2019. This experiment tests prediction 1 for real-life investment rates—do non-experts invest no less than experts when the hiding cost is low but less when the hiding cost is intermediate or high?, and prediction 3—do non-expert and expert wives invest at the same rate (the payoff-maximizing rate) when their reputation is not at stake?

We did not conduct the market experiment with the wives in the transfer and signaling experiment because the market experiment required us to present wives with goods that they could have acquired while shopping alone at the local markets.[28] We thus recruited participants on market days as follows. We approached women who were shopping alone at the market. We first administered a short survey that included standard questions on household demographics, schooling, and employment, as well as modules on expenditures and budget decisions in the household, and recent transfers from the husband to the wife. The married women included in the market experiment are similar in characteristics to those in the first two experiments: They have been married for an average of 10 years and have 2.5 children (see online appendix table B.8). They are an average of 30 years old, and have 7.3 years of education. They have earned an average income of MWK 15,117 (approx. USD 23) in the preceding two months, are married to husbands whom they report have earned an average income of MWK 20,397 (approx. USD 30) in the preceding two months, and report receiving an average transfer from their husband of MWK 11,293 (approx. USD 17) in the preceding two months.

7.1 Experimental Design

We offered women a compensation of MWK 1,000 (approx. USD 1.5) for their survey time. Using a Becker-DeGroot-Marschak (BDM) mechanism (Becker et al., 1964), we elicited their willingness to trade part or all the cash value of the compensation for an unfamiliar

in the US (Smith et al., 2018).

[28]It is extremely common for women to go to the market on their own in this context.

good. This generated an estimate of their willingness to pay for the unfamiliar good, without the amount of cash on hand they have at the time of the survey being a constraint.

We randomly offered women one of two unfamiliar goods:

- *Low hiding (time) cost:* An airtight crop storage bag purchased in Blantyre, the second largest city in Malawi. These bags are hermetically sealed to protect harvested grains (e.g., maize, red beans) from insect pests. They are used to store grains for months on end. While the returns of these bags are substantial, they were unknown to the women. The usage cost of a storage bag is low (in terms of the model, the hiding cost is low). This is because once the bag has been filled, even if it did not truly protect from pests, leaving the grains in the bag for the rest of the season would have no cost (since the status quo is to store the grains in non-sealed bags). In addition, if some of the grain rots, the wife can sort through and throw it away while the husband is absent.

- *High hiding (time) cost:* A child picture book (imported from overseas by the research team): Either Richard Scarry's "A Day at the Airport" picture book, or the illustrated "Lift-the-flap" Animal ABC baby book by Jonny Lambert. Such books are relatively expensive (USD 10 before shipping costs) and totally unavailable in Malawi: Even low-quality picture books are completely absent from even markets in the capital city. The evidence on the benefits of showing books and describing pictures to very young children is strong (but underestimated by parents worldwide). Board books are meant to be looked at/shown/read to children over and over again. The usage cost (hiding cost) is thus high because the good needs to be used repeatedly as it is obvious if it stays on the shelf for too long without being used.[29]

We implemented the intervention on market days so that, in case the respondent brought the good home, the husband would infer that the respondent had bought the good at the market. To test specific predictions of the model, women were further randomly allocated to one of four sticker groups:

- *Donated:* We put a "donated by Stanford University" sticker on the good.
- *Effectiveness:* We put a sticker on the good describing its proven effectiveness (e.g., describing the positive effects of reading/looking at picture books with children).
- *Both*: We put both Donated and Effectiveness stickers on the good.
- *None*: We put no stickers on the good.

The stickers are shown in online appendix figures B.3 and B.4.[30] When deciding whether and

[29] Because we had to bring the books by plane in a suitcase (there is no reliable shipping service to Malawi), we were only able to offer the books to 26% of the women in the sample.

[30] Even though literacy is high in our setting (88% among adult men and 78% among adult women in Zomba district (NSO and ICF, 2017)), we attempted to make the sticker content as clear as possible using images.

how much to invest, the women could see the stickers. Hence they knew what information would be available to their husband. Specifically:

- The donated sticker gave the woman the guarantee that the spouse would see that the good was acquired at no financial cost to the household (as it indeed was, since it was given in exchange for her time). In such a case, the reputation mechanism in the model is not at play as the cost of the good to the husband is 0, i.e., the payoff to the husband cannot be negative. The prediction is that investment rates should differ across experts and non-experts absent the sticker, but not in the presence of the sticker.
- The effectiveness sticker aimed to eliminate uncertainty about the quality of the risky good to the husband ($\lambda = 1$). The prediction is that investment rates should differ across experts and non-experts absent the sticker, but not in the presence of the sticker.[31]

To classify women as experts vs. non-experts, we could not administer the quality quiz used in the signaling experiment and elicit women's beliefs about their scores on that quiz.[32] Instead, we use a proxy informed by the signaling experiment. We asked six market math questions to the women who participated in the signaling experiment, and elicited their second-order beliefs (beliefs about her husband's beliefs about her market math score), using the visual handout shown in online appendix figure B.1. These second-order beliefs about the market math score are more predictive of the wife's own perceptions about her market expertise than anything else (i.e., her second-order beliefs about the market math score are more correlated with her mean prior beliefs about her quality quiz score than her actual market math score or her perceived market math score, see online appendix table B.8). Given this finding, we only administered the 6 market math questions to the market experiment sample and elicited second-order beliefs.[33] We classify women as follows:

- *"Non-Experts"*: Women with a second-order belief about their math score of at most 4 out of 6 (44% of the sample).
- *"Experts"*: Women with a second-order belief about their math score of 5 or 6 out of 6 (56% of the sample).

We estimate the impact of the stickers on the willingness to pay using the following equation:

$$\begin{aligned} WTP_i = &\alpha + \beta_1 NE_i + \beta_2 D_i + \beta_3 Eff_i + \beta_4(D\&Eff_i) + \beta_5(NE_i \times D_i) + \beta_6(NE_i \times Eff_i) \\ &+ \beta_7(NE_i \times D\&Eff_i) + \beta_8' X_i + \mu_e + \delta_m + \epsilon_i \end{aligned} \tag{3}$$

[31] To minimize a potential concern that the effectiveness sticker could be interpreted as a marketing ploy by husbands, we purposefully designed the stickers as information leaflets added to the products externally. This contrasts with traditional advertisements that are commonly integrated into product packaging.

[32] There are two reasons for this: (1) the quiz could have created tensions vis-a-vis market vendors, some of which were selling some of the low-quality goods in the quiz (since we procured them from local markets); and (2) going through the quiz takes quite some time because lengthy instructions need to be given.

[33] Results from the signaling experiment using these second-order beliefs are presented in online appendix B.11 and are similar even though noisier.

where WTP_i is woman i's willingness to pay for the good. NE_i is an indicator that is 1 if the woman is classified as non-expert, D_i is an indicator that is 1 if woman i is assigned to the donated treatment arm, Eff_i is an indicator that is 1 if woman i is assigned to the effectiveness treatment arm, and $D\&Eff_i$ is an indicator that is 1 if woman i is assigned to both stickers (donated and effectiveness). ϵ_i are Huber-White robust standard errors. We include enumerator fixed-effects μ_e and market fixed effects δ_m and show estimations with and without adjusting for individual controls X_i.

Wife characteristics are broadly balanced by treatment arms, though not perfectly (see Online appendix table B.10). We show results both controlling for covariates and without controls, and the results are unchanged.[34]

7.2 Results

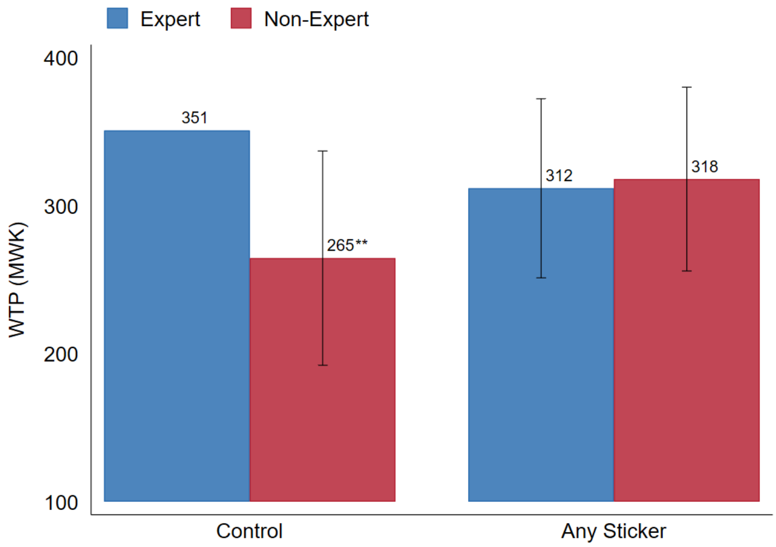
Figure 7 summarizes the results from the market experiment (the full estimation results are shown in Table A.4. For simplicity, Figure 7 pools all stickers into one "sticker arm" since their predicted effects are of the same sign and their observed effects cannot be distinguished from each other in Table A.4. All results are robust to omitting our vector of controls and controlling for market fixed effects.

The willingness to invest differs substantially by expertise when women cannot easily prove to their husbands that the good is donated or effective. In the control arm, expert wives have an average willingness to pay of MWK 351 and non-expert wives have an average willingness to pay of MWK 265 (-25%, column 2). Neither the donated nor the effectiveness sticker affect the willingness to pay of expert wives whose investment decisions already maximize their present payoffs, but any sticker increases the average willingness to pay of non-expert wives by MWK 93 (+26%, column 5), such that the willingness to pay of expert and non-expert wives is not statistically different if the good is offered with either of the two stickers.[35]

[34]The most concerning imbalance is that expert wives assigned to the effectiveness sticker treatment have been married longer, hence have larger families, and received a significantly lower transfer from their husbands in the previous two months. This is not the case for non-expert wives assigned to that arm. This means that a differential impact of the effectiveness sticker by expertise could possibly be due to these differences, especially those in income. These could not explain differences in the impacts of the 'donated sticker', however.

[35]The effect of the two stickers combined is in the same direction as each sticker alone, though somewhat muted, and not significant. Anecdotally, it seems to be because the two stickers combined occupied too much space on the goods and thus made them less attractive.

Figure 7: Investment experiment: Willingness to pay, by wife's expertise

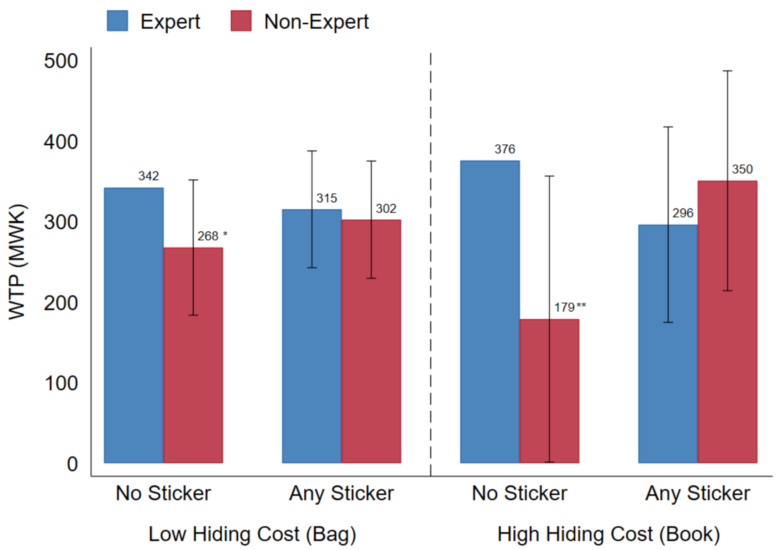


Notes: The graph shows adjusted means from OLS regressions with Huber-White robust SEs. The dependent variable is the willingness to pay in Malawian Kwacha. Non-Expert is an indicator that takes the value 1 if the wife has a second-order belief about her math score of at most 4 out of 6. Any Sticker is an indicator that takes the value 1 if either the donated or effectiveness sticker was attached to the good. Each bar is the sum of the control mean and the relevant regression coefficients, i.e., control mean, control mean+β_{NE}, control mean+$\beta_{AnySticker}$, and control mean+β_{NE}+$\beta_{AnySticker}$+$\beta_{NE\times AnySticker}$. We show 95% confidence intervals based on the estimated standard errors of β_{NE}, $\beta_{AnySticker}$, and β_{NE}+$\beta_{AnySticker}$+$\beta_{NE\times AnySticker}$, respectively. Significance from testing equal willingness to pay of expert and non-expert wives in control ($\beta_{NE} = 0$) or in the sticker treatments ($\beta_{NE}+\beta_{NE\times AnySticker} = 0$). $p < 0.10^{*}, p < 0.05^{**}, p < 0.01^{***}$.

According to the model, we should see stronger effects among women offered a book (high hiding cost) than women offered the bags (low hiding cost). We present results by the good type in Figure 8. In line with the model, the investment gap between expert and non-expert wives absent a sticker is much greater when the hiding cost is high than when it is low. Again these findings seem to be inconsistent with experimenter demand effects, which would not predict differential behavior for the two goods.[36]

[36] We also consider it consistent with our model if the results were due to differences in preferences of husbands and wives for the goods, with husbands disliking the book without stickers. This would still suggest that wives would shy away from purchasing the book for fear of losing their reputations as expert buyers inside the household as a result of bringing home a good that their husbands dislike.

Figure 8: Investment experiment: Willingness to pay, by wife's expertise and hiding cost

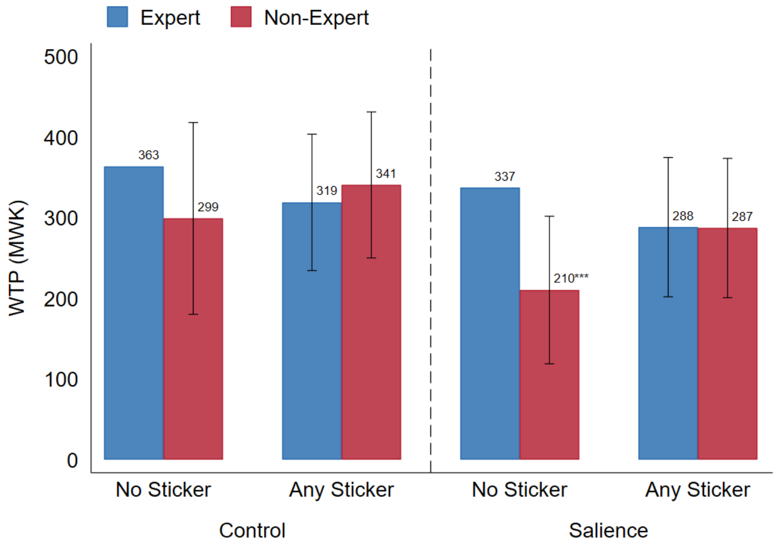


Notes: The graph shows adjusted means from OLS regressions with Huber-White robust SEs. Regressions are run separately for bags (left panel) and books (right panel). The dependent variable is the willingness to pay in Malawian Kwacha. Non-Expert is an indicator that takes the value 1 if the wife has a second-order belief about her math score of at most 4 out of 6. Any Sticker is an indicator that takes the value 1 if either the donated or effectiveness sticker was attached to the good. Each bar is the sum of the control mean and the relevant regression coefficients, i.e., control mean, control mean+β_{NE}, control mean+$\beta_{AnySticker}$, and control mean+β_{NE}+$\beta_{AnySticker}$+$\beta_{NE \times AnySticker}$. We show 95% confidence intervals based on the estimated standard errors of β_{NE}, $\beta_{AnySticker}$, and β_{NE}+$\beta_{AnySticker}$+$\beta_{NE \times AnySticker}$, respectively. Significance from testing equal willingness to pay of expert and non-expert wives in control ($\beta_{NE} = 0$) or in the sticker treatments (β_{NE}+$\beta_{NE \times AnySticker} = 0$). $p < 0.10^{*}, p < 0.05^{**}, p < 0.01^{***}$.

To more directly test whether non-expert wives have a lower willingness to invest because they are concerned about their reputation inside the household (as opposed to, for example, with their friends or neighbors), we varied the salience of the husband-wife relationship. Specifically, in half of the sample the BDM was played before the survey and in half of the sample the BDM was played after the survey, i.e., after eliciting the wife's second-order beliefs and asking her about previous transfers and her financial decision-making inside the household. As presented in Figure 9, the investment gap between expert and non-expert wives absent a sticker is much greater in the salience treatment than in the control arm.[37]

[37]This also alleviates concerns that the stickers might operate by changing the wife's beliefs about the goods.

Figure 9: Investment experiment: Willingness to pay, by wife's expertise and relationship salience



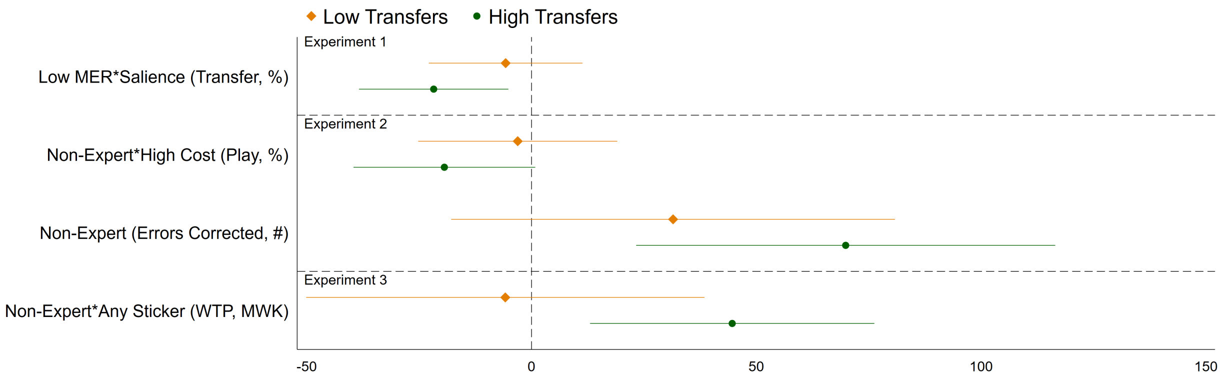
Notes: The graph shows adjusted means from OLS regressions with Huber-White robust SEs. Regressions are run separately in the control treatment (left panel) and the relationship salience treatment (right panel). The dependent variable is the willingness to pay in Malawian Kwacha. Non-Expert is an indicator that takes the value 1 if the wife has a second-order belief about her math score of at most 4 out of 6. Any Sticker is an indicator that takes the value 1 if either the donated or effectiveness sticker was attached to the good. Each bar is the sum of the control mean and the relevant regression coefficients, i.e., control mean, control mean+β_{NE}, control mean+$\beta_{AnySticker}$, and control mean+β_{NE}+$\beta_{AnySticker}$+$\beta_{NE\times AnySticker}$. We show 95% confidence intervals based on the estimated standard errors of β_{NE}, $\beta_{AnySticker}$, and β_{NE}+$\beta_{AnySticker}$+$\beta_{NE\times AnySticker}$, respectively. Significance from testing equal willingness to pay of expert and non-expert wives in control ($\beta_{NE} = 0$) or in the sticker treatments (β_{NE}+$\beta_{NE\times AnySticker} = 0$). $p < 0.10^{*}, p < 0.05^{**}, p < 0.01^{***}$.

Overall, the findings of the market experiment are in line with the idea that women internalize potential reputation costs when making real-life investment decisions. These results have important policy implications as they suggest that women might have a limited ability to experiment with new technologies unless it is ensured that they are able to credibly convey certain information to their husbands.

8 Heterogeneity by Discretionary Transfer Size

The experimental results presented in the preceding sections suggest that husbands' financial transfers respond to their beliefs about their wives' expertise as investors and that wives internalize their husbands' beliefs in their investment and hiding decisions. We now test prediction 4 of the model by assessing whether the results in all three experiments are driven by households in which women still receive discretionary transfers from their husbands. Our model predicts that spouses' behavior should stop responding to the wife's reputation once the reputation has fallen below the threshold above which discretionary transfers occur in the second period. Reported transfers respond substantially to wives' perceived expertise, with a low MER reducing transfers by 13% (-MWK 1076, appendix table A.1). To test prediction 4, we thus compare experimental results in households in which the wife receives only "subsistence level" transfers (i.e., transfers for basic household necessities) and households in which the wife receives additional discretionary transfers for investments.[38] In the data, this corresponds to households below or above the median transfer size (as reported by the husbands in experiments 1 and 2 and as reported by the wives in experiment 3). If we observe significant estimates only in households in which the wife's reputation is still above the threshold, and women thus still receive discretionary transfers, we can deduce that our experimental findings truly reflect real-life concerns about transfers in the household rather than, for example, experimenter demand effect.

Figure 10: Heterogeneity by discretionary transfer size



Notes: The graph shows the coefficients and confidence intervals from OLS regressions with Huber-White robust SEs. Low/High Transfers correspond to below/above the median. Rows 1 to 3 control for enumerator and compensation fixed effects (and version fixed effects for the transfer experiment) as well as the wife and the husband's age, education, average income in the last two months, variability of income (whether income is the same in most months or varies a lot), risk preferences, math and raven scores, and years married, number of children and number of household members, and MER index. Controls are as reported by the husband in the transfer and signaling experiment and as reported by the wife in the investment experiment. Row 3 controls for enumerator and market fixed effects as well as the wife's age, education, average income in the last two months, risk preferences, math score, as well as the husband's average income in the last two months, years married, and the number of children and household members. Coefficients are presented as percentage point deviations from the control means.

Figure 10 shows this heterogeneity analysis for all three experiments (all coefficients are shown in percentage point deviations from the control mean). The first row plots the coefficients of the effect of the interaction of Low MER*Salience on dictator game transfers in the transfer experiment. All husbands should use the dictator game to transfer for basic necessities (given the multiplier) and reduce their own private transfers to the wife afterwards. Only husbands who also transfer for non-necessities investments should react to

[38] We use transfers to classify households since we have this information for all three experiments.

the salience treatment and reduce their transfers for non-necessities if their wife has a low MER. This is exactly what we see: the reduction in transfers in the dictator game to low-MER wives in the salience treatment is entirely driven by men who regularly make large transfers to their wives. The second row plots the coefficients of the effect of the interaction of Non-Expert*High Cost on playing in the signaling experiment. As the prediction is the same for both intermediate and high hiding costs, we pool both costs. However, the results are the same for both costs individually. Again, consistent with prediction 4 of the model, we find that women who receive low transfers from their husbands do not reduce their participation in order to avoid sending a signal. The third row plots the coefficient on Non-Expert in the signaling experiment. Consistent with the theoretical prediction, we find that non-expert wives who already receive low transfers from their husbands do not correct mistakes. The fourth row plots the coefficients of the effect of the interaction of Non-Expert*Any Sticker on women's willingness to pay for the goods in the market experiment. Here again, we find that only women who receive high transfers from their husbands exhibit the under-investment behavior predicted by the model. Taken together our results thus provide strong evidence for the external relevance of the experiments as spouses' behaviors seem to be indeed driven by real-life reputation concerns inside the household.

9 Conclusion

This paper offers a new perspective on some potential dynamics at play between spouses in contexts where women are specialized in household production and at least partly dependent on their husband's income. We develop and test a signaling model in which a woman's access to the household budget varies with her husband's perceptions of her skills as an investor. We show that in order to maintain control over a greater share of the household budget, women experiment too little on average in domains where they have difficulty assessing the productivity of new goods and technologies. What's more, when they do experiment with new goods, they incur costs to hide bad purchase decisions. Hence our model is able to explain behavior akin to the sunk cost fallacy—using a product even after one has realized it does not have positive returns—within the realm of neoclassical economics.

Three experiments were designed to test specific pieces of the theory. The transfer experiment shows that husbands whose wives made bad market choices in the past transfer less to their wives in a dictator game with a multiplier if asked to recall these choices just before playing the game. The signaling experiment shows that women are willing to forgo earnings in order to avoid sending a bad signal about their investment skills to their husbands. Finally, the market experiment shows that these concerns have a direct bearing on a woman's willingness to invest in new technologies. In all three experiments, results are driven by couples in which the reputation of the wife has not yet fallen below the threshold level—providing additional evidence for the external relevance of our experimental findings.

From a policy perspective, our novel insights about dynamic reputation concerns within the household might help explain the relatively low willingness to pay for high-return investments observed in many programs and experiments targeting women (Cohen and Dupas, 2010; Meredith et al., 2013). Campaigns promoting new technologies or goods could potentially be more successful and pose a smaller reputation risk to women if they involved both spouses or ensured that women have the means to credibly convey information about the benefits of the goods to their spouses.

What's more, from an empirical standpoint, the existence of what we coin the "intra-household sunk cost fallacy" suggests that collecting data on *usage* of a given good may not be sufficient to ascertain its value to the household. This also implies some hindrance to social learning: neighbors may wrongly infer that a less productive good or technology is productive if they observe it being used.

Finally, while this paper focused on the husband as principal and the wife as an agent given the prevailing context of gender inequality, there is no reason why the mechanism would not be completely symmetric in a context where spousal roles are reversed. When both spouses earn equal income, reputation may still matter for the share of the budget that one has control over. For example, a husband who purchased a bench press that was used only twice in the past year may face resistance when he next suggests buying a treadmill. The welfare implications of such dynamics are likely much less stark in contexts where households can afford bench presses and treadmills, however, as compared to contexts with limited and unequal consumption such as the one we consider in rural Malawi.

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A Theory Appendix

A.1 Strategies

Before describing strategies, we introduce the notation for information sets, at which the husband and the wife make choices. Denote $h_t^H \in H_t^H$ the information set of the husband in period t. At $t=1$, the husband has only one information set. At $t=2$, h_t^H is characterized by the husband's observations — the wife's purchase and usage choices at $t=1$. Denote $h_{t,g}^{NE} \in H_{t,g}^{NE}$ and $h_{t,e}^{NE} \in H_{t,e}^{NE}$ the information sets of the non-expert wife when she makes an investment choice and a usage choice in period t. At $t=1$, the non-expert wife has only one information set when making the investment choice; when making the usage choice, her information set is described by the productivity of the purchased good. At $t=2$, the non-expert wife's information sets also depend on the history she observes. Similarly, denote $h_{t,g}^E \in H_{t,g}^E$ and $h_{t,e}^E \in H_{t,e}^E$ the information sets of the expert wife when she makes an investment choice and a usage choice in period t. In contrast to the non-expert wife, the expert wife's information set when making the investment choice depends on the productivity of the risky good, which she observes.

Denote the agent i's strategy σ^i. For convenience, we also introduce notation for behavior strategies at each information set, i.e., $\sigma_t^H : H_t^H \to [0,1]$, $\sigma_{t,g}^E : H_{t,g}^E \to [0,1]$, $\sigma_{t,e}^E : H_{t,e}^E \to [0,1]$, $\sigma_{t,g}^{NE} : H_{t,g}^{NE} \to [0,1]$, $\sigma_{t,e}^{NE} : H_{t,e}^{NE} \to [0,1]$ map histories to the probability of an action (making a transfer, buying the risky good, or using the purchased good).

Let $P_2(h_2^H)$ be the wife's reputation at the information set h_2^H. Since the wife observes more information than the husband, she also knows $P_2(h_2^H)$ in the second period. To simplify notation, we just write P_2 for the wife's reputation at $t=2$.

We focus on a Perfect Bayesian Equilibrium, which requires sequential rationality and the beliefs to be determined by Bayes' rule whenever possible. The Bayes' rule is the following:

$$P_2(P_1, g_1 = 1, e_1 = 1) = \frac{P_1 \sigma_{1,g}^E(h_{1,g}^E)\sigma_{1,e}^E(h_{1,e}^E)}{P_1 \sigma_{1,g}^E(h_{1,g}^E)\sigma_{1,e}^E(h_{1,e}^E) + (1-P_1)\sigma_{1,g}^{NE}(h_{1,g}^{NE})\sigma_{1,e}^{NE}(h_{1,e}^{NE})}$$

A.2 Proof of lemma 1

Proof. Consider $t=2$. This is the last period, so everyone plays their static best response. For the wife, the investment strategies are $\sigma_{2,g}^{NE}(h_{2,g}^{NE}) = 1$ for any $h_{2,g}^{NE}$, and $\sigma_{2,g}^E(h_{2,g}^E) = \begin{cases} 1 \text{ if } \eta_2^R = \eta^R \\ 0 \text{ if } \eta_2^R = 0 \end{cases}$. The usage strategies are $\sigma_{2,e}^E(h_{2,e}^E) = \begin{cases} 1 \text{ if } \eta_2 \neq 0 \\ 0 \text{ if } \eta_2 = 0 \end{cases}$, $\sigma_{2,e}^{NE}(h_{2,e}^{NE}) = \begin{cases} 1 \text{ if } \eta_2 \neq 0 \\ 0 \text{ if } \eta_2 = 0 \end{cases}$. The husband's payoff is increasing in P_2: $\lambda\eta^R + P_2(1-\lambda)\eta^S$.

Therefore, the husband's best response is $\sigma_2^H(h_2^H) = \begin{cases} 1 \text{ if } P_2 > P_2^* \\ [0,1] \text{ if } P_2 = P_2^* \\ 0 \text{ if } P_2 < P_2^* \end{cases}$, where P_2^* is defined by $\lambda\eta^R + P_2(1-\lambda)\eta^S = \omega$, i.e., $P_2^* = \dfrac{\omega - \lambda\eta^R}{(1-\lambda)\eta^S}$. □

A.3 Proof of proposition 1

Proof. Suppose the hiding cost is sufficiently small: $c \leq \dfrac{\lambda\eta^R - \eta^S}{1-\lambda}$. Lemma 1 pins down the equilibrium strategies at $t = 2$, except for the husband's strategy when he is indifferent between making the transfer or not, i.e., at h_2^H such that $P_2 = P_2^*$. For these cases, let the husband randomize with probabilities $\tilde{\sigma}_2^H(h_2^H) \in [0,1]$, which are defined further in the proof for various histories. At $t = 1$, equilibrium strategies are the following. The expert wife invests iff the risky good is productive and always uses the good in equilibrium:

$$\sigma_{1,g}^E(h_{1,g}^E) = \begin{cases} 1 \text{ if } \eta_1^R \neq 0 \\ 0 \text{ if } \eta_1^R = 0 \end{cases};$$

$$\sigma_{1,e}^E(h_{1,e}^E) = \begin{cases} 1 & \text{if } \eta_1 \neq 0 \text{ or } \left(\eta_1 = 0 \text{ and } P_1 \geq \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}\right) \\ 0 & \text{if } \eta_1 = 0 \text{ and } P_1 < \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1} \end{cases}$$

The non-expert wife invests with probability at least λ, always uses the productive and safe goods but uses the unproductive good with positive probability only when her reputation is not too low:

$$\sigma_{1,g}^{NE}(h_{1,g}^{NE}) = \begin{cases} 1 & \text{if } P_1 > \dfrac{P_2^*}{P_2^* + \lambda(1-P_2^*)} \\ \lambda \dfrac{P_1}{1-P_1}\dfrac{1-P_2^*}{P_2^*} \geq \lambda & \text{if } P_1 \in \left[P_2^*, \dfrac{P_2^*}{P_2^* + \lambda(1-P_2^*)}\right] \\ \dfrac{P_2^* - P_1 + \lambda P_1(1-P_2^*)}{(1-P_1)P_2^*} > \lambda & \text{if } P_1 < P_2^* \end{cases};$$

$$\sigma_{1,e}^{NE}(h_{1,e}^{NE}) =$$

$$\begin{cases} 1 & \text{if } \eta_1 \neq 0 \text{ or } (\eta_1 = 0 \text{ and } P_1 \geq P_2^*) \\ \left[\dfrac{P_1(1-P_2^*)}{P_2^* - P_1 + \lambda P_1(1-P_2^*)} - 1\right]\dfrac{\lambda}{1-\lambda} & \text{if } \eta_1 = 0 \text{ and } P_1 \in \left[\dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}, P_2^*\right) \\ 0 & \text{if } \eta_1 = 0 \text{ and } P_1 < \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1} \end{cases}$$

Note, that the husband makes a transfer at $t = 1$ if the expected payoff is higher than the outside option. Let $V_t(P_t)$ be the expected value of the husband at time t if he has a belief P_t. Note that
$V_2(P_2) = \begin{cases} \omega & \text{if } P_2 < P_2^* \\ \lambda\eta^R + P_2(1-\lambda)\eta^S & \text{if } P_2 \geq P_2^* \end{cases}$. We will show that the strategies of the wife and the husband form an equilibrium for different values of P_1 for which the wife has different investment and usage strategies: $P_1 > \dfrac{P_2^*}{P_2^* + \lambda(1-P_2^*)}$, $P_1 \in \left[P_2^*, \dfrac{P_2^*}{P_2^* + \lambda(1-P_2^*)}\right]$, $P_1 \in \left[\dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}, P_2^*\right)$, $P_1 < \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}$. For all values of P_1, we:

1. calculate the husband's Bayesian on-equilibrium and off-equilibrium posteriors $P_2(P_1|g_1, e_1)$ for $g_1 \in \{0,1\}$ and $e_1 \in \{0,1\}$ given the wife's strategies,
2. show that the wife has no profitable deviation in her usage choice and calculate the husband's transfer strategy in period 2 that makes the wife indifferent between different usage choices in case she has a mixed strategy, and

3. show that the wife has no profitable deviation in her investment choice and calculate the husband's transfer strategy in period 2 that makes the wife indifferent between different investment choices in case she has a mixed strategy,
4. calculate the husband's transfer strategy in period 1.

First, suppose $P_1 > \dfrac{P_2^*}{P_2^* + \lambda(1-P_2^*)} \geq P_2^*$.

- $P_2(P_1, g_1 = 1, e_1 = 1) > P_2^*$ and $P_2(P_1, g_1 = 0, e_1 = 1) = 1$, $P_2(P_1, g_1 = 1, e_1 = 0) < P_2(P_1, g_1 = 1, e_1 = 1)$.
- For the usage choice, the non-expert wife always uses the purchased good if $-c + \beta\lambda\eta^R \geq 0$. This condition is satisfied because we assume $\beta\lambda\eta^R(1-\lambda) \geq \lambda\eta^R - \eta^S$ and $c \leq \dfrac{\lambda\eta^R - \eta^S}{1-\lambda}$. Under this condition, the expert wife also always uses the purchased good.
- For the investment choice, the wife's static best responses are optimal (see lemma 1) as they induce a reputation $P_2 > P_2^*$, which guarantees the future transfers. Therefore, there is no profitable deviation.
- For the husband's strategy, as any posterior P_2 on the equilibrium path lies above P_2^*, $V_2(P_2)$ is linear in P_2, so $\mathbb{E}V_2(P_2) = \lambda\eta^R + \mathbb{E}P_2(1-\lambda)\eta^S = \lambda\eta^R + P_1(1-\lambda)\eta^S = V_2(P_1)$. Thus, the husband needs to only compare first-stage payoffs from $T_1 = 1$ and $T_1 = 0$. Since $P_1 > P_2^*$, we have $\mathbb{E}[U_1^H(T_1 = 1)|P_1] > \omega$, so the husband prefers to make the transfer, $T_1 = 1$.

Second, suppose $P_1 \in \left[P_2^*, \dfrac{P_2^*}{P_2^* + \lambda(1-P_2^*)}\right]$. Denote $\kappa_1^R \equiv \tilde{\sigma}_2^H(h_2^H)$ when P_1 is in this range and $g_1 = 1$.

- Given the strategies, the updated reputation is $P_2(P_1|g_1 = 1, e_1 = 1) = P_2^*$ and $P_2(P_1|g_1 = 0, e_1 = 1) \geq P_2^*$, $P_2(P_1, g_1 = 1, e_1 = 0) < P_2(P_1, g_1 = 1, e_1 = 1)$.
- For the usage choice, the non-expert wife always uses the purchased good if $-c + \beta\kappa_1^R\lambda\eta^R \geq 0$. Once we define κ_1^R, we can show that this condition is satisfied because we assume $\beta\lambda\eta^R(1-\lambda) \geq \lambda\eta^R - \eta^S$ and $c \leq \dfrac{\lambda\eta^R - \eta^S}{1-\lambda}$. Under this condition, the expert wife also always uses the purchased good.
- For the investment choice, the non-expert wife is mixing if $\lambda\eta^R - (1-\lambda)c + \beta\kappa_1^R\lambda\eta^R = \eta^S + \beta\lambda\eta^R$. This condition pins down the husband's transfer strategy: $\kappa_1^R = \dfrac{\eta^S + \beta\lambda\eta^R - \lambda\eta^R + (1-\lambda)c}{\beta\lambda\eta^R}$. This value of κ_1^R ensures that the condition for usage $-c + \beta\kappa_1^R\lambda\eta^R \geq 0$ holds. The only strategies that form an equilibrium are the husband randomizing for $g_1 = 1$ and transferring with probability 1 for $g_1 = 0$ as otherwise when $P_1 = P_2^*$ and the non-expert wife's investment rate is λ, the non-expert wife would have the incentive to deviate by increasing her investment rate. For the expert wife, buying the risky good is optimal when $\eta_1^R = \eta^R$ because $\eta^R + \beta\kappa_1^R(\lambda\eta^R + (1-\lambda)\eta^S) > \eta^S + \beta(\lambda\eta^R + (1-\lambda)\eta^S)$; buying the safe good is optimal when $\eta_1^R = 0$ because $-c + \beta\kappa_1^R(\lambda\eta^R + (1-\lambda)\eta^S) < \eta^S + \beta(\lambda\eta^R + (1-\lambda)\eta^S)$.

- For the husband's strategy, again any posterior P_2 lies above or at P_2^*, so the husband only compares first-stage payoffs from $T_1 = 1$ and $T_1 = 0$ (note that it does not matter whether $P_2 > P_2^*$ or $P_2 = P_2^*$ as the value from the transfer is the same as the outside option for $P_2 = P_2^*$). The expected first-stage payoff from $T_1 = 1$ is increasing in P_1:

$$\mathbb{E}[U_1^H(T_1 = 1)|P_1] = P_1(\lambda\eta^R + (1-\lambda)\eta^S) + (1-P_1)(\sigma_{1,g}^{NE}\lambda\eta^R + (1-\sigma_{1,g}^{NE})\eta^S)$$
$$\Rightarrow \frac{\partial\mathbb{E}[U_1^H(T_1 = 1)|P_1]}{\partial P_1} = \lambda\eta^R(1-\sigma_{1,g}^{NE}) + \eta^S(\sigma_{1,g}^{NE} - \lambda) + \frac{\partial\sigma_{1,g}^{NE}}{\partial P_1}(\lambda\eta^R - \eta^S) \geq 0$$

where we use $\frac{\partial\sigma_{1,g}^{NE}}{\partial P_1} \geq 0$. Consider the lower boundary of this interval, $P_1 = P_2^*$:

$$\begin{aligned}\mathbb{E}[U_1^H(T_1 = 1)|P_1 = P_2^*] &= P_2^*(\lambda\eta^R + (1-\lambda)\eta^S) + (1-P_2^*)(\lambda^2\eta^R + (1-\lambda)\eta^S) \\ &< P_2^*(\lambda\eta^R + (1-\lambda)\eta^S) + (1-P_2^*)\lambda\eta^R = \omega\end{aligned}$$

Thus, the husband prefers the outside option, $T_1 = 0$, at $P_1 = P_2^*$ and switches to $T_1 = 1$ at some belief P_1^* that is above P_2^*.

Third, suppose $P_1 \in \left[\frac{P_2^*}{(1-\lambda)(1-P_2^*)+1}, P_2^*\right)$. Denote $\kappa_2^R \equiv \sigma_2^H(h_2^H)$ when P_1 is in this range and $g_1 = 1$. Denote $\kappa_2^S \equiv \sigma_2^H(h_2^H)$ when P_1 is in this range and $g_1 = 0$.

- Given the strategies, the updated reputation is $P_2(P_1|g_1 = 1, e_1 = 1) = P_2(P_1|g_1 = 0, e_1 = 1) = P_2^*$, $P_2(P_1|g_1 = 1, e_1 = 0) = 0$.
- For the usage choice, the non-expert wife mixes when making the usage choice if $-c + \beta\kappa_2^R\lambda\eta^R = 0$. Thus, $\kappa_2^R = \frac{c}{\beta\lambda\eta^R}$. Under this condition, the expert wife strictly prefers to use the purchased good because her continuation payoff is higher.
- For the investment choice, the non-expert wife mixes if $\lambda\eta^R - (1-\lambda)c\sigma_{1,e}^{NE}(h_{1,e}^{NE}) + \beta\kappa_2^R\lambda\eta^R(\lambda + (1-\lambda)\sigma_{1,e}^{NE}(h_{1,e}^{NE})) = \eta^S + \beta\lambda\eta^R\kappa_2^S$. This condition is equivalent to $\kappa_2^S = \frac{\lambda(\eta^R + c) - \eta^S}{\beta\lambda\eta^R}$. The expert wife strictly prefers to buy the risky good when $\eta_1^R = \eta^R$ because $\eta^R + \beta\kappa_2^R(\lambda\eta^R + (1-\lambda)\eta^S) > \eta^S + \beta\kappa_2^S(\lambda\eta^R + (1-\lambda)\eta^S)$. The expert wife strictly prefers to buy the safe good when $\eta_1^R = 0$ because $-c + \beta\kappa_2^R(\lambda\eta^R + (1-\lambda)\eta^S) < \eta^S + \beta\kappa_2^S(\lambda\eta^R + (1-\lambda)\eta^S)$.
- For the husband's strategy, note that on the equilibrium path, any posterior P_2 lies below P_2^*. In this region, $V_2(P_2)$ is constant in P_2, so $\mathbb{E}V_2(P_2) = \omega = V_2(P_1)$. Thus, the husband needs to only compare first-stage payoffs from $T_1 = 1$ and $T_1 = 0$:

$$\begin{aligned}\mathbb{E}[U_1^H(T_1 = 1)|P_1] &= P_1(\lambda\eta^R + (1-\lambda)\eta^S) + (1-P_1)(\sigma_{1,g}^{NE}\lambda\eta^R + (1-\sigma_{1,g}^{NE})\eta^S) \\ &< P_1(\lambda\eta^R + (1-\lambda)\eta^S) + (1-P_1)\lambda\eta^R \\ &< P_2^*(\lambda\eta^R + (1-\lambda)\eta^S) + (1-P_2^*)\lambda\eta^R = \omega\end{aligned}$$

Thus, the husband prefers the outside option, $T_1 = 0$, in this interval.

Finally, suppose $P_1 < \frac{P_2^*}{(1-\lambda)(1-P_2^*)+1}$. Denote $\kappa_3^S \equiv \sigma_2^H(h_2^H)$ when P_1 is in this range and $g_1 = 0$.

- Given the strategies, the updated reputation is $P_2(P_1|g_1 = 1, e_1 = 1) < P_2^*$, $P_2(P_1|g_1 = 1, e_1 = 0) = 0$, $P_2(P_1|g_1 = 0, e_1 = 1) = P_2^*$.
- For the usage choice, $e_1 = 0$ for wife types when $\eta_1 = 0$ because using the unproductive good cannot increase the reputation enough to reach threshold P_2^*. Using the productive risky and safe goods is dominant, so $e_1 = 1$ for both wife types when $\eta_1 \neq 0$.
- For the investment choice, the non-expert wife mixes if $\lambda\eta^R = \eta^S + \beta\lambda\eta^R\kappa_3^S$. This condition is equivalent to $\kappa_3^S = \dfrac{\lambda\eta^R - \eta^S}{\beta\lambda\eta^R}$. The expert wife strictly prefers to buy the risky good when $\eta_1^R = \eta^R$ because $\eta^R > \eta^S + \beta\kappa_3^S(\lambda\eta^R + (1-\lambda)\eta^S)$. The expert wife strictly prefers to buy the safe good when $\eta_1^R = 0$ because $0 < \eta^S + \beta\kappa_3^S(\lambda\eta^R + (1-\lambda)\eta^S)$.
- For the husband's strategy, note that on the equilibrium path, any posterior P_2 is again below P_2^*. Thus, as in the previous interval, the husband prefers the outside option, $T_1 = 0$, in this interval.

Combining the four intervals, we conclude that the husband uses a threshold strategy:

$$T_1(P_1) = \begin{cases} 1 \text{ if } P_1 \geq P_1^* \\ 0 \text{ if } P_1 < P_1^* \end{cases}$$

where $P_1^* \in \left(P_2^*, \dfrac{P_2^*}{\lambda(1-P_2^*) + P_2^*}\right)$. □

A.4 Proof of proposition 2

Proof. Suppose the hiding cost is sufficiently high: $c > \beta\lambda\eta^R$. Lemma 1 pins down the equilibrium strategies at $t = 2$, except for the husband's strategy when he is indifferent between making the transfer or not, i.e., at h_2^H such that $P_2 = P_2^*$. For these cases, let the husband randomize with probabilities $\tilde{\sigma}_2^H(h_2^H) \in [0, 1]$, which are defined further in the proof for various histories. At $t = 1$, equilibrium strategies are the following. The expert wife invests iff the risky good is productive and always uses the good unless it is unproductive and the hiding cost is too high:

$$\sigma_{1,g}^E(h_{1,g}^E) = \begin{cases} 1 \text{ if } \eta_1^R \neq 0 \\ 0 \text{ if } \eta_1^R = 0 \end{cases};$$

$$\sigma_{1,e}^E(h_{1,e}^E) = \begin{cases} 1 & \text{if } \eta_1 \neq 0 \text{ or } c < \beta(\lambda\eta^R + (1-\lambda)\eta^S) \\ 0 & \text{if } \eta_1 = 0 \text{ and } c \geq \beta(\lambda\eta^R + (1-\lambda)\eta^S) \end{cases}$$

The non-expert wife invests with a probability that is decreasing in reputation, always uses productive and safe goods, and never uses unproductive goods.

$$\sigma_{1,g}^{NE}(h_{1,g}^{NE}) = \begin{cases} 0 & \text{if } P_1 > \dfrac{P_2^*}{(1-\lambda)(1-P_2^*) + P_2^*} \\ \dfrac{P_2^* - P_1 + \lambda P_1(1-P_2^*)}{(1-P_1)P_2^*} \leq \lambda & \text{if } P_1 \in \left[P_2^*, \dfrac{P_2^*}{(1-\lambda)(1-P_2^*) + P_2^*}\right] \\ \dfrac{P_2^* - P_1 + \lambda P_1(1-P_2^*)}{(1-P_1)P_2^*} > \lambda & \text{if } P_1 < P_2^* \end{cases};$$

$$\sigma_{1,e}^{NE}(h_{1,e}^{NE}) = \begin{cases} 1 & \text{if } \eta_1 \neq 0 \\ 0 & \text{if } \eta_1 = 0 \end{cases}$$

Using productive and safe goods is weakly dominant for both wife types. When the good is unproductive, $e_1 = 0$ is optimal for the non-expert wife because the hiding cost is greater than the highest continuation payoff: $c > \beta\lambda\eta^R$. For the expert wife, it is sometimes optimal to use the unproductive good (off-path) if the continuation payoff is larger than the cost, i.e., if $c < \beta(\lambda\eta^R + (1-\lambda)\eta^S)$. Next, consider the purchase decision. We will show that the strategies of the wife and the husband form an equilibrium for different values of P_1 for which the wife has different investment strategies: $P_1 > \frac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}$ and $P_1 \leq \frac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}$.

The proofs are structured as before. First, suppose $P_1 > \frac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}$.

- Given the strategies, the updated reputation is $P_2 > P_2^*$.
- For the investment choice, it is optimal for the non-expert wife to buy the safe good because $\eta^S + \beta\lambda\eta^R \geq \lambda\eta^R + \beta\lambda^2\eta^R$. This condition holds by assumption that $\beta\lambda\eta^R(1-\lambda) \geq \lambda\eta^R - \eta^S$ (assumption 1). For the expert wife, it is optimal to buy the risky good if $\eta_1^R = \eta^R$ because $\eta^R + \beta(\lambda\eta^R + (1-\lambda)\eta^S) > \eta^S + \beta(\lambda\eta^R + (1-\lambda)\eta^S)$. For the expert wife, it is optimal to buy the safe good if $\eta_1^R = 0$ because $\eta^S + \beta(\lambda\eta^R + (1-\lambda)\eta^S) > \max\{0, -c + \beta(\lambda\eta^R + (1-\lambda)\eta^S)\}$.
- For the husband's strategy, any posterior P_2 lies above P_2^*. In this region, $V_2(P_2)$ is linear in P_2, so $\mathbb{E}V_2(P_2) = \lambda\eta^R + \mathbb{E}P_2(1-\lambda)\eta^S = \lambda\eta^R + P_1(1-\lambda)\eta^S = V_2(P_1)$. Thus, the husband needs to only compare first-stage payoffs from $T_1 = 1$ and $T_1 = 0$. The first-stage payoff is increasing in P_1:

  $$\mathbb{E}[U_1^H(T_1 = 1)|P_1] = P_1(\lambda\eta^R + (1-\lambda)\eta^S) + (1-P_1)\eta^S$$

  Moreover, at the lower end of the interval, at $P_1 = \frac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}$, the husband prefers to make the transfer:

  $$\begin{aligned}
  &\mathbb{E}\left[U_1^H(T_1 = 1)|P_1 = \frac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}\right] - \omega \\
  &= \frac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}(\lambda\eta^R + (1-\lambda)\eta^S) + \frac{(1-\lambda)(1-P_2^*)}{(1-\lambda)(1-P_2^*)+P_2^*}\eta^S - \omega \\
  &\propto P_2^*(\lambda\eta^R + (1-\lambda)\eta^S) + (1-\lambda)(1-P_2^*)\eta^S - \omega + \omega\lambda(1-P_2^*) \\
  &= P_2^*(\lambda\eta^R + (1-\lambda)\eta^S) + (1-P_2^*)\lambda\eta^R + (1-P_2^*)(1-\lambda)(\eta^S - \lambda\eta^R) - \omega + \omega\lambda(1-P_2^*) \\
  &= (1-P_2^*)(\lambda(\omega - \lambda\eta^R) - (1-\lambda)(\lambda\eta^R - \eta^S)) \geq 0 \quad \text{(by assumption 1).}
  \end{aligned}$$

  Thus, $T_1 = 1$ in this interval.

Second, suppose $P_1 \leq \frac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}$.

- Given the strategies, $P_2(P_1|g_1 = 0, e_1 = 1) = P_2^*$, $P_2(P_1 \geq \frac{P_2^*}{(1-P_2^*)(1-\lambda)+1} \equiv \overline{P}_1|g_1 = 1, e_1 = 1) \geq P_2^*$ and $P_2(P_1 < \overline{P}_1|g_1 = 1, e_1 = 1) < P_2^*$. Denote $\kappa_1^S \equiv \sigma_2^H(h_2^H)$ when $P_1 \geq \overline{P}_1$ and $g_1 = 0$. Denote $\kappa_2^S \equiv \sigma_2^H(h_2^H)$ when $P_1 < \overline{P}_1$ and $g_1 = 0$.

- For the investment choice, the non-expert wife mixes if $\eta^S + \beta\kappa_1^S \lambda\eta^R = \lambda\eta^R + \beta\lambda^2\eta^R$ and $\eta^S + \beta\kappa_2^S \lambda\eta^R = \lambda\eta^R$. These conditions pin down the husband's mixing probabilities: $\kappa_1^S = \dfrac{\lambda\eta^R - \eta^S + \beta\lambda^2\eta^R}{\beta\lambda\eta^R}$ and $\kappa_2^S = \dfrac{\lambda\eta^R - \eta^S}{\beta\lambda\eta^R}$. For the expert wife, it is optimal to buy the risky good if $\eta_1^R = \eta^R$ because $\eta^R + \beta(\lambda\eta^R + (1-\lambda)\eta^S) > \eta^S + \beta\kappa_1^S(\lambda\eta^R + (1-\lambda)\eta^S)$ and $\eta^R > \eta^S + \beta\kappa_2^S(\lambda\eta^R + (1-\lambda)\eta^S)$. The only strategies that form an equilibrium are the husband randomizing for $g_1 = 0$ and transferring with probability 1 for $g_1 = 1$, as otherwise when $P_1 = \bar{P}_1$, and $P_2 = P_2^*$ and the non-expert wife's investment rate is $> \lambda$, the non-expert wife would have the incentive to deviate by decreasing her investment rate. For the expert wife, it is optimal to buy the safe good if $\eta_1^R = 0$ because $\eta^S + \beta\kappa_1^S(\lambda\eta^R + (1-\lambda)\eta^S) > \max\{0, -c + \beta(\lambda\eta^R + (1-\lambda)\eta^S)\}$ and $\eta^S + \beta\kappa_2^S(\lambda\eta^R + (1-\lambda)\eta^S) > 0$.
- For the husband's strategy, we will look at three regions separately: $P_1 \in \left[P_2^*, \dfrac{P_2^*}{(1-\lambda)(1-P_2^*) + P_2^*}\right]$, $P_1 \in (\overline{P}_1, P_2^*)$, and $P_1 \leq \overline{P}_1$:
  - First, suppose $P_1 \in \left[P_2^*, \dfrac{P_2^*}{(1-\lambda)(1-P_2^*) + P_2^*}\right]$. We look at the difference between the sum of the first-stage and continuation payoffs under the transfer and no transfer. The expected first-stage payoff if $T_1 = 1$ is

$$\begin{aligned}\mathbb{E}[U_1^H(T_1 = 1)|P_1] &= P_1(\lambda\eta^R + (1-\lambda)\eta^S) + (1-P_1)(\sigma_{1,g}^{NE}\lambda\eta^R + (1-\sigma_{1,g}^{NE})\eta^S) \\ &= ... = \lambda\eta^R + P_1\frac{1-\lambda}{P_2^*}(\eta^S - (1-P_2^*)\lambda\eta^R) \\ &\geq \lambda\eta^R + (1-\lambda)[\eta^S - (1-P_2^*)\lambda\eta^R]\end{aligned}$$

The difference in expected first-stage payoffs under $T_1 = 1$ and $T_1 = 0$ is

$$\Delta\mathbb{E}U_1^H = \lambda\eta^R + P_1\frac{1-\lambda}{P_2^*}(\eta^S - (1-P_2^*)\lambda\eta^R) - \omega$$

which is increasing in P_1. The expected (discounted) second-stage continuation payoff if $T_1 = 1$ is

$$\begin{aligned}\beta\mathbb{E}[U_2^H(T_1 = 1)|P_1] =& \beta[V_2(P_2(P_1|g = 1, e = 1))Pr(g = 1, e = 1) \\ &+ \omega Pr(g = 0) + \omega Pr(g = 1, e = 0)]\end{aligned}$$

The expected (discounted) continuation payoff if $T_1 = 0$ can also be written in a similar way using the linearity of payoff and $\mathbb{E}P_2 = P_1$:

$$\begin{aligned}&\beta\mathbb{E}[U_2^H(T_1 = 0)|P_1] = \beta V_2(P_1) \\ &= \beta[V_2(P_2(P_1|g = 1, e = 1))Pr(g = 1, e = 1) + \omega Pr(g = 0) + \lambda\eta^R Pr(g = 1, e = 0)]\end{aligned}$$

The difference in the expected continuation payoffs under $T_1 = 1$ and $T_1 = 0$ is

$$\begin{aligned}\beta\Delta\mathbb{E}U_2^H &= \beta Pr(g=1, e=0)(\omega - \lambda\eta^R)\\ &= \beta\frac{P_2^* - P_1 + \lambda P_1(1-P_2^*)}{P_2^*}(1-\lambda)(\omega - \lambda\eta^R)\end{aligned}$$

which is decreasing in P_1. The husband chooses $T_1 = 1$ iff $\Delta\mathbb{E}U_1^H + \beta\Delta\mathbb{E}U_2^H \geq 0$. First, we show that $\Delta\mathbb{E}U_1^H + \beta\Delta\mathbb{E}U_2^H \geq 0$ at the lower end, $P_1 = P_2^*$:

$$\begin{aligned}&\Delta\mathbb{E}U_1^H + \beta\Delta\mathbb{E}U_2^H\\ &= \lambda\eta^R + (1-\lambda)(\eta^S - (1-P_2^*)\lambda\eta^R) - \omega + \beta\lambda(1-P_2^*)(1-\lambda)(\omega - \lambda\eta^R)\\ &= \lambda\eta^R + (1-\lambda)(\eta^S - (1-P_2^*)\lambda\eta^R)\\ &- (\lambda\eta^R + P_2^*(1-\lambda)\eta^S) + \beta\lambda(1-P_2^*)(1-\lambda)(\omega - \lambda\eta^R)\\ &= (1-\lambda)(1-P_2^*)(\beta\lambda(\omega - \lambda\eta^R) - (\lambda\eta^R - \eta^S)) \geq 0,\end{aligned}$$

where the inequality holds by assumption 1.
Second, we show that $\Delta\mathbb{E}U_1^H + \beta\Delta\mathbb{E}U_2^H$ is monotonically increasing in P_1:

$$\begin{aligned}&\frac{\partial}{\partial P_1}(\Delta\mathbb{E}U_1^H + \beta\Delta\mathbb{E}U_2^H)\\ &= \frac{1-\lambda}{P_2^*}(\eta^S - (1-P_2^*)\lambda\eta^R) + \beta\frac{1-\lambda}{P_2^*}(\lambda(1-P_2^*) - 1)(\omega - \lambda\eta^R)\\ &\propto \eta^S - (1-P_2^*)\lambda\eta^R + \beta P_2^*(1-\lambda)\eta^S(\lambda(1-P_2^*) - 1)\\ &= P_2^*[\lambda\eta^R - \beta\eta^S(1-\lambda)(1-\lambda(1-P_2^*))] - (\lambda\eta^R - \eta^S)\\ &= \beta\lambda(\omega - \lambda\eta^R)\left[\frac{\eta^R}{\beta(1-\lambda)\eta^S} - \frac{1-\lambda(1-P_2^*)}{\lambda}\right] - (\lambda\eta^R - \eta^S)\\ &\geq \beta\lambda(\omega - \lambda\eta^R)\left[\frac{\eta^R}{(1-\lambda)\eta^S} - \frac{1-\lambda(1-P_2^*)}{\lambda}\right] - (\lambda\eta^R - \eta^S)\\ &= \beta\lambda(\omega - \lambda\eta^R)\left[1 + \frac{\lambda\eta^R + \lambda^2\eta^R - \lambda\omega - \eta^S + \lambda\eta^S}{\lambda(1-\lambda)\eta^S}\right] - (\lambda\eta^R - \eta^S) > 0,\end{aligned}$$

where we have used that $P_2^* = \dfrac{\omega - \lambda\eta^R}{(1-\lambda)\eta^S}$ and the inequality holds under assumption 1. Thus, the husband chooses $T_1 = 1$ at all $P_1 \geq P_2^*$.

– Next, suppose $P_1 \in (\overline{P}_1, P_2^*)$. Following the same approach as above, the difference in expected first-stage payoffs under $T_1 = 1$ and $T_1 = 0$ is

$$\Delta\mathbb{E}U_1^H = \lambda\eta^R + P_1\frac{1-\lambda}{P_2^*}(\eta^S - (1-P_2^*)\lambda\eta^R) - \omega$$

which is increasing in P_1. The difference in the expected continuation payoffs under

$T_1 = 1$ and $T_1 = 0$ is

$$
\begin{aligned}
\beta \Delta \mathbb{E} U_2^H &= \beta Pr(g=1, e=1)(\lambda \eta^R + P_2(P_1 | g=1, e=1)(1-\lambda)\eta^S - \omega) \\
&= \beta (P_1 + (1-P_1)\sigma_{1,g}^{NE})\lambda(\lambda \eta^R + P_2(P_1 | g=1, e=1)(1-\lambda)\eta^S - \omega) \\
&= \beta \frac{P_1 P_2^* + P_2^* - P_1 + \lambda P_1 (1 - P_2^*)}{P_2^*} \lambda \times \\
&\left(\lambda \eta^R + \frac{P_1 P_2^*}{P_1 P_2^* + P_2^* - P_1 + \lambda P_1 (1-P_2^*)} (1-\lambda)\eta^S - \omega \right) \\
&= \beta \lambda \left[(\omega - \lambda \eta^R) \frac{(1-\lambda) P_1 (1-P_2^*) - P_2^*}{P_2^*} + \eta^S (1-\lambda) P_1 \right]
\end{aligned}
$$

which is also increasing in P_1. Thus, $\Delta \mathbb{E} U_1^H + \beta \Delta \mathbb{E} U_2^H$ is monotonically increasing in P_1 in this interval. At the lower end, if $P_1 = \overline{P}_1$, then $P_2(P_1 | g=1, e=1) = P_2^*$, so $\beta \Delta \mathbb{E} U_2^H = 0$. For the first-stage payoff, $\Delta \mathbb{E} U_1^H < 0$. Therefore, the husband chooses $T_1 = 0$ at $P_1 = \overline{P}_1$ and switches to $T_1 = 1$ at some higher P_1.

– Finally, suppose $P_1 \leq \overline{P}_1$. On the equilibrium path, updated reputation is always below P_2^*. Then, following the same argument as in Proposition 1, the husband needs to only consider the first-stage payoff. The expected first-stage payoff is worse than the outside option:

$$
\begin{aligned}
\mathbb{E}[U_1^H(T_1 = 1) | P_1] &= P_1(\lambda \eta^R + (1-\lambda)\eta^S) + (1-P_1)(\sigma_{1,g}^{NE} \lambda \eta^R + (1-\sigma_{1,g}^{NE})\eta^S) \\
&\leq P_1(\lambda \eta^R + (1-\lambda)\eta^S) + (1-P_1)\lambda \eta^R \\
&< P_2^*(\lambda \eta^R + (1-\lambda)\eta^S) + (1-P_2^*)\lambda \eta^R \\
&\leq \lambda \eta^R + (1-\lambda)\eta^S = \omega
\end{aligned}
$$

Thus, the husband also chooses $T_1 = 0$ at all $P_1 < \overline{P}_1$.

Combining the four intervals for the husband, we conclude that the husband uses a threshold strategy:

$$
T_1(P_1) = \begin{cases} 1 \text{ if } P_1 \geq P_1^* \\ 0 \text{ if } P_1 < P_1^* \end{cases}
$$

where $P_1^* \in \left(\frac{P_2^*}{(1-P_2^*)(1-\lambda)+1}, P_2^* \right)$. □

A.5 Proof of Proposition 3

Proof. Suppose the hiding costs are intermediate: $\frac{\lambda \eta^R - \eta^S}{1-\lambda} < c \leq \beta \lambda \eta^R$.

Lemma 1 pins down the equilibrium strategies at $t = 2$, except for the husband's strategy when he is indifferent between making the transfer or not, i.e., at h_2^H such that $P_2 = P_2^*$. For these cases, let the husband randomize with probabilities $\tilde{\sigma}_2^H(h_2^H) \in [0, 1]$, which are defined further in the proof for various histories.

At $t = 1$, equilibrium strategies are the following. The expert wife invests iff the risky good is productive and always uses the good unless her reputation is very low:

$$\sigma_{1,g}^{E}(h_{1,g}^{E}) = \begin{cases} 1 \text{ if } \eta_1^R \neq 0 \\ 0 \text{ if } \eta_1^R = 0 \end{cases};$$

$$\sigma_{1,e}^{E}(h_{1,e}^{E}) = \begin{cases} 1 & \text{if } \eta_1 \neq 0 \text{ or } \left(\eta_1 = 0 \text{ and } P_1 \geq \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}\right) \\ 0 & \text{if } \eta_1 = 0 \text{ and } P_1 < \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1} \end{cases}$$

The non-expert wife invests with probability decreasing in reputation, always uses the productive and safe goods but uses the unproductive good with positive probability only when her reputation is not too low:

$$\sigma_{1,g}^{NE}(h_{1,g}^{NE}) = \begin{cases} 0 & \text{if } P_1 > \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*} \\ \dfrac{P_2^* - P_1 + \lambda P_1(1-P_2^*)}{(1-P_1)P_2^*} \leq \lambda & \text{if } P_1 \in \left[P_2^*, \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}\right] \\ \dfrac{P_2^* - P_1 + \lambda P_1(1-P_2^*)}{(1-P_1)P_2^*} > \lambda & \text{if } P_1 < P_2^* \end{cases};$$

$$\sigma_{1,e}^{NE}(h_{1,e}^{NE}) =$$

$$\begin{cases} 1 & \text{if } \eta_1 \neq 0 \text{ or } (\eta_1 = 0 \text{ and } P_1 \geq P_2^*) \\ \left[\dfrac{P_1(1-P_2^*)}{P_2^* - P_1 + \lambda P_1(1-P_2^*)} - 1\right]\dfrac{\lambda}{1-\lambda} & \text{if } \eta_1 = 0 \text{ and } P_1 \in \left[\dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}, P_2^*\right) \\ 0 & \text{if } \eta_1 = 0 \text{ and } P_1 < \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1} \end{cases}$$

Note that if the purchased good is productive or safe, it is weakly dominant to use it for both wife types because the cost is zero and reputation drops to $P_2 = 0$ if the good is not used.

We will show that the strategies of the wife and the husband form an equilibrium for different values of P_1 for which the wife has different usage or investment strategies: $P_1 > \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}$, $P_1 \in \left[P_2^*, \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}\right]$, $P_1 \in \left[\dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}, P_2^*\right)$, and $P_1 < \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}$. The proofs are structured as before.

First, suppose $P_1 > \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}$.

- Given the strategies, $P_2(P_1|g_1 = 1, e_1 = 1) = 1$ and $P_2(P_1|g_1 = 0, e_1 = 1) > P_2^*$.
- For the usage choice, if the purchased good is unproductive, both wife types use it because $-c + \beta\lambda\eta^R \geq 0$.
- For the investment choice, it is optimal for the non-expert wife to buy the safe good because $\eta^S + \beta\lambda\eta^R \geq \lambda\eta^R - (1-\lambda)c + \beta\lambda\eta^R$. This condition holds by the assumption that $c > \dfrac{\lambda\eta^R - \eta^S}{1-\lambda}$. For the expert wife, if $\eta_1^R = \eta^R$, it is optimal to buy the risky good because $\eta^R + \beta(\lambda\eta^R + (1-\lambda)\eta^S) > \eta^S + \beta(\lambda\eta^R + (1-\lambda)\eta^S)$. If $\eta_1^R = 0$, it is

optimal to buy the safe good for the expert wife because $\eta^S + \beta(\lambda\eta^R + (1-\lambda)\eta^S) > -c + \beta(\lambda\eta^R + (1-\lambda)\eta^S)$.

- The wife's strategy in this interval is the same as in proposition 2, so the husband's payoff is also the same. Thus, $T_1 = 1$ in this interval.

Second, suppose $P_1 \in \left[P_2^*, \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+P_2^*}\right]$. Denote $\kappa_1^S \equiv \sigma_2^H(h_2^H)$ when P_1 is in this interval and $g_1 = 0$.

- Given the strategies, $P_2(P_1|g_1 = 1, e_1 = 1) \geq P_2^*$ and $P_2(P_1|g_1 = 0, e_1 = 1) = P_2^*$.

- For the usage choice, if the purchased good is unproductive, both wife types use it because $-c + \beta\lambda\eta^R \geq 0$.

- For the investment choice, the non-expert wife mixes if $\eta^S + \beta\kappa_1^S\lambda\eta^R = \lambda\eta^R - (1-\lambda)c + \beta\lambda\eta^R$. These conditions pin down the husband's transfer strategy: $\kappa_1^S = \dfrac{\lambda\eta^R - \eta^S - (1-\lambda)c + \beta\lambda\eta^R}{\beta\lambda\eta^R}$. For the expert wife, it is optimal to buy the risky good if $\eta_1^R = \eta^R$ because $\eta^R + \beta(\lambda\eta^R + (1-\lambda)\eta^S) > \eta^S + \beta\kappa_1^S(\lambda\eta^R + (1-\lambda)\eta^S)$. If $\eta_1^R = 0$, it is optimal to buy the safe good for the expert wife because $\eta^S + \beta\kappa_1^S(\lambda\eta^R + (1-\lambda)\eta^S) > -c + \beta(\lambda\eta^R + (1-\lambda)\eta^S)$.

- For the husband's strategy, on the equilibrium path, updated reputation is always $\geq P_2^*$. Thus, the husband needs to only consider the first-stage payoff. The expected first-stage payoff is

$$\Delta\mathbb{E}[U_1^H(T_1 = 1)|P_1] = \lambda\eta^R + P_1\frac{1-\lambda}{P_2^*}(\eta^S - (1-P_2^*)\lambda\eta^R) - \omega,$$

  which is increasing in P_1. At the lower end of the interval, $P_1 = P_2^*$, the payoff from making the transfer is lower than the outside option:

$$\lambda\eta^R + (1-\lambda)\eta^S - (1-\lambda)(1-P_2^*)\lambda\eta^R < \lambda\eta^R + P_2^*(1-\lambda)\eta^S = \omega$$

  Thus, the husband chooses $T_1 = 0$ at $P_1 = P_2^*$ and switches to $T_1 = 1$ at some higher P_1 in this interval.

Third, suppose $P_1 \in \left[\dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}, P_2^*\right)$. Denote $\kappa_2^R \equiv \sigma_2^H(h_2^H)$ when P_1 is in this range and $g_1 = 1$. Denote $\kappa_2^S \equiv \sigma_2^H(h_2^H)$ when P_1 is in this range and $g_1 = 0$.

- Given the strategies, the updated reputation is $P_2(P_1|g_1 = 1, e_1 = 1) = P_2(P_1|g_1 = 0, e_1 = 1) = P_2^*$ and $P_2(P_1|g_1 = 1, e_1 = 0) = 0$.

- For the usage choice, the non-expert wife mixes if $-c + \beta\kappa_2^R\lambda\eta^R = 0$. Thus, $\kappa_2^R = \dfrac{c}{\beta\lambda\eta^R}$. Under this condition, the expert wife strictly prefers to use the purchased good because her continuation payoff is higher.

- For the investment choice, the non-expert wife mixes if $\lambda\eta^R - (1-\lambda)c\sigma_{1,e}^{NE}(h_{1,e}^{NE}) + \beta\kappa_2^R\lambda\eta^R(\lambda + (1-\lambda)\sigma_{1,e}^{NE}(h_{1,e}^{NE})) = \eta^S + \beta\lambda\eta^R\kappa_2^S$. This condition is equivalent to $\kappa_2^S = \dfrac{\lambda(\eta^R + c) - \eta^S}{\beta\lambda\eta^R}$. The expert wife strictly prefers to buy the risky good when $\eta_1^R = \eta^R$ because $\eta^R + \beta\kappa_2^R(\lambda\eta^R + (1-\lambda)\eta^S) > \eta^S + \beta\kappa_2^S(\lambda\eta^R + (1-\lambda)\eta^S)$. The expert wife strictly prefers to buy the safe good when $\eta_1^R = 0$ because $-c + \beta\kappa_2^R(\lambda\eta^R + (1-\lambda)\eta^S) < \eta^S + \beta\kappa_2^S(\lambda\eta^R + (1-\lambda)\eta^S)$.
- For the husband's strategy, as the updated reputation is always $\leq P_2^*$, the husband needs to only consider the first-stage payoff. The expected first-stage payoff is the same as above:

$$\mathbb{E}[U_1^H(T_1 = 1)|P_1] = \lambda\eta^R + P_1\frac{1-\lambda}{P_2^*}(\eta^S - (1-P_2^*)\lambda\eta^R)$$

  Since the payoff is increasing in P_1, and it is lower than ω at $P_1 = P_2^*$, it is also lower than ω at all $P_1 < P_2^*$.

Finally, suppose $P_1 < \dfrac{P_2^*}{(1-\lambda)(1-P_2^*)+1}$. Denote $\kappa_3^S \equiv \sigma_2^H(h_2^H)$ when P_1 is in this range and $g_1 = 0$.

- Given the strategies, the updated reputation is $P_2(P_1|g_1 = 1, e_1 = 1) < P_2^*$, $P_2(P_1|g_1 = 0, e_1 = 1) = P_2^*$ and $P_2(P_1|g_1 = 1, e_1 = 0) = 0$.
- For the usage choice, using the unproductive good cannot increase the reputation enough to reach threshold P_2^*. Therefore, $e_1 = 0$ for both types of wives when $\eta_1 = 0$. Using the productive risky and safe goods is weakly dominant, so $e_1 = 1$ for both types of wives when $\eta_1 \neq 0$.
- For the investment choice, the non-expert wife mixes if $\lambda\eta^R = \eta^S + \beta\lambda\eta^R\kappa_3^S$. This condition is equivalent to $\kappa_3^S = \dfrac{\lambda\eta^R - \eta^S}{\beta\lambda\eta^R}$. The expert wife strictly prefers to buy the risky good when $\eta_1^R = \eta^R$ because $\eta^R > \eta^S + \beta\kappa_3^S(\lambda\eta^R + (1-\lambda)\eta^S)$. The expert wife strictly prefers to buy the safe good when $\eta_1^R = 0$ because $0 < \eta^S + \beta\kappa_3^S(\lambda\eta^R + (1-\lambda)\eta^S)$.
- For the husband's strategy, as above, as the updated reputation is always $< P_2^*$, the payoff is also lower than ω in this interval.

Combining the four intervals, we conclude that the husband uses a threshold strategy:

$$T_1(P_1) = \begin{cases} 1 \text{ if } P_1 \geq P_1^* \\ 0 \text{ if } P_1 < P_1^* \end{cases}$$

where $P_1^* \in \left(P_2^*, \dfrac{P_2^*}{(1-\lambda)(1-P_2^*) + P_2^*}\right)$.

$\square$

B Empirical Appendix

Table A.1: Correlations between reputation and transfers from the husband to the wife in the previous two months (MWK) as well as the share of wives who have access to cash and savings

	Avg. transfers in the last two months (MWK)				Access to cash (%)
	(1)	(2)	(3)	(4)	(5)
MER=2	11.357		10.855		
	(1910.735)		(1911.101)		
MER=3	844.885		840.298		
	(1817.044)		(1819.637)		
MER=4	1310.761		1301.580		
	(1801.829)		(1807.818)		
Low MER		-1085.503		-1075.501	-8.993
		(843.682)		(849.411)	(3.980)
Low GAR			-58.394	-87.695	-7.167
			(669.120)	(666.459)	(2.979)
Control Mean	8186.59	8509.49	8509.49	8186.59	70.31
Observations	1093	1093	1093	1093	1092

Notes: The table shows results from OLS regressions with Huber-White robust SEs. The data is winsorized at 3 SDs (1.7% of the data). MER=2, MER=3, and MER=4 are binary variables that take the value 1 if the woman has an MER of 2 (13%), 3 (31%), or 4 (52%) respectively. Access to cash is an indicator that takes the value 1 if the husband reports that his wife has "access to cash and savings". The regressions control for the wife and the husband's age, education, average income in the last two months (as reported by the husband), variability of income (whether income is the same in most months or varies a lot), risk preferences, math, and raven scores, as well as years married, number of children and household members and enumerator fixed effects.

Table A.2: Transfer experiment: Effect of reputation salience on amount (%) transferred from the husband to the wife

	(1)	(2)	(3)	(4)
Low MER	0.343	-0.472	0.492	0.173
	(3.374)	(3.395)	(3.339)	(3.389)
Salience	2.143	1.635	2.128	3.237
	(1.720)	(1.741)	(2.224)	(2.298)
Low MER*Salience	-9.184	-9.311	-8.786	-8.917
	(4.231)	(4.181)	(4.226)	(4.241)
Low GAR			-3.763	
			(2.309)	
Low GAR*Salience			0.030	
			(2.993)	
Low Husband GAR				-2.566
				(2.310)
Low Husband GAR*Salience				-2.313
				(2.991)
Control Mean	68.89	68.89	70.61	71.29
Observations	1093	1093	1093	1093
Benchmark specification from Figure 3	✓			
Including controls		✓		
Testing for experimenter demand effect			✓	
Testing for effect of the husband's mood				✓

Notes: The table shows results from OLS regressions with Huber-White robust SEs. Market Expertise Reputation (MER) is defined as before. Column 2 tests for robustness when excluding controls. Column 3 tests for experimenter demand effect by assessing the impact of the salience treatment by the wife's General Ability Reputation (GAR). GAR is the normalized mean of the husband's beliefs about the wife's correct answers in a math test and a raven game. Low GAR is a binary variable that takes the value 1 if the woman has a General Ability Reputation below the median, and 0 otherwise. Column 4 tests whether the salience treatment works by making husbands angrier by assessing the impact of the salience treatment by the husband's General Ability Reputation (GAR). This is the normalized mean of the husband's beliefs about his correct answers in a math test and a raven game. Low Husband GAR is a binary variable that takes the value 1 if the husband has a general ability reputation below the median, and 0 otherwise. All regressions include enumerator, compensation, and version fixed effects. See Table A.1 notes for the list of controls.

Table A.3: Outcomes in the signaling experiment

	Whole sample (N=1093)			Participation sample (N=786)				Whole sample (N=1093)
	Panel A: By price and low perceived score							
	Initial score	Participate (%)	Foregone comp.	Initial score	# Errors corrected	Hiding fee	Final score	Total forgone
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Expert	-0.246	-4.080	8.160	-0.361	0.247	23.297	-0.114	24.540
	(0.129)	(4.670)	(9.341)	(0.147)	(0.108)	(11.043)	(0.159)	(10.774)
Intermediate Cost	0.168	4.578	-9.156	0.237	-0.179	10.223	0.059	1.413
	(0.118)	(3.874)	(7.747)	(0.129)	(0.074)	(10.973)	(0.130)	(10.750)
High Cost	0.113	-0.348	0.695	0.060	-0.238	17.802	-0.178	13.976
	(0.108)	(3.897)	(7.795)	(0.125)	(0.068)	(12.590)	(0.128)	(11.155)
Non-Expert*Intermediate Cost	-0.000	-12.476	24.952	-0.043	-0.028	21.570	-0.071	27.280
	(0.184)	(6.840)	(13.681)	(0.207)	(0.140)	(21.012)	(0.216)	(17.511)
Non-Expert*High Cost	0.119	-11.188	22.375	0.214	-0.243	-16.702	-0.029	0.128
	(0.176)	(6.588)	(13.176)	(0.208)	(0.126)	(22.269)	(0.218)	(17.445)
Mean (Low Cost & Expert)	4.149	76.349	47.303	4.196	0.462	46.196	4.658	82.573
P-value (Expert vs. Non-Expert, Intermediate Cost)	0.060	0.001	0.001	0.005	0.015	0.012	0.205	0.000
P-value (Expert vs. Non-Expert, High Cost)	0.293	0.001	0.001	0.320	0.957	0.734	0.338	0.074
	Panel B: By price and difficulty of the quiz							
	Initial score	Participate (%)	Foregone comp.	Initial score	# Errors corrected	Hiding fee	Final score	Total forgone
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Harder Version	-1.120	6.836	-13.672	-1.065	0.305	30.657	-0.760	11.536
	(0.112)	(4.433)	(8.866)	(0.129)	(0.100)	(10.257)	(0.144)	(10.379)
Intermediate Cost	0.116	5.113	-10.225	0.111	-0.195	0.953	-0.084	-7.833
	(0.104)	(4.529)	(9.059)	(0.121)	(0.069)	(9.692)	(0.124)	(10.501)
High Cost	0.102	-2.289	4.579	0.148	-0.219	9.460	-0.072	8.528
	(0.105)	(4.584)	(9.168)	(0.122)	(0.071)	(13.026)	(0.126)	(11.565)
Harder Version*Intermediate Cost	0.082	-11.762	23.524	0.149	0.039	38.063	0.188	43.937
	(0.163)	(6.516)	(13.031)	(0.186)	(0.128)	(19.217)	(0.201)	(17.133)
Harder Version*High Cost	0.152	-6.313	12.626	-0.002	-0.204	4.131	-0.206	13.044
	(0.154)	(6.351)	(12.702)	(0.178)	(0.119)	(20.887)	(0.192)	(17.261)
Mean (Low Cost & Easier Version)	4.594	71.875	56.250	4.601	0.406	40.580	5.007	85.417
P-value (Easier vs. Harder Version, Intermediate Cost)	0.000	0.303	0.303	0.000	0.000	0.000	0.000	0.000
P-value (Easier vs. Harder Version, High Cost)	0.000	0.909	0.909	0.000	0.107	0.054	0.000	0.074

Notes: The table shows results from OLS regressions with Huber-White robust SEs. Low Perceived Score is an indicator that takes the value 1 if the wife reports an average weighted score that is lower than 5 (39 % of women). The weighted average is calculated as the average across all scores, weighted by the probability assigned to each score by the woman (each woman placed 10 beans on the 7 different scores). Foregone comp. is the amount of money wives left on the table by opting out of the game. All regressions include enumerator and compensation fixed effects. The p-value is the p-value from a Wald test comparing outcomes between low perceived score and high perceived score wives or between the hard and the easy version when the hiding cost is high.

Table A.4: Investment experiment: Willingness to pay, by wife's expertise

	(1)	(2)	(3)	(4)	(5)	(6)
Non-Expert	-89.782	-86.941	-78.570	-89.219	-86.257	-77.216
	(36.868)	(36.999)	(36.288)	(36.769)	(36.875)	(36.149)
'Donated' Sticker	-32.684	-37.235	-38.032			
	(37.855)	(38.007)	(37.849)			
'Donated'*Non-Expert	113.829	107.463	115.436			
	(55.173)	(55.354)	(54.859)			
'Effectiveness' Sticker	-31.535	-32.110	-39.847			
	(40.388)	(39.376)	(38.914)			
'Effectiveness'*Non-Expert	121.058	120.382	136.007			
	(59.744)	(59.461)	(58.813)			
'Donated'&'Effectiveness' Stickers	-45.036	-49.979	-45.003			
	(39.776)	(38.544)	(38.505)			
('Donated'&'Effectiveness')*Non-Expert	48.426	52.750	59.247			
	(53.765)	(53.607)	(52.779)			
Any Sticker				-35.841	-39.075	-40.023
				(31.694)	(30.828)	(30.643)
Any Sticker*Non-Expert				94.123	92.504	102.193
				(44.053)	(44.298)	(43.178)
Mean(Control & Expert)	350.802	350.802	350.802	350.802	350.802	350.802
Observations	675	675	675	675	675	675
Market FE		✓	✓		✓	✓
Controls			✓			✓

Notes: The table shows results from OLS regressions with Huber-White robust SEs. The dependent variable is the willingness to pay in Malawian Kwacha. Non-Expert is an indicator that takes the value 1 if the wife reports that her husband has a prior about her math score below 5 (44%). All regressions include enumerator fixed effects. Market fixed effects are dummies for the different markets in which the enumerators recruited married women. Controls include the wife's age, education, average income in the last and previous month, risk preferences, math score, as well as the husband's average income in the last and previous month, years married, and the number of children and household members.