Middlemen, Bargaining and Price Information: Is Knowledge Power?*

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Abstract

This paper investigates an important channel through which improved access to market information could increase the prices that producers receive from middlemen. I develop a theoretical model of trade between a farmer and a middleman which allows for the existence of different types of middlemen. The source of heterogeneity is attitudes towards fairness. I provide an empirical test of the theory from an original framed field experiment carried out with farmers and middlemen in India. The model predicts that there will be a non-monotonic relationship between the benefit of information and the cost of switching to a new middleman. The results of the experiment support the predictions of the model and demonstrate that actual middlemen differ in their attitudes towards fairness, middlemen make higher offers when the farmer is informed, and the benefit of information to the farmer varies with the cost of switching.

1 Introduction

The majority of the poor in developing countries depend on agriculture for their livelihoods. Moreover, high and volatile food prices can have severe negative consequences for the welfare of the poor. Improving the efficiency of agricultural markets is therefore a priority. Agricultural supply chains are often

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dominated by middlemen with substantial market power. Their high margins distort the market by driving a wedge between the price paid to farmers and by final consumers. One source of market power lies in the fact that middlemen are better informed about market conditions, especially the prices further down the supply chain. This raises the possibility that better access to market information can increase the prices that farmers receive from middlemen, thereby increasing their income and helping them to make better production decisions.

A number of recent empirical papers have investigated the effects of better market information on producer prices, although results are mixed. However, few of these studies are able to model explicitly how a farmer can use price information when bargaining with a middleman. It is normally assumed that the farmer receives a higher price when he is informed because he is risk averse. However, since the variability of the price that he receives will also be higher, it is not clear that the farmer will be better off when he is informed. In this paper, I develop a theoretical model to demonstrate how market information can lead to an increase in the price that a farmer receives from middlemen through a different channel. The approach allows for the presence of different types of middlemen, and for farmers to switch to a different buyer between periods. The paper provides an empirical test of the theory from an original framed field experiment carried out with actual farmers and middlemen in Gujarat, India.[1]

In the basic two-period model, a farmer and a middleman trade with one another. The middleman is informed about the market price for the good that they are trading while the farmer knows only the distribution of prices. The farmer has an outside option to go to the market himself but faces high transport costs. He may encounter one of two types of middlemen. The 'good' type cares about fairness and splits the gains from trade equally with the farmer. The 'bad' type behaves strategically and aims to maximize the sum of his gains from the two periods. The field experiment reported on here is mapped closely on to the set-up of the model. It is used to investigate whether the posited heterogeneity among middlemen is observed in reality. Also, by exogenously varying the cost of switching to a different middlemen it is possible to test the prediction that the benefit of information varies with the degree of competition between middlemen.

[1] I believe that this experiment qualifies as a framed field experiment as described by Harrison and List (2004) as the participants bring relevant information with them from their daily experiences of interacting with other farmers and middlemen and they also have experience in the field that is relevant to the tasks that they must perform in the experiment.

There are a number of different ways to model heterogeneity among middlemen, e.g. different transport costs, different outside options, and these will result in similar predictions to those of the model presented here. In this paper, I decided to model the different types as having different attitudes to fairness, as this seems to be something that is true in reality and the framed field experiment gives us an opportunity to investigate its importance. Interviews with farmers and information providers in India suggest that exploitation by dishonest middlemen is an important concern for farmers and that information can be used to protect against this. The idea that the honesty or integrity of the middleman can be hidden when the farmer is uninformed about prices has been alluded to by previous authors but until now has not been explicitly addressed.[2]

The model yields some intuitive predictions. The existence of different types of middlemen creates a new role for price information stressing selection as well as incentives. It is easier for the bad middleman to disguise his type if the farmer is uninformed about the market price. The model predicts that there will be a non-monotonic relationship between the benefit of information to the farmer and the cost of switching to a different middleman. If the degree of competition between middlemen is high (i.e. the switching cost is low) then the farmer does not need to be informed about the market price in order to get a good offer from the middleman. As the cost of switching becomes higher, the benefit to the farmer of being informed also increases. For this region of the switching cost, information and competition act as substitutes. Once the switching cost is high enough, however, the bad middleman no longer needs to disguise his type and once again price information will not help the farmer.

The results from the experiment show that middlemen do vary in their attitudes towards fairness and that 'bad' types tend to make lower offers in the second round of the game. In the first round, the 'bad' type of middleman also makes higher offers when the farmer is informed. For all levels of switching costs, the farmer receives a higher average offer when he is informed, with the benefit of information varying with the switching cost. These findings confirm the relevance of the theory in interpreting the data.

Taken together, the approach and results confirm the importance of institutional arrangements in the agricultural sector to the welfare of farmers. There is

[2]Eggleston, Jensen and Zeckhauser, (2002): "Although trust may develop over multiple transactions, the paucity of information continues to handicap the farmer since he cannot independently assess the integrity of the dealer, or the reasonableness of the price he offers"; Opening quote from Aker and Fafchamps (2011): "[With a mobile phone], no dishonest trader can cheat me when I buy and sell."

long-standing suspicion of the role that middleman play in monopolistic settings and it is instructive to see that information provision can have an impact in this setting.

The rest of this paper is organized as follows. Section 2 presents a review of the relevant literature. The theoretical model is presented in Section 3. Section 4 describes the experimental design. The experimental results are presented in Section 5. Section 6 briefly discusses the potential effects of an intervention to increase access to price information and Section 7 concludes.

2 Related Literature

The issue of exploitation of farmers by middlemen is not new and has been debated for decades.[3] The existing literature relating to middlemen has tended to view middlemen as either fulfilling an important role in the market or as being purely exploitative. This paper builds on this literature by allowing for the presence of both types of middlemen in the same market. Biglaiser (1993), Biglaiser and Friedman (1994) and Li (1997) present models in which middlemen act as guarantors of quality in markets where the quality of the good being traded is uncertain and middlemen invest in becoming experts. Another important role that middlemen can play is in reducing the search costs in markets with frictions. Van Raalte and Webers (1997) present a model where intermediation is necessary for matching to occur, whereas Rubinstein and Wollinsky (1987) show how middlemen can shorten the time period between transactions because they increase the likelihood of matches occurring. Jori and Leach (2002) demonstrate how middlemen can improve efficiency by improving match quality in markets with heterogeneous buyers and sellers. Masters (2007 and 2008), on the other hand, assumes that middlemen are purely exploitative and shows how their presence can reduce the efficiency of markets. Finally, a number of studies investigate competition between middlemen and either 'market makers' or direct sales between consumers and producers.[4]

In terms of the empirical evidence, Hayami, Kikuchi and Marciano (1999) find that there is a high degree of competition between middlemen in the market for rice in the Philippines. They state that it is very easy for farmers to switch to a different trading partner if they are not satisfied with their current relationship and this means that farmers are not exploited in this market. Conversely, Mitra

[3] Bauer and Yamey (1968).
[4] Rust and Hall (2005); Spulber (2002); Fingleton (1997); Vesala (2008).

and Sarkar (2003) find that the potato market in West Bengal is controlled by a small number of traders who earn oligopolistic profits. Fafchamps and Hill (2008) investigate the transmission of increases in coffee prices in Uganda. They state that high search costs exist and farmers are not well informed about prices. As a result, increases in prices are not passed on to producers. Another important source of middlemen's market power can be high transport costs as shown by Minten and Kyle (1999) and Merel, Sexton and Suzuki (2009).

In recent years, a number of empirical studies have investigated the effect of price information on producer prices in developing countries and the results have been mixed. The theoretical framework presented in this paper could help us to interpret these results as they are consistent with the prediction that the effect of information will vary with the competitive environment. Svensson and Yanagizawa (2008) found that having access to regular market information via radio was associated with 15% higher farm gate prices in Uganda. The results from an experiment in Rwanda, on the other hand, found no effect of having a mobile phone on prices received by farmers, although the authors report that the randomization mechanism was problematic and so the results should be interpreted with caution (Futch and McIntosh, 2009). A recent study by Fafchamps and Minten (2011) looks at the effect of SMS-based agricultural information on producer prices in India and finds that access to this information did not significantly increase the prices that they received, whereas Muto and Yamano (2009) found that in Uganda mobile phone coverage had a positive effect on farm-gate prices for bananas. They did not find a significant impact on prices for maize, however. Aker and Fafchamps (2011) also find that the effect of mobile phones varies by crop in Niger. They report that there is no significant effect on average producer prices but there is a reduction in the variability of prices for cowpea. They do not find the same effect for millet, however. Using examples from Tanzania, Molony (2008) argues that the ability of producers to use price information may be limited by the fact that they are tied in to relationships with particular middlemen and are dependent on them for credit. Since they do not have an option to trade with someone else if they are unhappy with the price they receive, being informed about the market price does not help them. These results give some support to the idea that the benefit of information to farmers will vary depending on what options are available to them. The perishability of the crop will be an important element of this, and so we would expect to see the results varying by crop.

This paper also draws on the large literature which focuses on bargaining

with incomplete information. One strand of this literature has allowed for the preferences of one of the players to be unknown to the other, such as Rubinstein (1985) who presents a model where one of the players has incomplete information about the time preferences of the other player. Other authors address the issue of bargaining when the seller has incomplete information about the valuation of the buyer and investigate how players can use the cost of delay to communicate information.[5] This paper adds to this literature by allowing for two kinds of uncertainty and also allowing for the outside option of one of the players to be unknown to that player.

Finally, this paper builds on a number of experimental studies which have looked at the importance of fairness and deception in ultimatum games.[6] It contributes to this literature by investigating how the ability to deceive depends on how easy it is to find a new trading partner.

3 Model

3.1 Description of Economic Environment

There are a number of characteristics of the relationship between a farmer and a middleman that are specific to a developing country setting. The key characteristics that I will focus on in this paper are the following: (i) middlemen are better informed about market conditions than farmers, (ii) farmers face high transport costs to go to the market themselves, (iii) farmers often trade with the same middleman for multiple periods, and (iv) the existence of frictions in the market means it is not costless for the farmer to find a different middleman to trade with. The model presented in this section will aim to capture these characteristics in the simplest way possible.

The core intuition of the model is most easily demonstrated using a model where there are only two possible values of the price and that is what I will present in this section. However, it is reasonably straightforward to extend the model to allow for more than two prices and the key predictions of the model remain the same.[7] I will describe a two-period model of trade between

[5] Sobel and Takahashi (1983); Fudenberg, Levine and Tirole (1987); Cramton (1984); Blouin and Serrano (2001); Sen (2000); Grossman and Perry (1986); Srivastava, Chakravarti and Rapoport (2000).

[6] Boles, Cross and Murnighan (2000); Pillutla and Murnighan (1995); Croson, Boles and Murnighan (2003)

[7] The case with three prices is presented in the appendix.

a farmer and a middleman. At the start of the first period, a farmer and middleman are matched and have an opportunity to trade. The farmer has a good which has a market price, p. This price is independently and identically distributed in each period, with $p \in \{p_L, p_H\}$, $p_H > p_L$, and $Pr(p = p_H) = \lambda$. The middleman observes p_t in each period but the farmer knows only the distribution of p. The middleman makes a take-it-or-leave-it offer, x_t, to the farmer. The farmer can accept the middleman's offer or he can go to the market himself to sell the good but he must pay a transport cost, τ, in order to do so. The middleman's transport costs are normalized to zero. Gains from trade exist as the middleman's transport costs are lower than those of the farmer. The middleman's outside option is also normalized to zero.

I assume that the middleman may be one of two types, 'good' or 'bad', $i \in \{G, B\}$, with $Pr(i = B) = q$. The farmer does not know the type of a given middleman but he does know that the probability that he is a bad type is equal to q. A good middleman will always split the gains from trade equally, and so he will offer $p_t - \frac{1}{2}\tau$. A bad middleman will behave strategically and will choose x in order to maximize his expected payoff. At the end of the first period, the farmer may decide to stay matched with the same middleman for the second period, or he may pay a cost κ to be matched with a new middleman. The type of the second middleman is an independent draw from an identical distribution to that of the first middleman. If the farmer decides to switch to a new middlemen, then the first middleman will receive zero in the second period. In the second period, the middleman observes p_2 and makes an offer, x_2, to the farmer, which the farmer may accept or reject. There is no discounting and the farmer and the bad middleman aim to maximize the sum of their own payoffs from the two periods.

In this game, the farmer has two choices to make. Firstly, he may decide whether to accept the middleman's offer for that period or go to the market himself. Secondly, he must decide whether to stay matched with the same middleman for the second period or to pay the cost κ and be matched with a new middleman. His first decision simply depends on whether or not the middleman's offer is greater than his expected return from going to the market. The second decision depends on his beliefs about the middleman's type given the offer made in the first period. I assume that it is always better for a farmer to trade with a good middleman than a bad middleman. This requires the following assumption about the parameter values: $\tau > 2\lambda(p_H - p_L)$. Since a farmer always prefers to be matched with the good type in the second period,

this means that it may be optimal for the bad middleman to give the impression that he is a good type in the first period to avoid losing the opportunity to trade with the farmer in the second period.

The bad middleman will choose x_1 in order to maximize the sum of his expected payoff from the two periods:

$$\max_{x_1} \rho(x_1)(p_1 - x_1) + \sigma(x_1)\rho(x_2)(E(p_2) - x_2)$$

where $\rho(x)$ is the probability that the farmer accepts the middleman's offer and $\sigma(x)$ is the probability that the farmer does not switch to a new middleman for the second period, given the middleman's offer in the first period.

3.2 Equilibrium

This is a two-period game of incomplete information between the farmer and the middleman and in what follows I will characterize the perfect Bayesian equilibrium of this game. Since I have already assumed that $\tau > 2\lambda(p_H - p_L)$, this means that it is always possible for the middleman to offer the farmer the expected value of his outside option.[8]

3.2.1 Second period

In the second period, the bad middleman's only concern is whether or not the farmer will accept or reject his offer. As long as the middleman's offer is greater than or equal to the farmer's expected outside option given his beliefs about the market price, then it is optimal for the farmer to accept his offer. The pure strategy equilibrium of the game is as follows:[9]

The bad middleman always offers $x_2^* = \lambda p_H + (1-\lambda)p_L - \tau$, and the farmer's strategy is

$$\rho^*(x_2) = \begin{cases} 1 & x_2 \geq \lambda p_H + (1-\lambda)p_L - \tau \\ 0 & x_2 < \lambda p_H + (1-\lambda)p_L - \tau \end{cases}$$

The farmer's expected payoff if he is matched with a bad middleman in the

[8] In order for the middleman to be willing to offer the farmer the expected value of his outside option, the following must be true: $p_L > \lambda p_H + (1-\lambda)p_L - \tau$. This will be true if $\tau > \lambda(p_H - p_L)$.

[9] There is also a mixed strategy equilibrium but the expected payoff to the farmer is the same in both equilibria. The strategies of the mixed strategy equilibrium are as follows: $x_2^* = p_H - \tau$ if $p_2 = p_H$ and $p_L - \tau$ if $p_2 = p_L$, and $\rho^*(x_2) = 1$ if $x_2 \geq p_H - \tau$, $\frac{\tau}{p_H - p_L + \tau}$ if $x_2 = p_L - \tau$ and 0 if $x_2 < p_L - \tau$.

second period is $E(p)-\tau$. The good middleman will offer $p_2-\frac{1}{2}\tau$. The expected gain for a farmer from being matched with a good middleman rather than a bad middleman in the second period is, therefore, equal to $\frac{1}{2}\tau$. The expected payoff in the second period for a type B middleman, if the farmer continues to trade with him, is τ.

3.2.2 Decision to switch

Let μ_x denote the farmer's belief that the type of the middleman that he is currently matched with is B, given x_1. The farmer will therefore decide to switch to a new middleman if

$$(\mu_x - q)\,\frac{1}{2}\tau > \kappa$$

I assume that the farmer forms his beliefs according to Bayes' rule.

3.2.3 First period

In this section, I will describe the intuition behind the main results of the model. A formal proof can be found in the appendix. In the first period, the good middleman will offer either $x_L = p_L - \frac{1}{2}\tau$ or $x_H = p_H - \frac{1}{2}\tau$. It is therefore reasonable to assume that the farmer's posterior beliefs will assign probability zero to the good type for any other x. Given that this is the case, there are three possible equilibrium strategies for the bad type of middleman: x_L, x_H or x_B, where $x_B = \lambda p_H + (1-\lambda)p_L - \tau$. Given that any offer other than x_L or x_H will lead the farmer to believe that the middleman is type B with probability 1, x_B dominates any other $x' \notin \{x_L, x_H\}$. If the middleman offers $x' > x_B$, his payoff in the first period will be lower without changing the probability that the farmer will continue to trade with him in the second period and, if he offers $x' < x_B$, the farmer will reject his offer and take up his outside option instead.

In this period, the middleman has to worry about two things. Firstly, whether the farmer will accept or reject his offer for this period. Secondly, whether or not the farmer will continue to trade with him in the second period. He must weigh up the extra gain from offering a low price this period against the probability of losing the farmer's trade next period if the farmer's belief that he is a bad type is high enough for him to switch. The more costly it is for the farmer to switch, the less the middleman has to worry about disguising his type as even if the farmer's belief that he is type B is very high, he still might

not be willing to pay the cost to switch. In the extreme case, when the cost of switching is high enough, the middleman can reveal his type and the farmer still won't switch. This leads us to Proposition 1.

Proposition 1: *If the level of competition in the market is low, i.e.* $\kappa > (1-q)\frac{1}{2}\tau$*, the bad type does not need to conceal his type. In this situation, improving the farmer's access to price information will not increase the expected price that he receives in the first period.*

If $\kappa > (1-q)\frac{1}{2}\tau$, it is too costly for the farmer to switch to a different middleman even if he knows for certain that the one he is matched with is type B. Given that this is true, the bad type has no incentive to pretend to be a good type and therefore will offer the lowest price that the farmer will be willing to accept, which is x_B. Since the bad type is already revealing his type, price information will not help the farmer to get a higher price.

If $\kappa < (1-q)\frac{1}{2}\tau$, on the other hand, the middleman must try to disguise his type. If the farmer does not know when the market price is high then the middleman can still appear to be a type G middleman by offering x_L when $p = p_H$. As long as κ is high enough, the farmer will not switch when he receives an offer of x_L as it is possible that the middleman could be a type G middleman and $p = p_L$.

Proposition 2: *For an intermediate level of competition, i.e.* $(1-q)\frac{1}{2}\tau > \kappa > \frac{\lambda q(1-q)}{q+(1-q)(1-\lambda)}\frac{1}{2}\tau$*, the bad type of middleman will need to disguise his type or else the farmer will switch to a new trading partner for the second period. For this level of competition, the expected price that the farmer receives in the first period will be higher with price information.*

Since $\kappa < (1-q)\frac{1}{2}\tau$, if the farmer knows that the middleman's type is B with certainty, then he will switch to a different middleman for the second period. The middleman cannot offer x_B, therefore, without losing the farmer's trade in the second period. κ is high enough, however, that even if the type B middleman always offers x_L, the farmer will not switch when he receives an offer of x_L. This is because the probability that the middleman is a type G middleman with a low price is high enough that the farmer does not want to pay the cost of switching. If, on the other hand, the farmer knows that the price is high, the type B middleman can no longer get away with offering him the low price as this will reveal his type. Now, the type B middleman must always offer

x_H when the price is high and so the expected price that the farmer receives is higher when he is informed about the market price.

Proposition 3: *As the level of competition in the market increases, the benefit to the farmer of being informed about the market price decreases.*

If $\kappa < \frac{\lambda q(1-q)}{q+(1-q)(1-\lambda)} \frac{1}{2}\tau$, the farmer will prefer to switch to a new middleman when he receives a low offer if the type B middleman's strategy is to always offer x_L. That means that this can no longer be an equilibrium. Now, the middleman must sometimes offer x_H in order for the farmer to remain indifferent between staying matched with him and switching to a new middleman. The farmer will stay matched with the middleman when he receives an offer of x_L with the probability $\sigma^*(x_L)$ which makes the middleman indifferent between offering x_H and x_L:

$$\sigma^*(x_L) = \frac{\tau - (p_H - p_L)}{\tau}.$$

The probability that the type B middleman offers x_L when the price is high (γ_H) decreases as κ decreases:

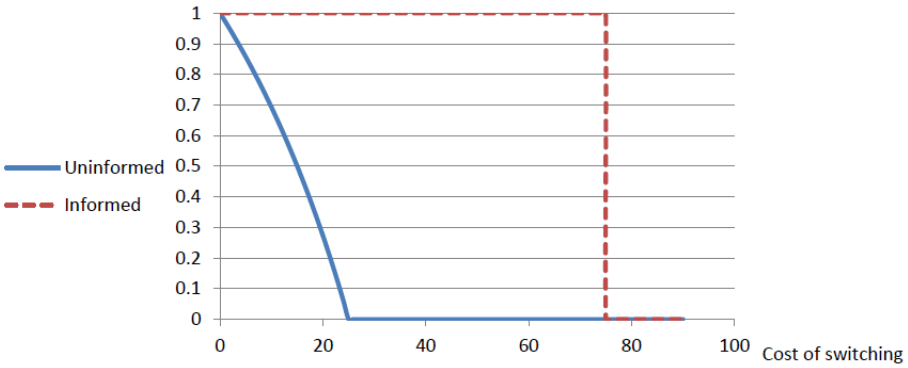
$$\gamma_H^* = \frac{(1-\lambda)\kappa}{\lambda[\frac{1}{2}q(1-q)\tau - q\kappa]},$$

which means that the benefit to the farmer of being informed about the price also decreases.

In each case, the key variable that determines the expected payoff to the farmer is the probability that the middleman offers x_H when the price is high. If the level of competition is very low, then this probability is zero with or without price information as the middleman never needs to disguise his type. For an intermediate level of competition, the probability that the type B middleman makes a high offer when the price is high is zero if the farmer is uninformed about the price but 1 if the farmer is informed. This is the situation where information is most valuable to the farmer. As the level of competition increases (i.e. κ decreases), however, the probability that the middleman makes a high offer when the farmer is uninformed also increases and thus price information becomes less valuable to the farmer. This is demonstrated in Figure 1, assuming $q = \frac{1}{2}$ and setting $\tau = 300$, $p_H = 550$, $p_L = 350$ and $\lambda = \frac{1}{2}$, which were the values used in the experiment.

The benefit to the farmer of being informed comes entirely through the first period offer. Price information does not cause bad types to be pushed out of the

Figure 1: The probability that type B offers x_H when $p = p_H$.



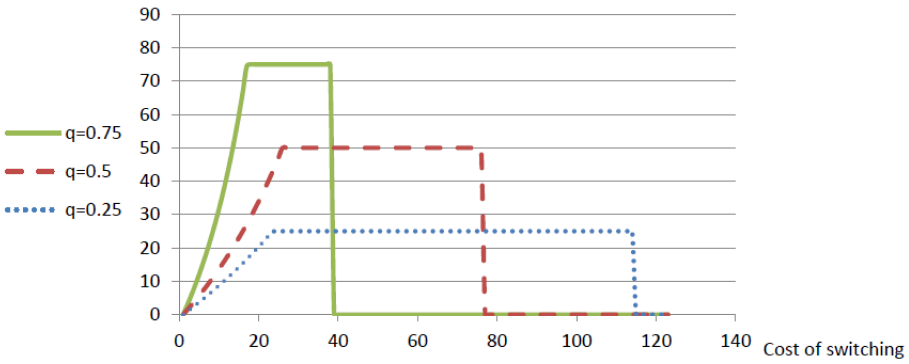
market, it just forces them to behave like good types in the first period. Figure 2 shows how the benefit of information to the farmer varies with κ and with the share of type B middlemen in the population, q, for the same parameter values as in the previous figure. As q increases, the point at which information stops being useful decreases, as the farmer will be less inclined to switch if there are more bad types in the population. For the region of κ over which he would be willing to switch, however, information is more valuable if the proportion of bad types in the population is higher.

As these figures show, as long as the cost of switching is low enough that the bad type must try to appear like a good type, information and competition act as substitutes. Price information forces the bad type to always behave like a good type, achieving the same outcome that we would have if κ were equal to zero. Of course, the benefit of this to the farmer depends on how far away we were from this outcome without information.

4 Experimental design and procedures

In this section, I will describe the details of a framed field experiment which I carried out with farmers and middlemen in Gujarat, India. The experiment

Figure 2: Expected offer in the first round with price information minus the expected offer without price information.



was designed to map as closely as possible onto the set-up of the model. A key assumption of the model is that there are different types of middlemen who have different attitudes towards fairness, which cause them to make different offers to farmers. Carrying out an experiment with actual farmers and middlemen means that we can investigate whether or not this is the case in reality. There is of course a trade-off between being able to precisely estimate the causal effects of information through one channel and having to abstract away from other factors. A framed field experiment allows us to exogenously vary the degree of competition between middlemen and the amount of information that farmers have, while controlling for everything else. This gives us the opportunity to isolate one mechanism through which information could affect the prices that farmers receive from middlemen but it also retains relevance for the real world as participants can draw on their experiences from real bargaining situations when making decisions in the experiment.

The participants were recruited by Reuters Market Light, an organization that runs an SMS-based agricultural information service for farmers in India. RML have strong links with APMCs (Agricultural Produce Marketing Committee) across Gujarat and so were able to facilitate the recruitment of participants through the markets. The majority of participants were not RML customers. Sessions were carried out at various agricultural markets across Gujarat. Each

session had an average of 20 participants,[10] half of whom were farmers and half of whom were middlemen, and there were 15 sessions in total. The participants were all from the local area where the session was being carried out but we were assured that individual farmers and middlemen who participated did not have strong personal relationships with one another outside of the experiment. Sessions began with all of the participants together. An explanation of what we were going to do was given and participants were asked to sign a consent form. Each participant was then given a questionnaire to fill out and some short games designed to elicit participants' preferences regarding fairness were played. This was followed by the bargaining game.

4.1 Middleman type

The key dimension of heterogeneity addressed in the model is attitudes towards fairness and so it is important that we obtain a measure for this in the experiment. With this in mind, the participants were asked to play two games at the beginning of the experimental session which were designed to elicit their attitudes towards fairness. The first game was a simple dictator game. The participants were told that they would each be given Rs.50. They were also told that they had been randomly and anonymously matched with another participant to whom they could give some of this money. They were asked how many rupees they would like to give to the other participant[11].

The participants were then asked to play a game designed to test their interpersonal orientation. This test requires participants to make a choice between three possible allocations of points to themselves and an anonymous 'other'. The options consist of one choice which maximizes the points allocated to oneself, another that equalizes the payoffs to both but gives a lower payoff to oneself than the first choice and a final choice which maximizes the relative payoff to oneself but gives a lower absolute payoff than the first choice. Each option corresponds to a different personality type: individualistic, prosocial or competitive. The instructions for the game are provided in the appendix. In the example given there, A is the 'competitive' choice, B is the 'prosocial' choice and C is the 'individualistic' choice. The participants are required to make nine such

[10] A number of sessions had 22 or 24, one session had 18 and one session had 14.

[11] It is important to note that this is not a standard dictator game as in this game all participants receive some money and can choose how much to give away. We wanted to elicit the preferences of all participants, however, so it was decided that this was the best way to do this. The results are therefore not comparable to a standard dictator game but they do generate an ordinal measure of fairness which can be used in the empirical analysis.

Table 1: Parameter values in experiment

Parameter	Value (Rs.)
price	350, 400, 450, 500, 550
τ	300
κ_H	90
κ_M	40
κ_L	10
Outside option for middleman	40

choices with different payoff values. If they make six or more choices consistent with one of the types then they are classified as that type. It has been shown in previous studies that participants' offers in ultimatum games, and whether or not they behave strategically, are correlated with this measure of personality type (van Djik, de Cremer and Handgraff (2002) and Carpenter (2003)).

The results from these games provide us with a number of different potential measures of a 'bad' type of middleman. In what follows, I construct a number of alternative measures and investigate how the results differ depending on the measure used.

4.2 Bargaining game

The experiment had six different treatment cells: there were two information treatments (informed and uninformed) combined with three costs of switching (Rs.10, Rs.40 and Rs.90). These costs of switching were chosen to map on to the different regions of κ described in the model, assuming that q was equal to $\frac{1}{2}$. The values for the parameters of the game were chosen to match the assumptions of the model as closely as possible and to give the participants a large enough expected payoff that they would care about the outcome of the game. There were five possible values for the price, ranging from Rs.350 to Rs.550. The farmer's transport costs were set equal to Rs.300. In the set-up of the model, the middleman's outside option was normalized to zero. However, piloting showed that participants strongly dislike the possibility of getting a payoff of zero and this affects their choices in the game, so it was decided to give them a small, non-zero outside option instead. A summary of the parameter values can be found in Table 1.

Since there were likely to be significant differences between participants in different sessions and there were only 15 sessions in total, it was decided that all

of the participants should each play all 6 types of game. This allows individual fixed effects to be calculated. The order in which the games were played was varied across sessions. The rules of the game were explained to the participants in detail with the use of examples. They were asked questions to make sure that they understood how the game would work. After the explanation, the farmers and middlemen were separated.[12] A space was kept between each participant to ensure that they could not influence each other or look at each other's responses. In each session, the participants played six games, consisting of two rounds each. At the start of each game, the participants were reminded of the conditions of the game i.e. the cost of switching and whether or not the farmers were informed about the market price. Each farmer was randomly and anonymously matched with a different middleman at the start of each game.

At the start of the round, the market price for the round was chosen. There were five possible values for the price: Rs.350, Rs.400, Rs.450, Rs.500, Rs.550. A middleman was asked to select a ball from a bag containing five balls, one corresponding to each of the five prices. The middlemen were told the market price and in the full-information games, the farmers were also told the price. In the uninformed games, the farmers knew the possible values that the price could take, and that each one was equally likely. Each middleman was then given a form and asked to write down the offer that they would like to make to the farmer. Each form had a code on it to match the offer to the relevant middleman and farmer but this code changed between games and the participants could not identify their trading partner from this code. Once the middleman had written down an offer, the form was passed to the farmer with whom he had been matched. The farmer was then asked if he wanted to accept this offer and circled either 'yes' or 'no' on the form. If the farmer chose 'yes', then his payoff from that round was equal to the offer and the middleman's payoff was equal to the market price minus the offer. If the farmer chose 'no', then his payoff was the market price minus Rs.300 (representing transport costs) and the middleman's payoff was Rs.40.

After all of the farmers had decided whether or not to accept the middleman's offer, they were given another form asking them whether they would like to switch to a different middleman for the second round. They were reminded of the cost that they would have to pay if they said 'yes'. If a farmer decided to switch, then the first middleman only received Rs.40 for the second round.

[12]For most of the sessions they were put in separate rooms. For a few sessions, they were at opposite ends of a large hall.

Once all farmers had made this choice, the second round began. A new price was chosen and the middlemen were given an offer form. If some farmers had decided to switch, then some middlemen received two forms in the second period as they were then matched with two farmers. They were told that they should make offers to two farmers but they would only get paid for one of the offers, which would be selected randomly. If a farmer chose to switch to a different middleman, then the first middleman did not receive a form in the second round, unless he was rematched with a different farmer who had also chosen to switch. In this case, the middleman was told that he would get paid the outcome for one of the rounds that would be chosen randomly and would receive only Rs.40 for the other round. Once all the middlemen had made offers, the forms were passed to the farmers who again chose to accept or reject. The game then ended.

The participants were paid for both rounds of one of the games which was selected randomly at the end. In general, middlemen tend to be wealthier than farmers and results from piloting suggested that the amounts of money involved were not as significant for the middlemen. In order to get them to care more about the game, therefore, one middleman was chosen randomly at the end of each session and that middleman's payoff from the game was tripled. Participants were informed of this before the game was played.

A summary of the timing of the bargaining game is as follows:

1. Farmers and middlemen are matched into pairs for Game 1.
2. All participants are told the cost of switching for that game and whether the farmers will be informed or uninformed about the price.
3. Round 1 begins. The price for Round 1 is chosen and told to the middlemen and also to the farmers in the informed treatments.
4. Each middleman writes down his offer on the offer sheet. This sheet is passed to the farmer that he has been matched with. Each farmer chooses to accept or reject the middleman's offer.
5. Each farmer is given a sheet of paper which asks him if he wants to stay matched with the same middleman for the second round or pay a cost to be matched with a new middleman. He chooses to switch or not to switch.
6. Farmers who choose to switch are matched with a different middleman for the second period. This means that some middlemen are matched with two farmers for the second period.

7. Round 2 begins. The price for Round 2 is chosen and told to the middlemen and also to the farmers in the informed treatments.

8. Each middleman who is playing in this round writes down his offer on the offer sheet (or two offer sheets if he is matched with two farmers). This sheet is passed to the farmer that he has been matched with. Each farmer chooses to accept or reject the middleman's offer.

9. Game 1 ends.

10. Each farmer is matched with a different middleman for Game 2.

11. The above steps are repeated 5 times, once for each treatment type, i.e. 6 games are played in total.

5 Experimental Results

This section will present the results from the experiment following the order in which the model was presented. Firstly, I will discuss the results for the second period offers. I will investigate the effect of being informed in the second round and, using the exogenous measures of 'bad' obtained from the tests of fairness, I will present results which demonstrate that these types of middlemen do actually make lower offers in the second round. Secondly, I will present the results for the farmer's decision to switch and show that they are consistent with the predictions of the model. Finally, I will discuss the results for the first period offers which show that farmers receive higher offers when they are informed but that the magnitude of this effect varies with the cost of switching. I will also present results which demonstrate that bad types are forced to make higher offers in the first round when the farmer is informed.

5.1 Second period offers

5.1.1 Effect of information

The model predicts that the offer that the middleman makes in the second period should not be affected by whether or not the farmer is informed. However, we can see from the results in Table 3 that even in the second round, the average offer that the farmer receives is around Rs.20 higher when he is informed about the market price. The most likely explanation for this result is that farmers are

risk averse, which would mean that they would be willing to accept a lower offer rather than face the uncertainty of going to the market themselves.

5.1.2 Middleman characteristics

According to the assumptions of the model, the 'bad' type of middleman will make a lower offer in the second period. As mentioned earlier, we have a number of different measures of 'bad' type available to us, based on the results of the dictator game and test of interpersonal orientation. The different measures used are as follows: (i) classified as 'competitive' on the test of interpersonal orientation, (ii) classified as 'competitive' or 'individualistic' on the test of interpersonal orientation, (iii) gave less than Rs.15 in the dictator game, (iv) gave less then Rs.25 on the dictator game, and (v) classified as 'competitive' or gave less than Rs.15 on the dictator game. Table 4 presents results using these different measures. The variable 'bad' is a dummy equal to one if the middleman was classified as a 'bad' type according to the particular measure used.

The results of these regressions clearly show that certain types of middlemen make lower offers in the second round. The only measure of 'bad' type that does not make a significantly lower offer in the second round is the measure that includes those middlemen who were classified as 'individualistic' on the test of interpersonal orientation. For the other measures of the 'bad' type, these middlemen make offers that are Rs.17-38 lower than the other middlemen. These results demonstrate that differences in attitudes towards fairness do exist among actual middlemen and these differences translate into significantly lower offers for farmers.

5.2 Decision to switch

Table 5 presents results from the following regression:

$$\begin{aligned} S_{it} &= \alpha + \beta_1 \text{Informed}_t + \beta_2 \text{medium cost}_t + \beta_3 \text{high cost}_t \\ &\quad + \beta_4 \text{medium cost}_t * \text{Informed}_t + \beta_5 \text{high cost}_t * \text{Informed}_t \\ &\quad + \beta_6 \ln(\text{price})_t + \beta_7 \ln(\text{price})_t * \text{Informed}_t + \epsilon_{it} \end{aligned}$$

where S_{it} is a dummy equal to 1 if farmer i decided to switch in period t, Informed_t is a dummy equal to 1 if the farmers knew the market price in round t, medium cost_t is a dummy equal to one if the cost of switching in round t was

Rs.40 and high cost$_t$ is a dummy equal to 1 if the cost of switching in round t was equal to Rs.90.[13]

The results support the predictions of the model. The farmer is more likely to switch if he is uninformed about the price. If he is uninformed, he is less likely to switch as the cost of switching increases but since β_2 and β_4 are similar in magnitude and of opposite sign, as are β_3 and β_5, it seems that when the farmer is informed, he is equally likely to switch at any cost. If the farmer is informed about the price, then he is more likely to switch when the market price is higher. The negative coefficient on ln(price) is most likely picking up the positive correlation between the offer and the price (since in this case the farmer does not observe the price, he only observes the offer), suggesting that the higher the offer, the less likely the farmer is to switch. These results suggest not only that different types of middlemen exist and make different offers, but also that the farmers are aware of this. If there were no differences in middlemen types then there would be no reason for the farmer to pay a cost to switch to a different middleman for the second period.

5.3 First period offer

5.3.1 Effect of information

Table 6 presents the results for the first period offer. A 'low cost' dummy equal to one when the cost of switching was Rs.10 is included. As can be seen from the results in the table, the benefit of information is higher in the low cost treatment, although there is still a benefit of information in the other treatments. As was shown in the previous table, the probability that the farmer switched was very similar when the cost of switching was Rs.40 and when it was Rs.90 which supports the idea that participants did not behave differently in these two treatments. It was found that there was no difference in the effect of information between the medium and high cost of switching treatments and these results are not reported. This result could be consistent with the model if the actual cut-off point for κ, above which we should see no effect of information, was less than Rs.40. The costs were chosen based on the assumption that the proportion of 'bad' middlemen in the population was equal to 50%. In reality, it was less than this and, depending on the measure of 'bad' that we use, could have been as low as 10%. This should actually increase the value of the highest

[13]The offer was not included in the regression as it is endogenous to the switching decision.

cut-off for κ, however, rather than reduce it. The results from Table 3 could give us an indication of what else is going on. These results suggest that the difference between the offer made by the 'bad' type and the 'good' type is much lower than initially assumed. The highest estimate that we get for this difference is Rs.38.43. If this is the expected gain from being matched with a good type rather than a bad type, then we shouldn't expect to see any switching when the cost of switching is Rs.40 or above and the benefit of information should disappear at this point. As mentioned before, we still find a positive effect of information for the Rs.40 and Rs.90 treatments but the magnitude of this effect is similar to that found in the case of second round offers.

5.3.2 Middleman characteristics

Table 7 presents the results from the first round including the various measures of a 'bad' type. The results are comparable to those found for second round offers. Depending on the measure of 'bad' used, the results show that the 'bad' middlemen make offers that are Rs.13-48 lower than other middlemen.

5.3.3 Effect of information on the offers made by 'bad' types

According to the model, only some middlemen should use the farmer's lack of information to make lower offers in the first round. This means there should be a greater advantage to being informed when matched with one of these middlemen. Table 8 reports the results of regressions which include an interaction between 'bad' and 'informed' for three of the measures of 'bad' used in the previous table. The coefficient on bad*informed is positive and significant in the first column where the measure of 'bad' is whether or not the middleman was classified as 'competitive'. Column 2 shows that this result is robust to clustering the standard errors at the session level. Columns 3 and 4 present results from the same regression with a middleman classified as 'bad' if he gave Rs.15 or less on the dictator game. The coefficient on bad*informed is still positive in this case although it is not significantly different from zero. In the final two columns, the 'bad' dummy is equal to 1 if the middleman was classified as 'competitive' on the test of interpersonal orientation or if he gave less than Rs.15 on the dictator game. Once again, the coefficient on the interaction term is positive and significant.

The size of the coefficient on the 'bad' dummy in these regressions ranges from -40.97 to -66.98 and the coefficient on the interaction term ranges from

19.70 to 38.03. These results clearly demonstrate that 'bad' types make significantly lower offers in the first round when farmers are uninformed but they increase their offers when the farmer knows the exact value of the market price.

5.4 Summary of results

It is clear from the results of the experiment that actual middlemen differ in their attitudes towards fairness and this has relevance for the offers that they make to farmers. Farmers are better off with information in both rounds but there is an additional benefit of being informed in the first round if the cost of switching is low. This is driven by the result that 'bad' middlemen will offer lower prices if the farmer is uninformed, but are forced to offer higher prices if the farmer is informed in order to prevent the farmer from switching away from him. These results are consistent with reports from farmers who state that dishonest middlemen can no longer take advantage of them when they have better information about market prices.

6 Implications

The results from the model and the experiment suggest that even when a farmer's options of who to trade with in a given period are constrained, informing farmers about market prices can lead to an increase in the offer that the farmer receives from the middleman. A full analysis of the general welfare effects of this increase in producer prices is beyond the scope of this paper. It is helpful, however, to briefly discuss the potential ways in which welfare could be affected by this change and the possible magnitude of these effects.

In the experiment, the average share of the surplus received by the farmer in the first round increased from 60% to 69% in the case where the cost of switching was Rs.40 or Rs.90 and to 74% when the cost of switching was Rs.10. We can see that even in the case where the farmer was uninformed, the share of the surplus that he received was quite high. This reflects the fact that most middlemen believed that it was right for the farmer to receive a higher share of the surplus because in general the farmer must also pay for the cost of production, and middlemen earn income from trading with many farmers so the total amount that they earn will be higher. This norm that farmers should receive a higher share of the surplus seemed to affect decisions made in the game, which supports the idea that the participants drew on their experiences from the real world when

making choices in the experiment.

A potential concern about interpreting the results from this experiment is the likelihood that there was selection bias in the sample of participants. RML decided to organize sessions in the areas where they thought it would be easiest to recruit participants, which automatically introduces a bias. In addition, there were two sessions where, part way through, the middlemen decided that they did not want to participate in the experiment and they walked out of the session. It would not be difficult to imagine that the type of middleman who would be more willing to participate in a research project might also be the type of middleman who would offer higher prices, which means that the sample in the experiment is probably not representative of the general population of middlemen in Gujarat. If it is true that the 'good' types are the ones that are more likely to participate in the experiment, however, then the bias created by this problem should work against finding an effect of information. This means that the results from the experiment should give us a lower bound on this effect.

The most direct effect of an increase in the farmer's share of the surplus is a simple transfer from middlemen to farmers. Even if there were no general welfare effects from this, this is still an important result since, in general, farmers are significantly poorer than middlemen. According to the World Development Report (2008), Agriculture for Development: "Of the developing world's 5.5 billion people, 3 billion live in rural areas, nearly half of humanity. Of these rural inhabitants an estimated 2.5 billion are in households involved in agriculture, and 1.5 billion are in smallholder households". Even a small increase in the income of these households could significantly improve their welfare.

In addition, however, an increase in farmers' income is likely to have more general welfare effects. It may lead to farmers being able to better manage risk and therefore start producing more valuable but riskier crops or it may allow them to save up in order to invest in better production technologies. This could lead to an increase in overall agricultural productivity, which could have significant effects on the economy.

If the average price that farmers receive increases, this may have an effect on their production decisions which in turn could have a positive impact on consumers. There are two ways in which production might change as a result of increased prices for farmers. The first is a direct increase in supply as a response to an increase in the price received. Farmers may decide to use inputs more intensively since the return from production is higher. Getting a precise estimate of the magnitude of this effect is difficult as good data on farm gate

Table 2: Costs and prices for rice and soya bean in India, 2004-05 (Rs. per quintal)

	Cost of Production	Producer price	Wholesale Price
Paddy/Rice	530.94	898	1090
Soya bean	881.86	1010	1334

prices, cost of production and middlemen margins are hard to find. In what follows, however, I will present some back-of-the-envelope calculations to give an idea of the possible magnitude of the effect of improving access to information for farmers for two different crops in India. Table 2 presents data on the cost of production, wholesale prices and farm gate prices for rice and soya bean from 2004-05.[14]

A number of assumptions are made in order to calculate the potential change in price received as a result of better information. Firstly, the outside option of the farmer is not known so it is not possible to work out the surplus from trade. I will look instead at the total surplus from production which I assume is equal to the sum of the profits earned by the farmer and the trader. According to Acharya (2005), on average 20% of gross marketing margins go to the middleman as profit. I will therefore assume that the middleman's profit is 20% of the difference between the wholesale price and the price paid to the producer. In line with the results from the experiment, I will assume that the farmer's share of the surplus increases by 12 percent for soya bean. As the farmer's share of the surplus for rice is already 90%, it cannot increase by 12 percent, so I will assume that it increases by 7 percentage points.

Using these assumptions, the implied increase in producer prices would lead to a 7.7% increase in income for rice farmers and a 12% increase in income for soya bean farmers. Using supply elasticities estimated in previous studies,[15] this suggests that this increase in prices could lead to an increase in the amount of rice produced of between 423,000 and 619,000 tons and an increase in soya bean production of between 30,000 and 50,000 tons.

The second effect of an increase in producer prices could come through the composition of crops that farmers choose to produce, as suggested by Jensen (2010). Since having access to price information should lead to a greater increase in the prices received for crops where the level of competition is lower (as

[14]Data on cost and wholesale prices from indiastat.com; data on producer prices from FAOstat.

[15]Kumar et al. (2010); Mythili (2006).

long as we are above the level where there is no effect), this could lead to farmers switching to producing more of these crops once they are informed. Since these were the crops for which the greatest distortions existed prior to farmers becoming informed, this should improve efficiency. Without detailed data on demand and supply, however, it is not possible to say how these efficiency gains will be distributed between producers and consumers.

The results presented in this paper have important policy implications. If we want to increase the prices that farmers receive from middlemen because we believe that middlemen have too much market power, then we have a couple of options. Firstly, we could try and intervene directly in the market to reduce their power. This has been tried before and has led to the setting up of agricultural marketing boards, minimum price supports and the fair trade movement. There are a number of reasons why we might not like this option. First of all, it might be extremely costly. Secondly, we might create distortions that are as bad or worse than the ones we are trying to fix. Finally, we might just end up transferring market power from one group to another (such as the agricultural marketing boards) and not having any effect on the prices that farmers receive. A second option for achieving the goal of higher prices for farmers could be to provide them with information about market prices. This might be a preferable option as it still allows the market to do the work, it just makes sure that the agents in the market have the best information possible to help them make decisions.

7 Conclusion

This paper presented a theoretical model outlining an important channel through which better access to market information could increase the prices that farmers receive from middlemen. The model introduced the idea of different types of middlemen and demonstrated how price information constrains the ability of bad types to offer lower prices to farmers and forces them instead to behave like good types. The model also predicts that the relationship between the benefit of information to the farmer and the degree of competition in the market will be non-monotonic. This could explain why the results from empirical studies investigating the impact of information on producer prices have been mixed.

The paper provided empirical support for the predictions of the model from a framed field experiment carried out with actual farmers and middlemen in India.

The results from the experiment demonstrate that attitudes towards fairness do vary among actual middlemen. By obtaining an exogenous measure of the middlemen's attitudes towards fairness it was possible to show that middlemen who cared less about fairness also made lower offers to farmers in the second round. Providing farmers with information about prices was able to counteract this effect in the first round as it forced the bad middlemen to make higher offers, demonstrating that this is an important channel through which information could benefit farmers. In addition, the results from the experiment showed that the benefit of information varied with the cost of switching to a different middleman.

In general, the literature has tended to either view middlemen as purely exploitative or as fulfilling a necessary role in the market. The results in this paper suggest that we should take a more nuanced view and allow not just for the possibility that the truth lies somewhere in between but also that different types of middlemen may exist in the same market and some may be more exploitative than others. It is important to bear this in mind when carrying out empirical studies.

In the model presented in this paper, I have assumed that the cost of switching to a new middleman is exogenous. A potentially interesting avenue for future research could be to investigate how the competitive environment itself could be affected by information in the longer-term. The source of heterogeneity that I have focused on in this paper is attitudes towards fairness but there are many other possible ways in which middlemen could differ. In the model presented here, bad types are not pushed out of the market but instead are forced to behave like good types. If the difference between middlemen types comes through differences in costs, then efficiency could be improved if the high cost types were forced out of the market. The model presented in this paper could easily be extended to allow for this effect and to investigate how effective price information could be at changing the composition of middleman types in the market.

The focus of this paper has been on middlemen in agricultural markets in developing countries. The idea of competition and information acting as substitutes could be relevant to any number of situations, however.[16] I believe that it is applicable to any situation where one agent is tied in to a relationship with a particular trading partner for some period of time, some trading partners

[16] Although it looks at a very different context, the model in this paper is similar in spirit to that presented in Besley and Smart (2007) which looks at the role of fiscal restraints on politicians in a model with both moral hazard and adverse selection.

may be preferable to others and there is a cost to switching to a different partner, e.g. telephone provider, bank etc.

The agricultural sector is hugely important in developing countries and is a source of livelihoods for approximately 86 percent of rural people.[17] Improving efficiency in agricultural markets could have a major impact on the welfare of the poor. The structure of the middleman market in this sector is extremely complicated and much research remains to be done. The results from this paper are encouraging, however, as they highlight one important channel through which providing farmers with price information could help to counteract the market power of intermediaries.

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Table 3: Second period offer

VARIABLES	(1) offer	(2) offer
Price	0.673***	0.673***
	(0.0262)	(0.0321)
Informed	20.04***	20.04***
	(3.367)	(5.437)
Constant	19.99	19.99
	(24.71)	(17.00)
Observations	942	942
R-squared	0.793	0.793
Clustered SE	No	Yes

Notes:

(1) Middlemen fixed effects are included.

(2) Standard errors in parentheses.

(3) When clustered, standard errors are clustered at the session level.

(4) *** p<0.01, ** p<0.05, * p<0.1

(5) Informed is a dummy equal to 1 if the farmer knows the market price.

Table 4: Second period offer with bad type

VARIABLE	(1) offer	(2) offer	(3) offer	(4) offer	(5) offer
Price	0.674***	0.672***	0.672***	0.672***	0.675***
	(0.0382)	(0.0386)	(0.0384)	(0.0384)	(0.0380)
Informed	17.45***	17.40***	17.50***	17.33***	17.42***
	(4.902)	(4.945)	(4.921)	(4.922)	(4.869)
Bad	-38.43***	-1.827	-23.83***	-17.17***	-36.14***
	(9.488)	(5.592)	(7.800)	(5.685)	(6.658)
Constant	53.71**	53.31**	52.78**	52.87**	52.96**
	(21.34)	(21.55)	(21.42)	(21.43)	(21.20)
Observatic	942	942	942	942	942
R-squared	0.469	0.459	0.465	0.464	0.476

Notes:

(1) Standard errors in parentheses.

(2) *** p<0.01, ** p<0.05, * p<0.1

(3) Session fixed effects included in all columns

(4) Bad is a dummy equal to 1 if the middleman is classified as a 'bad' type.

The classification in each column is as follows: Column 1: 'bad' if 'competitive' on test of interpersonal orientation; Column 2; 'bad' if classified as 'individualistic' or 'competitive'; Column 3: 'bad' if gave less than Rs.15 on the dictator game; Column 4: 'bad' if gave less than Rs.25 on the dictator game; Column 5: 'bad' if classified as 'competitive' or gave less than Rs.15 on the dictator game.

Table 5: Decision to switch

VARIABLES	(1) switch	(2) switch
Informed	-2.178**	-2.178*
	(0.926)	(1.234)
medium cost	-0.108***	-0.108**
	(0.0341)	(0.0387)
high cost	-0.144***	-0.144***
	(0.0344)	(0.0453)
medium cost*informed	0.103**	0.103*
	(0.0487)	(0.0526)
high cost*informed	0.113**	0.113*
	(0.0485)	(0.0621)
ln(price)	-0.262**	-0.262*
	(0.107)	(0.132)
ln(price)*informed	0.344**	0.344
	(0.151)	(0.201)
Constant	1.689**	1.689*
	(0.666)	(0.821)
Observations	942	942
R-squared	0.232	0.232
Clustered SE	No	Yes

Notes:

(1) Farmer fixed effects are included.

(2) Standard errors in parentheses.

(3) When clustered, standard errors are clustered at the session level.

(4) *** p<0.01, ** p<0.05, * p<0.1.

(5) medium cost is a dummy equal to 1 if the cost of switching is Rs. 40.

(6) high cost is a dummy equal to 1 if the cost of switching is Rs. 90.

Table 6: First period offer

VARIABLES	(1) offer	(2) offer
Price	0.761***	0.761***
	(0.0294)	(0.0348)
Informed	23.37***	23.37**
	(4.423)	(8.413)
low cost	3.304	3.304
	(5.421)	(7.169)
low cost*informed	13.50*	13.50*
	(7.684)	(6.836)
Constant	-25.70	-25.70
	(25.73)	(14.67)
Observations	942	942
R-squared	0.736	0.736
Clustered SE	No	Yes

Notes:

(1) Middlemen fixed effects are included.

(2) Standard errors in parentheses.

(3) When clustered, standard errors are clustered at the session level.

(4) *** p<0.01, ** p<0.05, * p<0.1.

Table 7: First period offer with bad type

VARIABLES	(1) offer	(2) offer	(3) offer	(4) offer	(5) offer
Price	0.760***	0.760***	0.760***	0.760***	0.760***
	(0.0405)	(0.0410)	(0.0407)	(0.0409)	(0.0402)
Informed	23.36***	23.36***	23.36***	23.36***	23.36***
	(6.084)	(6.161)	(6.114)	(6.148)	(6.047)
low cost	3.298	3.298	3.298	3.298	3.298
	(7.459)	(7.555)	(7.497)	(7.538)	(7.414)
low cost*informed	13.49	13.49	13.49	13.49	13.49
	(10.58)	(10.71)	(10.63)	(10.69)	(10.51)
bad	-47.96***	-5.716	-31.13***	-13.09**	-40.74***
	(9.650)	(5.725)	(7.943)	(5.878)	(6.755)
Constant	-9.857	-14.26	-16.71	-16.71	-10.89
	(22.05)	(22.42)	(22.11)	(22.24)	(21.89)
Observations	942	942	942	942	942
R-squared	0.410	0.395	0.404	0.397	0.417

Notes:

(1) Standard errors in parentheses.

(2) *** p<0.01, ** p<0.05, * p<0.1.

(3) Session fixed effects included in all columns.

(4) bad is a dummy equal to 1 if the middleman is classified as a 'bad' type.

The classification in each column is as follows: Column 1: 'bad' if 'competitive' on test of interpersonal orientation; Column 2: 'bad' if 'competitive' or 'individualistic'; Column 3: 'bad' if gave less than Rs.15 on the dictator game; Column 4: 'bad' if gave less than Rs.25 on the dictator game; Column 5: 'bad' if 'competitive' or 'gave less than Rs.15 on the dictator game.

Table 8: First period offer with bad type and informed interaction.

VARIABLES	(1) offer	(2) offer	(3) offer	(4) offer	(5) offer	(6) offer
Price	0.761***	0.761***	0.765***	0.765***	0.766***	0.766***
	(0.0404)	(0.0315)	(0.0408)	(0.0330)	(0.0402)	(0.0321)
Informed	20.45***	20.45**	20.73***	20.73**	18.30***	18.30**
	(6.239)	(7.777)	(6.420)	(8.339)	(6.476)	(8.429)
low cost	3.291	3.291	3.253	3.253	3.245	3.245
	(7.447)	(6.602)	(7.493)	(6.610)	(7.399)	(6.624)
low cost*informed	13.51	13.51*	13.61	13.61**	13.63	13.63**
	(10.56)	(6.300)	(10.63)	(6.325)	(10.49)	(6.336)
bad	-66.98***	-66.98***	-40.97***	-40.97***	-54.45***	-54.45***
	(13.41)	(16.62)	(10.83)	(9.488)	(9.271)	(11.66)
bad*informed	38.03**	38.03**	19.70	19.70	27.40**	27.40***
	(18.67)	(16.61)	(14.72)	(13.74)	(12.73)	(9.044)
Constant	-8.762	-8.762	-17.67	-17.67	-11.09	-11.09
	(22.02)	(15.52)	(22.12)	(14.77)	(21.85)	(15.09)
Observations	942	942	942	942	942	942
R-squared	0.413	0.413	0.405	0.405	0.420	0.420
Clustered SE	No	Yes	No	Yes	No	Yes

Notes:

(1) Standard errors in parentheses.

(2) *** p<0.01, ** p<0.05, * p<0.1.

(3) Session fixed effects included in all columns.

(4) bad is a dummy equal to 1 if the middleman is classified as a 'bad' type.

The classification in each column is as follows: Columns 1 and 2: 'bad' if 'competitive' on test of interpersonal orientation; Column 3 and 4: 'bad' if gave less than Rs. 15 on the dictator game; Column 5 and 6: 'bad' if 'competitive' or gave less than Rs. 15 on the dictator game.

Appendix

Farmer's beliefs and strategy

It is not possible to have an equilibrium where, when the farmer receives an offer of x_L, his belief that the middleman is a bad type is lower than his prior belief. If this were the case, then he would never switch when he received a low offer, which means that it would always be optimal for the strategic middleman to make a low offer, which means that the farmer's belief that the middleman is more likely to be good when he receives a low offer could not be correct. Let γ_H denote the probability that B offers x_L when $p = p_H$ and γ_L denote the probability that B offers x_L when $p = p_L$. The farmer's posterior beliefs for each x observed in equilibrium will be:

$$\mu_B = 1$$

$$\mu_H = \frac{q[\lambda(1-\gamma_H) + (1-\lambda)(1-\gamma_L)]}{q[\lambda(1-\gamma_H) + (1-\lambda)(1-\gamma_L)] + \lambda(1-q)} \in [0, q]$$

$$\mu_L = \frac{q[\lambda\gamma_H + (1-\lambda)\,\gamma_L]}{q[\lambda\gamma_H + (1-\lambda)\,\gamma_L] + (1-\lambda)\,(1-q)} \in [q, \frac{q}{q + (1-q)(1-\lambda)}]$$

Let σ_x denote the probability that the farmer continues to trade with the same middleman in the second period, given the middleman's offer in the first period. If the farmer receives an offer of x_B, then his optimal strategy will depend on the value of κ.

$$\text{If } \kappa > (1-q)\,\tfrac{1}{2}\tau, \text{ then } \sigma_B^* = 1$$

$$\text{If } \kappa = (1-q)\,\tfrac{1}{2}\tau, \text{ then } \sigma_B^* \in [0, 1]$$

$$\text{If } \kappa < (1-q)\,\tfrac{1}{2}\tau, \text{ then } \sigma_B^* = 0$$

Likewise, if the farmer receives an offer of x_L, his optimal strategy will be as follows

$$\text{If } \kappa > (\mu_L - q)\,\tfrac{1}{2}\tau, \text{ then } \sigma_L^* = 1$$

$$\text{If } \kappa = (\mu_L - q)\,\tfrac{1}{2}\tau, \text{ then } \sigma_L^* \in [0, 1]$$

$$\text{If } \kappa < (\mu_L - q)\,\tfrac{1}{2}\tau, \text{ then } \sigma_L^* = 0$$

Finally, since $\mu_H < q$, $\sigma_H^* = 1$, regardless of the value of κ.

Proof of Proposition 2:

Proposition 2: *For an intermediate level of competition, i.e.* $(1-q)\frac{1}{2}\tau > \kappa > \frac{\lambda q(1-q)}{q+(1-q)(1-\lambda)}\frac{1}{2}\tau$*, the bad type of middleman will need to disguise his type or else the farmer will switch to a new trading partner for the second period. For this level of competition, the expected price that the farmer receives in the first period will be higher with price information.*

Proof: (i) If the middleman makes an offer of x_B the farmer will know that the middleman's type is B with certainty. If $\kappa < (1-q)\frac{1}{2}\tau$, the farmer will switch to a new middleman with probability 1. Suppose $p_1 = p_H$. If the middleman chooses to offer x_B, his payoff will be:

$$p_H - \lambda p_H - (1-\lambda)p_L + \tau$$

if he offers x_H, his expected payoff will be:

$$p_H - p_H + \frac{1}{2}\tau + \tau$$

As long as $\tau > 2(1-\lambda)(p_H - p_L)$, the middleman will always prefer to offer x_H if offering x_B will cause the farmer to switch with certainty. I will assume that this condition holds[18]. If it is not optimal for him to offer x_B when $p = p_H$ then it will not be optimal for him to offer x_B when $p = p_L$.

(ii) If $\kappa > \frac{\lambda q(1-q)}{q+(1-q)(1-\lambda)}\frac{1}{2}\tau$, then the cost of switching is high enough that even if the farmer knows that the bad type always offers x_L, he still will not switch when he receives an offer of x_L as the probability that he is matched with a good type (but the market price is low) is high enough that it is not worth paying the cost to switch. Since the farmer will never switch when he receives an offer of x_L, it is not optimal for the middleman to ever make a higher offer.

Proof of Proposition 3

Proposition 3: *As the level of competition in the market increases, the benefit to the farmer of being informed about the market price decreases.*

[18] I have already assumed that $\tau > 2\lambda(p_H - p_L)$. As long as the distribution of p is fairly even, then it is not unreasonable to assume that this condition also holds

Proof: If the middleman offers x_H, his expected return will be:

$$p - p_H + \frac{1}{2}\tau + \tau$$

If he offers x_L, his expected return will be:

$$p - p_L + \frac{1}{2}\tau + \sigma_L^*\tau$$

He will, therefore, be indifferent between offering x_H and x_L if $\sigma_L = \frac{\tau-(p_H-p_L)}{\tau}$.

Assume $\gamma_L = 1$.[19] The farmer will be indifferent between switching to a new middleman and staying with the same one if:

$$\kappa = \left(\frac{q[\lambda\gamma_H + (1-\lambda)]}{q[\lambda\gamma_H + (1-\lambda)] + (1-\lambda)(1-q)} - q\right)\frac{1}{2}\tau$$

which implies

$$\gamma_H^* = \frac{(1-\lambda)\kappa}{\lambda[\frac{1}{2}q(1-q)\tau - q\kappa]}$$

which is increasing in κ.

Model with three prices

It is reasonably straightforward to extend the model to allow for the price to take three values instead of two: p_H, p_M, and p_L. Now, there will be four possible prices that the type B middleman could offer in equilibrium:

$$x_H = p_H - \frac{1}{2}\tau$$

$$x_M = p_M - \frac{1}{2}\tau$$

$$x_L = p_L - \frac{1}{2}\tau$$

$$x_B = E(p) - \tau$$

[19] This equilibrium is not unique. As the condition that makes the middleman indifferent between offering x_H or x_L is independent of the value of the market price, it will hold for both $p = p_H$ and $p = p_L$. It is not necessary that $\gamma_L = 1$ but the following must hold:

$$\lambda\gamma_L + (1-\lambda)\gamma_H = \frac{(1-\lambda)[(1-q)\kappa + q(1-q)\frac{1}{2}\tau]}{q(1-q)\frac{1}{2}\tau - q\kappa}$$

The expected return for the farmer in the first round, however, is the same for all of the possible equilibria.

For each offer made, the condition for whether or not the farmer decides to switch is the same as before:

$$\text{If } \kappa > (\mu_x - q)\,\tfrac{1}{2}\tau, \text{then } \sigma_x^* = 1$$

$$\text{If } \kappa = (\mu_x - q)\,\tfrac{1}{2}\tau, \text{ then } \sigma_x^* \in [0,1]$$

$$\text{If } \kappa < (\mu_x - q)\,\tfrac{1}{2}\tau, \text{then } \sigma_x^* = 0$$

For simplicity, assume that it is equally likely for the market price to take any of the three values. Let γ_i denote the probability that type B offers x_L, given p_i, and let α_i denote the probability that type B offers x_M, given p_i, $i = H, M, L$.

Proposition 1*: *If the level of competition in the market is low, i.e.* $\kappa > (1-q)\,\frac{1}{2}\tau$*, the bad type does not need to conceal his type. In this situation, improving the farmer's access to price information will not increase the expected price that he receives in the first period.*

As in the case with two prices, if $\kappa > (1-q)\,\frac{1}{2}\tau$, the farmer will never switch and the middleman will always offer x_B.

Proposition 2*: *For an intermediate level of competition, i.e.* $(1-q)\,\frac{1}{2}\tau > \kappa > \frac{q(1-q)\frac{2}{3}}{q+(1-q)\frac{1}{3}}\,\frac{1}{2}\tau$*, the bad type of middleman will need to disguise his type or else the farmer will switch to a new trading partner for the second period. For this level of competition, the expected price that the farmer receives in the first period will be higher with price information.*

If $(1-q)\,\frac{1}{2}\tau > \kappa > \frac{q(1-q)\frac{2}{3}}{q+(1-q)\frac{1}{3}}\,\frac{1}{2}\tau$, the middleman will always offer x_L and

$$\sigma_B^* = 0$$

$$\sigma_L^* = 1$$

$$\sigma_M^* = 1$$

$$\sigma_H^* = 1$$

Proposition 3*: *As the level of competition in the market increases, the benefit to the farmer of being informed about the market price decreases.*

Suppose $\frac{q(1-q)\frac{2}{3}}{q+(1-q)\frac{1}{3}}\frac{1}{2}\tau > \kappa > \frac{q(1-q)}{2-q}\frac{1}{2}\tau$.[20] For this value of κ, it is no longer possible for the bad type to always offer x_L, as if he did, then $(\mu_L - q)\frac{1}{2}\tau > \kappa$, and the farmer would switch when he received an offer of x_L. Assume $\gamma_L = 1$.[21] In order for the middleman to be indifferent between offering x_L and x_M, the farmer must sometimes switch when he receives the lower offer. We must have $(\mu_L - q)\frac{1}{2}\tau = \kappa$, which implies:

$$\gamma_M^* + \gamma_H^* = \frac{\kappa}{q(1-q)\frac{1}{2}\tau - q\kappa}$$

As long as $\kappa > \frac{q(1-q)}{2-q}\frac{1}{2}\tau$, it is not optimal for the farmer to switch when he receives an offer of x_M, even if the middleman never offers x_H. Therefore, the following will be an equilibrium:

$$\alpha_M^* = 1 - \gamma_M^*$$

$$\alpha_H^* = 1 - \gamma_H^*$$

$$\sigma_B^* = 0$$

$$\sigma_L^* = \frac{\tau - (p_M - p_L)}{\tau}$$

$$\sigma_M^* = 1$$

$$\sigma_H^* = 1$$

As κ decreases, $\gamma_M^* + \gamma_H^*$ must fall so that the farmer remains indifferent between switching or staying when he receives an offer of x_L. Since $\alpha_M^* + \alpha_H^* = 2 - (\gamma_M^* + \gamma_H^*)$, $\alpha_M^* + \alpha_H^*$ must rise. This will happen up until the point where

$$\kappa = (\mu_M - q)\frac{1}{2}\tau$$

$\mu_M = \frac{q(\alpha_M^* + \alpha_H^*)}{q(\alpha_M^* + \alpha_H^*) + (1-q)} = \frac{q(1-q)}{2-q}\frac{1}{2}\tau$, since $\gamma_M^* + \gamma_H^* = \frac{\kappa}{q(1-q)\frac{1}{2}\tau - q\kappa}$must still hold.

At this point, the middleman must start occasionally offering x_H in order for the farmer to remain indifferent to switching when he receives an offer of x_M.

[20] This is possible as long as $q < \frac{3}{4}$

[21] As in the case with two prices, this is not the only equilibrium as the middleman is indifferent between offering x_L and x_M regardless of the value of the market price. As the expected payoff to the farmer is the same for all of the equilibria, however, I will focus on this one for simplicity.

We then have

$$\gamma_M^* + \gamma_H^* = \frac{\kappa}{q(1-q)\frac{1}{2}\tau - q\kappa}$$

$$\alpha_M^* + \alpha_H^* = \frac{(1-q)\kappa - q(1-q)\frac{1}{2}\tau}{q(1-q)\frac{1}{2}\tau - q\kappa}$$

$$\sigma_B^* = 0$$

$$\sigma_L^* = \frac{\tau - (p_H - p_L)}{\tau}$$

$$\sigma_M^* = \frac{\tau - (p_M - p_L)}{\tau}$$

$$\sigma_H^* = 1$$

As κ decreases, $\gamma_M^* + \gamma_H^*$ and $\alpha_M^* + \alpha_H^*$ must also decrease, meaning that the benefit to the farmer of being informed also decreases.

An Instrument to Measure Interpersonal Orientation

In this task we ask you to imagine that you have been randomly paired with another person, whom we will refer to simply as the "Other." This other person is someone you do not know and that you will not knowingly meet in the future. Both you and the "Other" person will be making choices by circling either the letter A, B, or C. Your own choices will produce points for both yourself and the "Other" person. Likewise, the other's choice will produce points for him/her and for you. Every point has value: the more points you receive, the better for you, and the more points the "Other" receives, the better for him/her.

Here's an example of how this task works:

	A	B	C
You get	500	500	550
Other gets	100	500	300

In this example, if you choose A you would receive 500 points and the other would receive 100 points; if you chose B, you would receive 500 points and the other 500; and if you chose C, you would receive 550 points and the other 300. So, you see that your choice influences both the number of points you receive and the number of points the other receives. Before you begin making choices, please keep in mind that there are no right or wrong answers -- choose the option that you, for whatever reason, prefer most. Also, remember that the points have value: the more of them you accumulate the better for you. Likewise, from the "other's" point of view, the more points s/he accumulates, the better for him/her.