

Working paper

Potato Traders in West Bengal

A Survey of
Contractual
Relations and
Market Structure

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Introduction

Our study consists of a pilot survey of a random sub-set of *phorias* (middlemen) and larger traders who operate in 72 villages of West Medinipur and Hugli districts and their corresponding potato markets. Our goal is to understand the nature of contractual relations between farmers and *phorias* on the one hand, and between *phorias* and wholesale traders that they sell to on the other hand. The surveys will enable us to obtain systematic information on market structure, trader costs and profits, entry barriers, contractual relations across successive layers of the supply chain, and the nature of competition at each layer. Eventually the hope is that we will obtain a richer understanding of the organization of these bottom-most layers of the supply chain, that will both explain magnitudes of observed margins and pass-through of external price shocks to farmer earnings, as well as enable us to predict the effect of various policies intended to enhance efficiency of the supply network and pass-through to farmers.

Context: Potato Markets in West Bengal

The state of West Bengal accounts for about a third of the total volume of potatoes produced in India. It is the leading crop in the two districts in our study: Hugli and West Medinipur. The large majority of farmers sell their potatoes to local traders (known as *phorias*) who re-sell them in neighbouring wholesale markets (*mandis*) to larger traders. These large traders in turn sell them in the large retail markets in the capital, Kolkata or in neighbouring states such as Orissa and Andhra Pradesh.

Potatoes are a winter crop; they are planted between October and December, and harvested between January and March. They are storable, so not all potatoes harvested need to be sold upon harvest. Farmers have the option of placing potatoes in home stores (from where they would have to be sold within two or three months) or in cold stores, where they can survive until October, when the new planting season begins. In data collected (by a subset of the

current authors) for a related study in 2011, 64 percent of the amount produced was sold immediately upon harvest, about 12 percent was put into home stores, and about 18 percent was put into cold stores.

The predominant method to sell potatoes is to sell to local intermediaries. The bulk of potato sales by farmers are to *phorias*, who are small self-employed traders or commission agents of wholesalers operating within the village, or in neighboring villages and local markets. A small fraction (less than 10 percent) is sold to money lenders or in a retail market.

Motivation: Previous findings on the non-effect of price information provision

The results emerging from previous research (by Mitra, Mookherjee, Torrero and Visaria (2012) partly funded by the IGC) conducted in 72 villages in two districts of West Bengal, India indicate that (a) middleman margins in 2008 were substantial, amounting to between 55% to 100% of the farmgate prices, and (ii) despite the existence of substantial asymmetric information between middlemen and farmers regarding prices prevailing in wholesale and external retail markets, providing farmers with information about these prices had no significant average treatment effects on the prices that farmers received. Fafchamps and Minten (2012) report similar findings from Western India. Our previous research also shows that the margins earned by the *phorias* cannot be explained as insurance premiums.

Our previous research explained the inability of informational treatments to enable farmers earn a higher price from *phorias* by a model of ex post bargaining with limited competition across different *phorias*. When a *phoria* makes a price offer, the only outside option of the farmer is to take the crop to a local market outside the village and sell to a different *phoria* there. It leaves open the question why there is not greater competition between different *phorias* operating within the village. Or why farmers cannot sell directly to a wholesale buyer. Numerous field visits and interviews indicate that farmers cannot sell directly to wholesale buyers at the potato *mandi* (wholesale market), and expect to receive the prevailing *mandi* price that *phorias* get. A *phoria* can buy potatoes from a farmer and immediately resell to a wholesaler at a substantially higher price, raising the question why wholesalers do not buy from farmers directly.

Anecdotes and farmer interviews suggest problems of reputation and trust prevent wholesalers from trading directly with farmers. The role of the *phoria* seems partly to overcome these. Wholesaler traders do not have the time and detailed social capital required to select individual farmers, negotiate with them and inspect the potatoes supplied. They

delegate this task to the middleman *phoria*. The margins earned by the latter are then a rent earned with respect to their knowledge and experience in identifying reliable suppliers, and effort they spend in inspecting supplies.

Possible Hypotheses to be Explored

Nevertheless there still ought to be scope for different *phoria* to compete with one another in making price offers to farmers. With unrestricted Bertrand price competition, all middlemen rents ought to vanish, whence wholesale price changes would pass through to farmers. Why does this not happen? This is the principal motivation for the current project. We would like to examine the relative plausibility of a number of possible explanations:

- a) *Market concentration, collusion and trader profits*: The market structure on the *phoria* side could be highly concentrated, owing to high entry barriers or economies of scale in services provided by *phorias* such as transport, inspection or handling. Even if there are a number of different *phorias* in the village that could potentially compete with one another, they may engage in tacit or explicit price collusion. Or perhaps traders incur high costs of providing services, so their gross margins do not translate into significant profit margins (analogous to Aleem's (1990) study of informal credit for cotton farmers in Pakistan).
- b) *Asymmetric information about farmer reliability and contractual lock-in*: Farmers could vary with respect to their reliability of supplies. Established *phorias* may have acquired information privately about farmer reliability from past dealings. They may be able to earn positive profits from high quality suppliers by locking them into long term relationships and/or providing them selective price or service benefits (as in Ghosh and Ray (1996), or in our study of microfinance in these villages (Maitra, Mitra, Motta, Mookherjee and Visaria, 2012).
- c) *Search frictions*: *Phorias* and farmers might incur significant search costs to find each other, whence *phoria* profit margins would arise owing to temporary lock-in resulting from these frictions (as in Antras and Costinot (2011) or Chau, Goto and Kanbur (2011)).
- d) *Reputation rents*: If wholesalers are concerned about reliability of potatoes supplied to them, they may decide to buy only from *phoria* that they trust, i.e., those with a reliable market reputation. *Phoria* profits could then be reputational rents, necessary to induce them to screen farmers, inspect their potatoes and provide reliable supplies to wholesalers, as in Bardhan, Mookherjee and Tsumagari (2010). In the latter theory, *phoria* are price-takers. Entry into the *phoria* business requires sufficient capital and/or managerial capacity to achieve a certain minimum turn over, hence the supply of entrants is restricted.

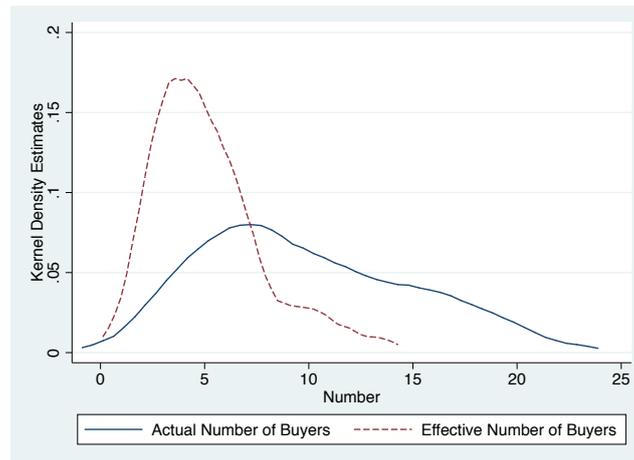
Sample Selection and Survey Details

The pilot surveys began in mid-August 2012. Using the potato farmer surveys that we have been conducting in these villages over the last few years, we obtained the names of potato buyers (who buy from our sample households) in these villages. In each of the 72 villages in our sample we randomly selected 2 buyers (from the list of potato buyers obtained from the household surveys) and we have been conducting surveys with them on a fortnightly basis. We collect information on *all* their potato transactions in the 15 days prior to each survey. We therefore have a sample of 144 potato buyers (*phorias*). As of March 2013 we have 8 rounds of data on potato transactions by these *phorias*. The data are currently being cleaned and digitized, so we are unable to report results based on these. In addition to these 8 recurring surveys, we conducted a longer survey, where we collected information on the history of the *phoria's* operation in the village, his relationships with the potato producers (farmers) and also his relationships with the potato traders higher up in the product marketing chain. This report is based on the one-time (longer) survey and on the household surveys we have been conducting in these villages since 2010.

A. Market Concentration

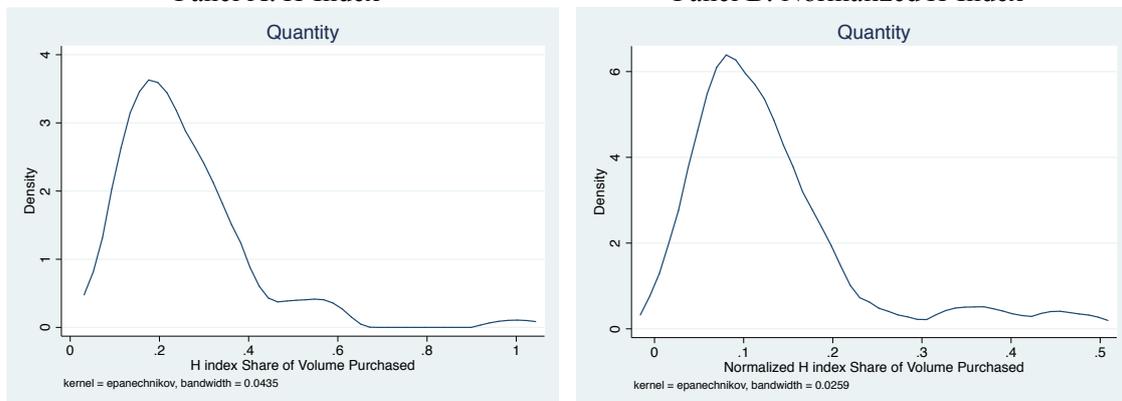
Our data shows that most villages are characterized by co-existence by multiple *phorias*. The average number of *phorias* in a village is 10, with a wide range, from 1 to 22. In Figure 1 we present the distribution of the total number of buyers of potato from farmers in each village. The median market share of a particular *phoria* is 5 percent. The market share of the largest *phoria* is around 35 percent. Figure 1 also presents the distribution of the effective number (of equal sized) buyers in the sample villages – the market structure is equivalent to having 5.11 buyers of the same size. Hence we find no evidence of outright monopolization.

Figure 1: Distribution of the Number of Buyers (Actual and Effective Equal Sized) per village



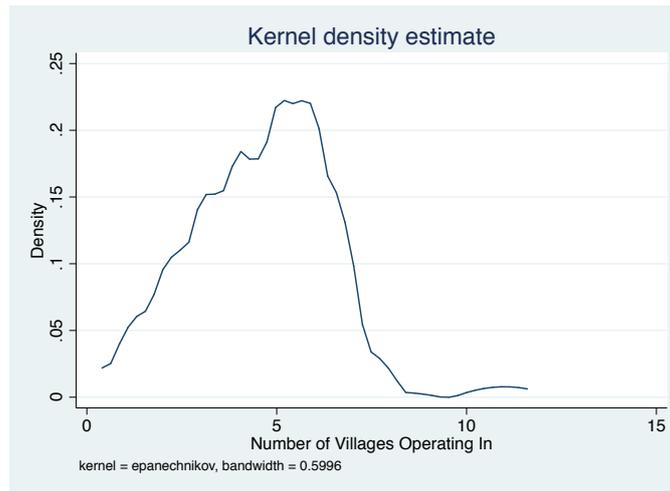
The available data also allow us to compute aggregate measures of competitiveness in the potato market in each village: the Herfindahl Index (H), computed as $\sum_{i=1}^N s_i^2$, where s_i is the market share of trader i defined over the volume purchased and N is the number of buyers in the village. Panel A in Figure 2 presents the distribution of the H index in the set of sample villages. The peak of the distribution is attained at around 0.2. We find that the market structure is equivalent to having 5.11 buyers of the same size. Panel B in Figure 2 presents the distribution of normalized H index, computed as $H^* = \frac{H - (1/N)}{1 - (1/N)}$, which tells a similar story.

Figure 2: Distribution of H and Normalized H Index
 Panel A: H Index
 Panel B: Normalized H Index



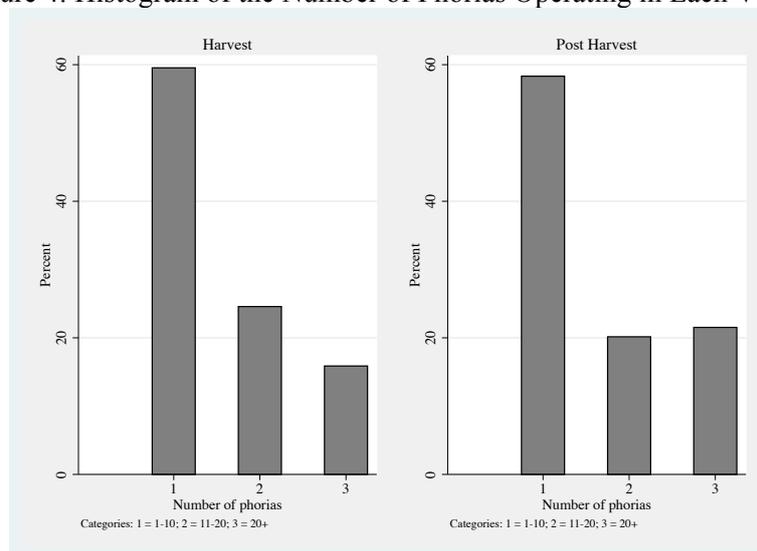
Phorias typically operate in multiple villages – the number of villages each *phoria* operates in varies from 1 – 11, with an average of 4.6 villages on average. Figure 3 presents the distribution of the number of villages each *phoria* operates in. The peak of the distribution is attained at 6 villages. More than 25 percent of *phorias* operate in 6 or more villages.

Figure 3: Distribution of the Number of Villages each Phoria Operates in



Each village has on average 9.5 *phorias* operating during harvest season and 5 *phorias* operating in the post-harvest season. However the distribution of the number of *phorias* operating during harvest and in the post-harvest period are similar (see Figure 4). There is also a great deal of variation in the volume of purchases (measured by the number of packets or 50 kg bags) made by each *phoria* in a particular village – i.e., in the scale of operation in each village. This ranges from 22 – 20000 during the harvest period (with an average of 2600 packets) to 15 – 10000 during the post-harvest period (with an average of a little more than 1100 packets).

Figure 4: Histogram of the Number of Phorias Operating in Each Village



Each *phoria* buys from a large number of farmers, ranging from 6 to more than 300. Panel A in Figure 5 presents the histogram of the number of farmers each *phoria* buys from. The distribution is bimodal – while almost 50 percent of *phorias* buy from 100 farmers or less, 20 percent of *phorias* buy from more than 250 farmers. Conversely each farmer also sells to a

large number of traders, varying from 1 to 90 traders. Panel B in Figure 5 shows that the majority of *phorias* sell to at most 10 traders, and on average they sell to 4 traders. Hence, these markets do not show any overt signs of monopsonization, with farmers locked into selling to a particular *phoria* and *phorias* locked into selling to a particular trader/wholesaler. It is better characterized as a network of buyers and sellers, with each agent having multiple trading partners on the other side of the market. Given the large number of *phorias* operating in each village, it is not surprising that the market share of each *phoria* in a particular village is relatively small – both in the harvest and the post-harvest season the majority of the *phorias* have a market share of 10 percent or less.

Figure 5: Histogram of the Number of Farmers each *Phoria* buys from and Number of Traders each *Phoria* sells to

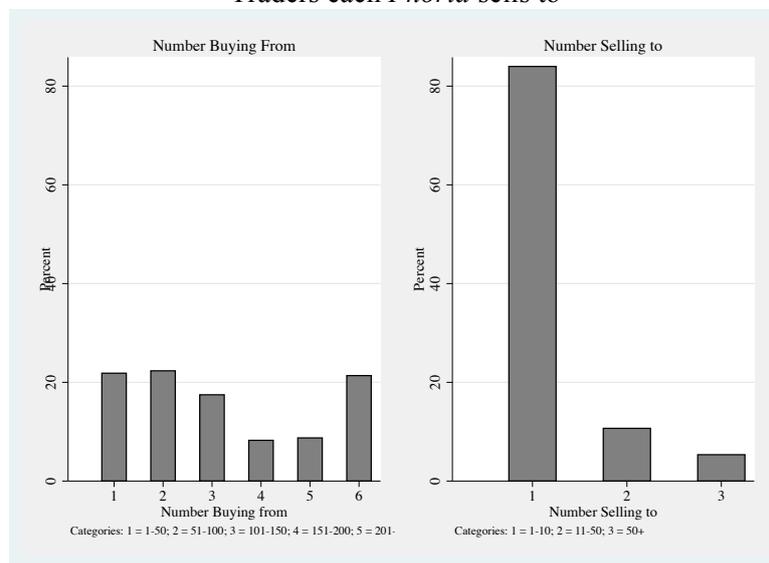
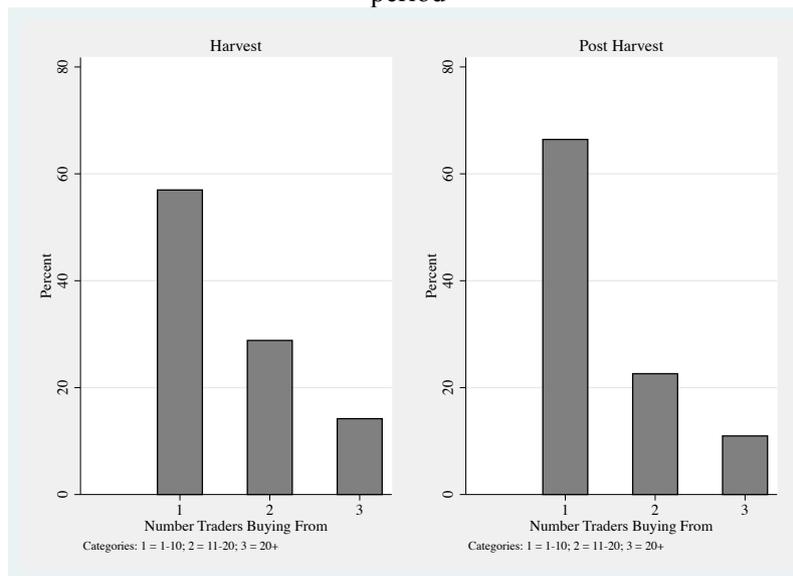


Figure 6: Histogram of the number of *Phorias* each trader buys from during and post harvest period



A similar network structure appears also in the relation of *phorias* to wholesalers. While on average each *phoria* sells to 4 traders, each trader/wholesaler on average buys from 8 *phorias* during the harvest season and from 7 *phorias* in the post-harvest season (see Figure 6). The market share of most *phorias* in the wholesale market is therefore quite small – of the percentage of potatoes purchased by each wholesaler, an overwhelming majority of *phorias* contribute less than 10 percent.

The preceding discussion implies that the middleman market for potatoes does not appear highly concentrated. At the next step we need to calculate trader costs and thereby their profit

Margins

The data required for this is yet to be cleaned, so this will be provided in future versions of this report. Nevertheless, we should point out that Mitra, Mookherjee, Torero and Visaria (2012) calculated a lower bound to *phoria* profits in the year 2008 by using selling costs (transport, handling and storage) incurred by those farmers that sold directly in local markets as an upper bound to these costs that might be incurred by *phorias*. They estimated the *phoria* margins net of selling costs amounted to 25-30 percent of the wholesale price, while farmgate prices were approximately 55 to 60 percent. The margins were higher during the harvest period if the *phoria* resold the potatoes immediately as storage costs were not incurred: for such transactions their net margin was approximately equal to the farmgate price! These calculations however do not include overhead costs incurred by the *phorias*. We hope to calculate costs incurred by the *phorias* during 2011-2013 using cost information directly provided by them.

Entry Requirements

We now present evidence concerning entry requirements for a *phoria*. This throws light on how easy hit-and-run entry is feasible in these markets.

The majority of *phorias* we surveyed operate a small business. Only 30 percent of the *phoria* surveyed operate more than 1 business and almost 60 percent of the *phoria* do not employ anyone in their business. 45 percent of the *phoria* report that capital availability is the most important requirement to starting a new *phoria* business, following by having friends and family members who cultivate potato. The capital requirements can be substantial. As shown in Figure 7, almost 40 percent of the *phoria* we surveyed report that an initial capital of Rs 20000 – 50000 is necessary to start a *phoria* business, though there is a great deal of variation

here. 15 percent of the *phoria* surveyed report that the capital requirement is less than Rs 20000, while nearly 20 percent report the requirement to be more than Rs 100000 (Rs 1 lakh).

Capital requirement and contact with farmers through other means are the two most important requirements for starting a *phoria* business – see Figure 8. Hence hit-and-run entry does not appear to be feasible. While the market is characterized by multiple buyers and sellers, not anyone on the outside can respond to significant middleman margins by entering for a short period of time and undercutting prices quoted by incumbent *phorias*. The principal barriers involve having sufficient capital (as we shall see below liquidity constraints are important: *phorias* have to be able to accept delayed payments from wholesalers for potatoes supplied to them), and enough connections with farmers who would be willing to supply to them (as we shall see below, farmers need to trust the *phoria*). Regulatory barriers do not seem important: approximately 60 percent of the *phoria* surveyed report that they do not require permission to start operating a *phoria* business. Very few mentioned political connections as a prerequisite.

Figure 7: Capital required to start a new *phoria* business

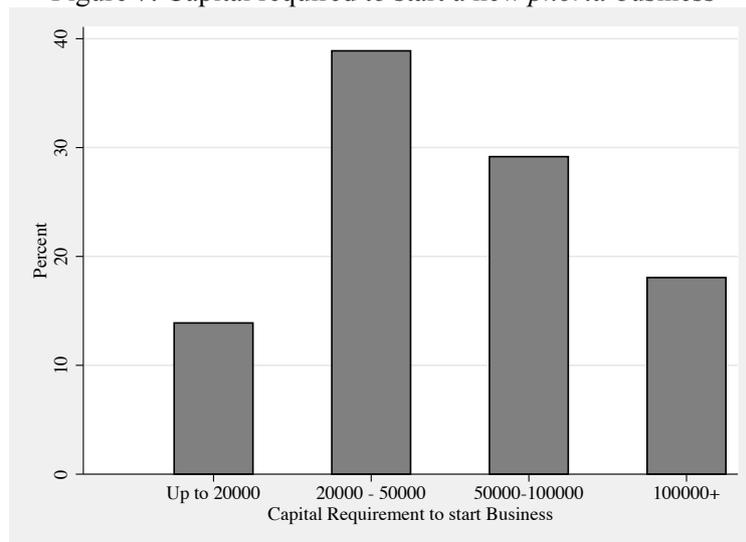
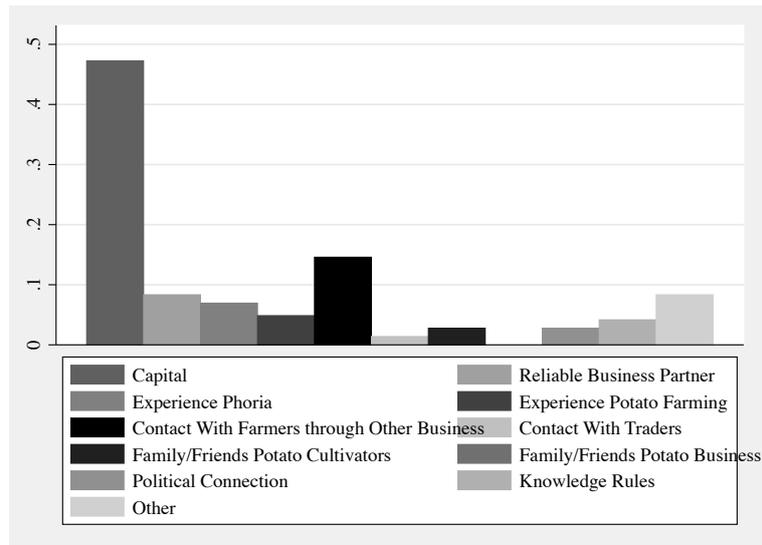


Figure 8: Most Important Requirement to Start a New *Phoria* Business



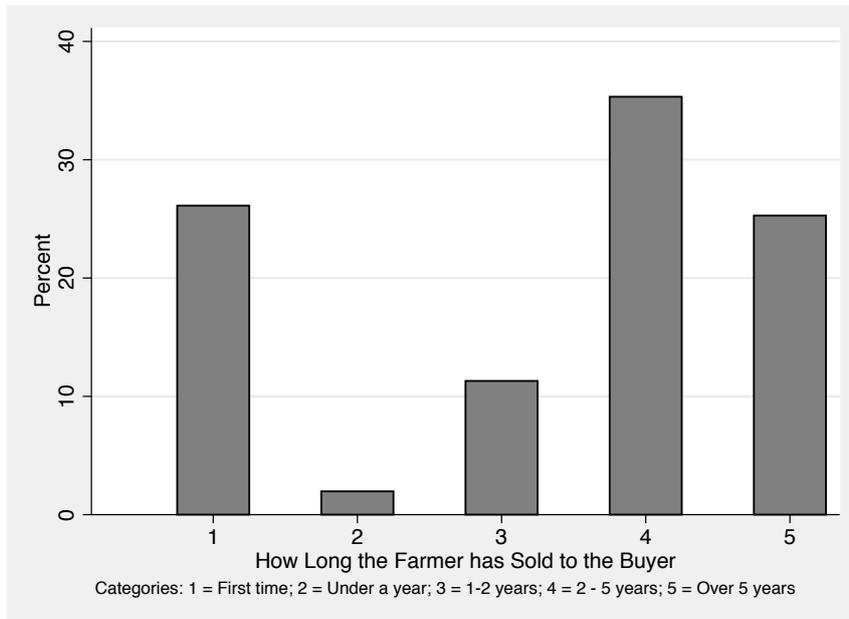
B. Specialized Information and Contractual Lock-in

We now examine whether existing *phorias* manage to earn profits owing to specialized information regarding the reliability of different farmers, or by designing contracts which lock-in their favored suppliers from being competed away by other *phorias*. These might enable *phorias* to segment the market in ways that make it difficult for new entrants to undercut their profit margins. Typical forms of such segmentation involve long-term contracts providing special benefits to suppliers who have developed a track record of providing them reliable supplies over a period of time.

Length of Relationships

Long-term relationships are common. Figure 9 reports the length of relationship between the farmer and the buyer of his produce. Almost 30 percent of potato producers report relationships longer than 5 years; another 30 percent report relationships between 2 and 5 years. But there also appears to be a functioning short-term market, with 15 percent reporting relationships of one year or less.

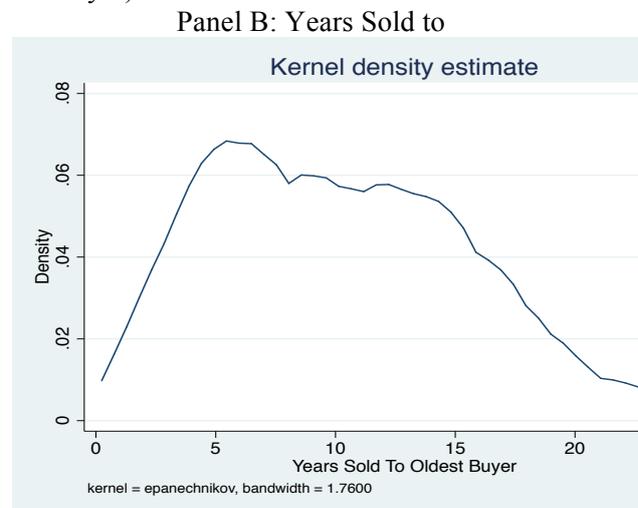
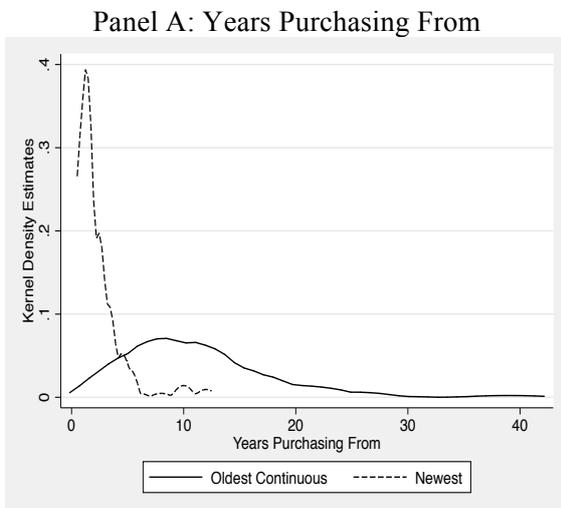
Figure 9: Length of relationship of farmer with buyer



This was from the farmer's side. From the *phoria's* side, we enquired about the relationship of each *phoria* with his oldest continuous supplier and with his newest supplier (supplier here refers to the farmer who sold the potato to the *phoria*). In almost 80 percent of the cases, the years purchased from the oldest continuous supplier exceeds 5 years. Panel A in Figure 10 presents the distribution of the years purchased from the oldest continuous supplier and the newest supplier. For the latter, the peak of the distribution is attained at 2 years.

Panel B in Figure 10 presents the distribution of the number of years the *phoria* has been selling to his oldest buyer (buyer here refers to the trader/wholesaler who the *phoria* sells to). The average is more than 5 years again indicative of extended (long term) relationships.

Figure 10: Distribution of years purchased from (oldest continuous and newest Supplier) and sold to (oldest buyer)



What are the benefits to farmers from long-term relationships? We asked the *phorias* how the price per packet (50 kg bag of potato) they offer to the oldest supplier and the newest supplier would compare to the prices the relevant farmer would receive (1) at the *mandi* where the *phoria* re-sold the potato; (2) at the local market (*haat*) where the farmer could transport and sell the same potatoes; and (3) from a different *phoria* for the same potatoes.

Only in the case of post-harvest sales, is there a statistically significant difference between relative likelihood of offering longer-term suppliers a better price than would be offered by other *phorias*. Even in this case the extent of difference is not quantitatively large: the reported likelihood is 65% for the oldest continuous supplier compared with 58% for the newest supplier.

Table 1: How does the price offered to the farmer for the largest transaction compare to the price the farmer could receive elsewhere

	Newest Supplier	Oldest Continuous Supplier	Difference
Harvest: Higher than Mandi Price	0.26	0.28	-0.02
Harvest: Higher than Haat Price	0.56	0.62	-0.05
Harvest: Higher than price offered by other <i>phoria</i>	0.59	0.58	0.01
Post-Harvest: Higher than Mandi Price	0.06	0.09	-0.03
Post-Harvest: Higher than Haat Price	0.28	0.25	0.03
Post-Harvest: Higher than price offered by other <i>phoria</i>	0.58	0.65	-0.08**

What are the advantages to long term relationships if there is no price advantage? Does the *phoria* provide any additional services to longer-term suppliers? We next turn to the issue of interlinked contracts.

Bundling of Other Services to Favored Suppliers: Interlinked Contracts

Approximately 30 percent of the households report that at the time of the sale they had outstanding loans from the trader who buys their crop. Of these households, more than 37 percent report that they have been borrowing from this person for 2-5 years and an equally high 36 percent report that they have been borrowing for more than 5 years.

Table 2: At the time of sale, did you have an outstanding loan from this buyer?

Outstanding Loan	Percentage
Yes	24.44
No	75.56

Table 3: Since when have you been borrowing from this buyer (if loan outstanding at time of

sale)?

Length of Borrowing	Percentage
First time	7.53
Under a Year	2.11
1 – 2 Years	14.40
2 – 5 Years	43.86
More than 5 Years	32.10

Note also that cross-market links are not restricted to the credit market. In particular, more than 40 percent of households report that they purchased inputs from the buyer whom they sold the output to. In approximately 20 percent of cases the purchase of inputs was on credit, so there was overlap between borrowing and input purchase relations.

Table 4: Did you purchase any inputs from this buyer to plant this crop?

Purchase Inputs	Percentage
Yes	40.23
No	59.77

Hence while there is some incidence of trade credit or other transactions occurring between a farmer and the *phoria* that he tends to sell to, the majority of farmers are not engaging in any other transaction.

On the other hand, the *phoria* is significantly more likely to provide credit to the regular supplier to buy inputs relative to the newest suppliers (see Table 5). The *phoria* is also significantly more likely to provide inputs for the regular supplier (again the difference is statistically significant). The *phorias* are more likely to enter into agreements with the more regular supplier about transactions, though the difference is not statistically significant. There is however no concession to more regular suppliers in the form of lower inspection of quality – the *phoria* is as likely to inspect the quality of potatoes he purchases from a more regular supplier as he is of the quality he purchases from the newest supplier.

Table 5: Non-price advantages of Longer Relationships

	Newest Supplier	Oldest Continuous Supplier	Difference
Provide Credit to farmer to buy inputs	0.30	0.47	-0.17***
Provide Inputs for the farmer to use	0.31	0.46	-0.15***
Make Agreement with farmer to buy his potatoes	0.23	0.28	-0.05

Trust and Reputation: Reliability Checks

The survey provides clear evidence of the importance of trust and reputation in the supply chain. Farmers and *phorias* trading with one another check each others reliability, and so do *phorias* and wholesalers trading with one another. Panel A of Table 6 shows that more that 55 percent of *phorias* checked the reliability of the farmer, most often with regard to the quality of their potatoes, and also with stability of their supply. Panel B shows that between 42 to 60 percent farmers checked the reliability of the *phoria*, most often the latter's trade reputation, followed by the sales network. Payments made by *phorias* to farmers are frequently characterized by delayed payments of part of the value of the transaction, owing to delays the *phorias* themselves get paid by wholesalers they sell to. Hence farmers check a *phoria*'s reputation for timely repayment. Similarly *phorias* check a wholesaler's reputation for timely repayment before selling to them.

Table 6: Reliability Checks

Panel A: Did <i>phoria</i> check the reliability of farmer						
		Percent Checking	What Aspect if Checking			
			Quality of potatoes	Stability of supply	Creditworthiness	
Oldest Supplier	Continuous	56.64	80.25	62.96	54.32	
Newest		58.47	84.52	32.14	45.24	
Panel B: Did farmer check the reliability of <i>phoria</i>						
		Percent Checking	What Aspect if Checking			
			Sales Network	Stability of Demand	Creditworthiness	Reputation
Oldest Supplier	Continuous	59.57	70.24	46.43	51.19	96.43
Newest		42.55	73.33	30.00	51.67	93.33
Panel C: Wholesaler- <i>Phoria</i> Checking						
		Percent Checking	What Aspect if Checking			
			Sales Network	Stability of Demand	Creditworthiness	Reputation
Did wholesaler check reliability of <i>phoria</i>		61.87	80.23	72.09	37.21	72.09
Did <i>phoria</i> check reliability of wholesaler		88.03	72.08	60.80	69.60	88.00

Exclusive Dealing; Market Restrictions on Farmers

While almost all farmers in our sample cultivate potato, and the majority of the produce (67 percent) is sold directly from the field, immediately following harvest, a large number of

farmers report that they expect to sell in outside markets (mandi, haat, cold-store, retail markets) during the next four months as they expected market prices to appreciate. This suggests that there are no restrictions imposed on farmers on who they choose to sell to, even though the majority of them end up selling to a *phoria* within a village who many of them have been selling to in the past. This is consistent with informal farmer interviews: farmers say they are not bound by any prior understanding to sell to any specific *phoria*. And as we have seen earlier, most farmers have sold to many different *phorias* in the recent past. Hence we do not see much evidence of any exclusive dealing clauses.

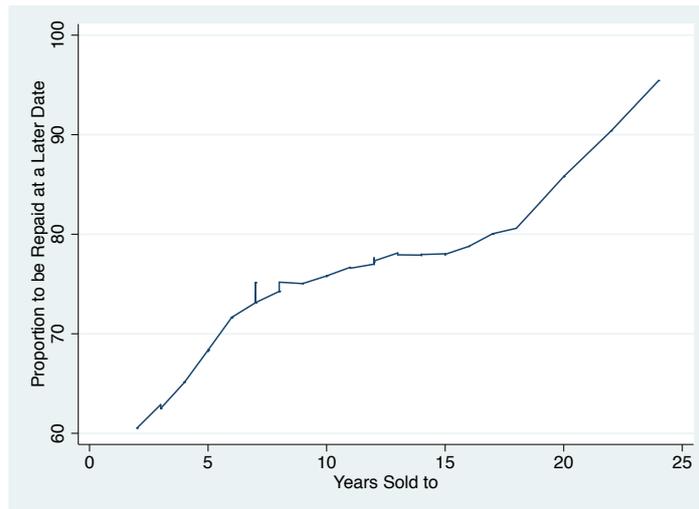
Phoria-Trader Relationship

We have noted above the network character of trade relationships between *phorias* and wholesalers, i.e., the absence of exclusive dealing at that layer. There is also not much evidence of any prior contractual agreement on price or quantity of sales. In more than 56 percent of the cases, there is no prior agreement (before the harvest) between the wholesaler and the *phoria*. Even if there was an agreement, there was no explicit agreement on the price or quantity before the harvest; instead there was an implicit agreement that the wholesaler would buy what the *phoria* had to offer. That said, the wholesaler was free to buy from any seller he wished to and the *phoria* was also was under no-obligation to sell to the wholesaler despite the agreement.

Almost 80 percent of the *phorias* report that they do not receive any trade credit even from their most frequent buyer. Unlike the relationship between the *phoria* and the farmer, there are no interactions between the trader and the *phoria* across different markets. While the wholesaler insists on inspecting the potato delivered by the *phoria* (almost 96 percent of wholesalers inspect the potato supplied); 60 percent of wholesaler inspect the potato after delivery, while others do so before agreeing to purchase.

Sales to the wholesaler by a *phoria* is frequently characterized by delayed payments. Hence wholesalers end up borrowing from the *phorias* they buy from, despite having a much larger business. Approximately 85 percent of trades between a wholesale and a *phoria* are not settled at the time of delivery and on average 75 percent of the payment amount was to be settled later. Figure 11 shows a systematic positive relationship between the length of the relationship between the fraction of the payment amount that was to be repaid at a later date.

Figure 11: Lowess plot of years sold to oldest buyer and fraction of payment that was to be repaid at a later date



Summary and Conclusion

We summarize our main findings:

1. Markets between *phoria* and farmers are not particularly concentrated. While trades often take place repeatedly between partners over many years, agents on each side trade with multiple partners.
2. Long-term trading relationships are more likely to involve trade credit and purchase of farm inputs by a farmer from the same *phoria*. But it seems to not involve any price premia received compared with recently acquired suppliers of the same *phoria*.
3. Farmer-*phoria* and *phoria*-wholesaler relationships are characterized by two-sided trust concerns. Buyers check quality of potatoes supplied and stability of supplies, while sellers check the buyers reputation for timely payment and stability of demands.
4. Entry into the *phoria* business is restricted by capital requirements and the need to establish connections with buyers and suppliers (which may reflect the same concerns for trust and reliability).

These results are consistent with models where large *phoria* margins arise as rents to their reputation, combined with some entry barriers arising from capital and networking requirements. There seem to be not much evidence of contractual lock-in, or restrictions on who a farmer can sell to. Hence large *phoria* margins do not seem to result from any kind of explicit monopsonization. What is less obvious is whether *phoria* engage in any kind of price collusion with one another. Or whether search frictions are significant sources of their margins.

Going forward, we will need to use the detailed data from the recurring surveys to: (a) calculate *phoria* costs and profits more precisely, and in the event that these turn out to be large, (b) discriminate between competing explanations (collusion, search, reputation rents) of high *phoria* profits econometrically to the extent possible. For this we will need to develop testable predictions of theoretical models of these phenomena.

At this intermediate stage of the research, it would be premature to draw any policy conclusions. These will have to await a better understanding of the trading mechanism between farmers and *phorias*.

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