Do Chili Traders Make Price Volatility Worse? A Qualitative Analysis of East Java Trading Practices

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Abstract

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Chili prices in Indonesia at the end of 2010 soared 10-fold within the span of a few months. This was not an isolated event. Chili prices have been extremely volatile over the past decade. Although chili is a condiment in Indonesian cooking and, like other spices, demand is very inelastic, this does not explain the persistence of large price swings. Repeated large price movements create opportunities for those with the information to take market positions that would generate profit opportunities and, at the same time, result in actions that would reduce the magnitude of price fluctuations. Those with the information to take advantage of the price swings are market intermediaries—traders and wholesalers—because they must monitor both upstream and downstream activities.

This paper is a qualitative investigation of the role of market intermediaries in the Indonesian chili market supplemented with available data and statistical analysis. We posit 5 possible explanations for the contribution of market intermediaries to the farm-retail price spread for chili sales in Java island which can be summarized as: (1) market structure impediments to competition; (2) lack of scale economies; (3) market intermediary value-added functions; (4) post harvest losses; and (5) price risk premiums. We use a series of structured interviews with chili traders and wholesalers in a chili-producing region of East Java to assess the effect of trader activities on the efficiency of the chili marketing chain. We follow this with a regression analysis of farm and retail prices and price margins. Results show that there is no stockholding at any level of the marketing chain. For the East Java study area, price margins are positively and statistically related to farm price levels indicating the traders exacerbate price volatility.

Do Chili Traders Make Price Volatility Worse? A Qualitative Analysis of East Java Trading Practices

Alan J. Webb, Fransischa Galuh Kartikarsari and Ivan Aditirta Kosasih[1]

1. Introduction

Indonesian consumers faced a crisis at the end of 2010 and the beginning of 2011. As reported in the Jakarta Post, the price of chilies, "… have soared as much as 10-fold in recent months…driving up inflation and pulling everyone from housewives to the president into the debate…. The country's most popular ingredient is hovering between $10 to $11 per kilogram—making it more expensive than beef…."

Although this price surge in early 2011 was extraordinary, an analysis of chili prices for the preceding 10 years shows that this was not an isolated event. Chili prices have shown a high degree of volatility over the past decade since the 1997 Asian financial crisis led to a relaxing of government control of commodity markets. Chili price volatility is an enigma. Chili, of course, is a condiment in Indonesian cooking and so, like salt, pepper and other spices, demand is very inelastic—less than -.07% according to a recent study (AVRDC, 2006). This implies a 14% price increase for every 1% decline in supply which is in the range of the price changes reported at the beginning of 2011. However, repeated large price movements create opportunities for those with market information to anticipate price changes and take market positions for their own financial benefit. In an efficient market, we should expect market intermediaries to bid down the farm retail price spread and, at the same time, to use storage and the timing of purchasing and selling to reduce price fluctuations. The question is, why has this not happened in the Indonesia chili market? Are there market impediments or information barriers that prevent traders from taking actions that would dampen this price volatility? If so, what are they and are there policy measures that would improve market efficiency and lead to a less disruptive outcome for consumers?

This paper is a qualitative investigation of the role of market intermediaries in the Indonesian chili market supplemented with available data and statistical analysis. Our objective is to understand the trading practices of market intermediaries and how they affect the transmission of chili market information through their effect on prices.

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We begin with the following two sections on supply and demand conditions of the Indonesian chili market. These set the context for the analysis that follows. Next, we consider efficiency of the chili market from two aspects—spatial efficiency which is based on a brief geographic price analysis—and an analysis of the role of traders in marketing chain efficiency. The latter includes a series of structured interviews in which we seek to determine how market intermediaries affect the farm-retail price spread for chili sales in Java Island. We posit 5 possible ways that intermediary market characteristics could drive a wedge between farm and retail prices for chilies. These can be summarized as: (1) market structure impediments to competition; (2) lack of scale economies; (3) the cost of market intermediary value-added functions; (4) the costs of post harvest losses; and (5) price risk premiums. We follow this with an analysis of vertical price transmission using monthly data for farm, wholesale and retail prices in the Kediri district of East Java. Finally, we summarize our findings and draw implications for how the Indonesian government might address chili price volatility in the future.

2. Demand Characteristics

Chilies play a critical but limited role in the Indonesian diet. Three basic types of chili are consumed daily. They are red chili, Bird's Eye chili and green chili. Most chilies are consumed fresh from the market. A research report from Bank Indonesia (Prastowo, et. al., 2008) shows that red chili and Bird's Eye chili account for 50 percent and 42 percent of the fresh chili consumed with green chili accounting for the remainder.

Chili is used as a condiment in Indonesian cooking in relatively small amounts. A 2002 survey estimated per capita consumption of chili and its products (converted to fresh weight) to be 185 g per week (AVRDC, 2006, p.182) of which more than 70% was consumed fresh. At the time, consumers spent Rp 1234 per capita per week (or about US16 cents) on chili purchases. But by the end of 2010, 185g of chili would have cost Rp7190 (US 93 cents) which would be a significant expense for poor Indonesian families.

There are no data on actual chili consumption nationally or by province but consumer purchase behavior suggests that, other than the holy month of Ramadan when there is a surge in demand, chili consumption is relatively stable throughout the year. Empirical estimates indicate a significant Ramadan effect for chili retail prices for Jakarta, Bandung and Yogjakarta (Webb & Kosasih, 2012).

3. Supply Characteristics

Chili is mostly grown as a supplemental cash crop on small plots throughout Indonesia (AVRDC, 2006) although it is an important main crop in some areas. Area harvested in 2009 was just over 200 thousand hectares for all of Indonesia and has been almost constant for the last 5 years. Average yields also have been steady over the period at around 5.9 tons per hectare although there is considerable

variation in yields across provinces. As a result, nationwide annual production has not shown much variation in the recent 5-year period.

Provincial data from the Indonesian Bureau of Statistics (BPS or Badan Pusat Statistik) are summarized in Table 1. They show that most of Indonesia's chili production is concentrated in the 3 Java provinces. These 3 provinces—West Java, Central Java and East Java together accounted for 56.6% of Indonesia chili production in 2009. The remaining 44% is scattered across other islands to the west and east. There is considerable geographic variation in yields across the archipelago and even on the island of Java. West Java yields were 15.6 tons/ha in 2009 compared to only 4.1 tons/ha in East Java—nearly a 4-fold difference.

Table 1: Red Chili Production in Indonesia in 2009 by Region

Province/Region	Land Area ***(Hectares)***	Production ***(tons)***	Yield ***(tons/ha)***	Share of Indonesia ***(Percent)***
Sumatra & West Islands	66,847	391,731	5.86	28.40%
Jawa Barat (W. Java)	23,212	315,569	13.60	22.89%
Jawa Tengah (C. Java)	40,729	220,929	5.42	16.02%
Jawa Timur (E. Java)	59,308	243,562	4.11	17.67%
North & East Islands	43,808	206,936	4.72	15.02%
Indonesia	**233,904**	**1,378,727**	**5.89**	**100.00%**

Source: BPS

Chili is produced year around in Indonesia but there are two main production seasons—one starting from mid-February with a harvest running from late April to early June and the second season starting in late July with a harvest running from September to as last as early November. Consequently, chili production for Indonesia does not exhibit a very strong seasonal pattern. Monthly production of chili nation-wide, averaged by month over the period from 2000 to 2009, ranges from 60 to 100 thousand tons per month with a peak in April and a lower peak in September. With a standard deviation of 20 to 30 thousand tons in any given month, it means that variations in weather, planting and other factors can overwhelm seasonal output effects.

A final characteristic of the Indonesia chili market is that there is virtually no external trade—either exports or imports—of fresh chilies. Data from the Food and Agriculture Organization (FAO) shows that from the 2000-2009 period, annual chili imports never exceeded one-tenth of a percent of production and exports only reached two-tenths of a percent of production once. Virtually 100% of production is consumed domestically so the Indonesia fresh chili is a very isolated market.

Characteristics of Indonesia fresh chilies on both the demand side and the supply side indicate a market that is self-contained (no significant imports or exports) and

one where there is very little adjustment in quantities in response to a change in prices. Consumers are very reluctant to change the quantity of chilies they purchase for food preparation and farmers cannot change supply quantities very quickly due to the time lag needed to add production capacity. Even under the best of conditions, a market with these conditions would have a tendency for high price volatility. Marketing channels, however, play a crucial role in mitigating or exacerbating the price effects of supply or demand disruptions. An efficient market responds quickly to a disruption by moving chilies from surplus low-price areas or low value market segments to deficit high-price areas or higher value market segments. In this way, the effect of a disruption is shared across a wider spectrum of the market, reducing the impact on any one segment or region.

4. Market Efficiency

There are many aspects of market efficiency but all have to do with price transmission. Prices are the key source of information in a market signaling buyers, sellers, producers and consumers what action they should take to reduce costs or increase returns. An efficient market should exhibit both spatial efficiency and marketing chain efficiency. Spatially, a price change in one region should be reflected in the price change in another region after adjusting for transportation and handling costs. For marketing chain efficiency, we expect a change in consumer prices to be reflected in a subsequent change in producer and/or farm prices and, likewise we expect a change in prices at the farm level to be transmitted through the marketing chain to be reflected in consumer prices. The speed and magnitude of the price transmission depend on a number of factors to be discussed below.

Our examination of chili market efficiency will focus on the island of Java—home to 60 percent of Indonesia's population and accounting for 57 percent of the nation's chili production in 2009.

4.1 Spatial Market Efficiency

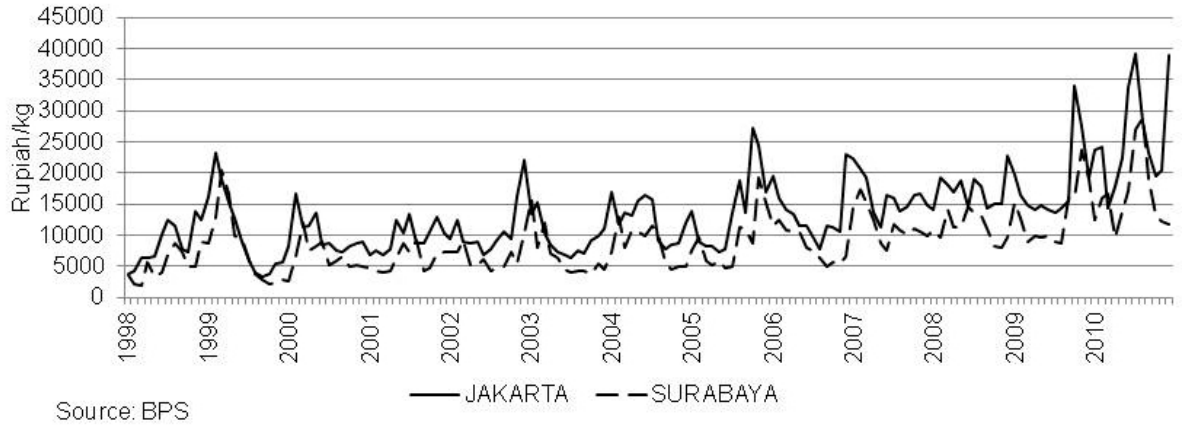
There are five major cities on the island of Java—Jakarta, Bandung, Yogjakarta, Semarang and Surabaya. The Bureau of Statistics tracks key consumer prices, including chili, in all five cities on a monthly basis. Table 2 shows that for the period from 1999 through 2012, monthly chili prices in all 5 major Java cities exhibited high correlation indicating the close relationship of price movements across the island.

Figure 1 shows a plot of monthly prices for Jakarta and Surabaya—the two cities with the maximum geographical separation on Java. The figure shows that prices in the two cities track each other closely over the period from 1998 to the end of 2010. As we might expect, prices in Jakarta—the major retail center—are at a premium over Surabaya chili prices.

Table 2. Correlation of monthly retail chili prices in 5 Indonesian cities, 1999~2010

	JAKARTA	BANDUNG	SEMARANG	YOGYAKARTA	SURABAYA
JAKARTA	1.000				
BANDUNG	0.878	1.000			
SEMARANG	0.852	0.959	1.000		
YOGYAKARTA	0.883	0.966	0.954	1.000	
SURABAYA	0.868	0.971	0.972	0.965	1.000

Figure 1. Jakarta and Surabaya Monthly Retail Prices for Chili



Source: BPS

Hence, the monthly retail price data suggest that, for the island of Java, the chili market is highly integrated. Prices in one region or city are closely linked to prices in other regions.

4.2 Marketing Chain Efficiency

A number of studies by agricultural economists have looked at vertical price transmission for the food marketing chain. Gardner (1975) developed a structural modeling framework to analyze simultaneous equilibrium in three vertically linked markets—farm product supply, marketing services and retail food demand. A key question examined by Gardner was the "viability of simple rules of markup pricing by marketing firms. …" (p. 399). That is, do market intermediaries use a simple percentage mark-up or a fixed value market or do they adjust the mark-up based on market conditions?

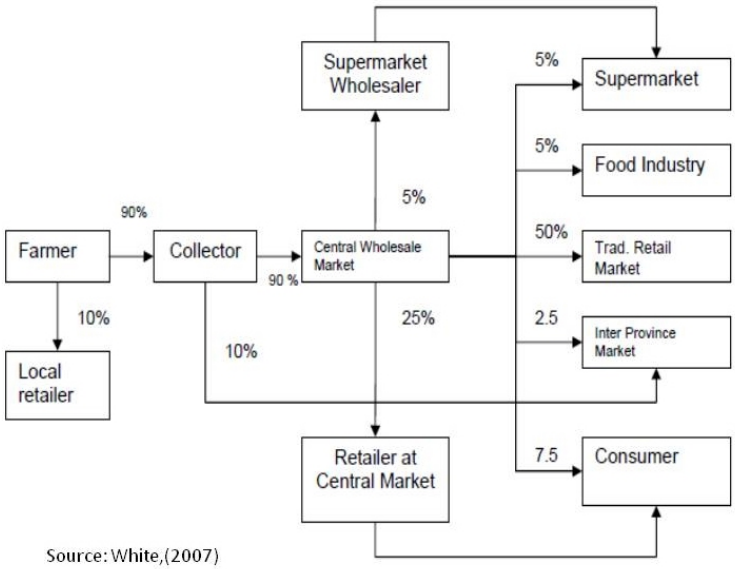
Much of the empirical work on price transmission in agricultural markets has focused on the issue of (a.) the extent to which price changes are transmitted through the vertical chain—be it a supply-driven change at the farm level or a demand-driven change at the consumer level—and/or (b.) the speed of the price transmission (Buccola, 1989). Vavra and Goodwin (2005) present a framework that encompasses both of these elements. They observe that "the speed with which markets adjust to shocks is determined by the actions of market agents who are involved in the

transactions that link levels; i.e., wholesalers, distributors, processors, retailing firms…" (p.5).

Our analysis of the Indonesian chili market recognizes the key role that marketing agents play in the transmission of prices. The evidence on geographic distribution of retail prices presented above indicates that chili markets on the island of Java are spatially integrated. This suggests that the market intermediaries react quickly to price changes in other parts of the country. But this does not explain how prices are transmitted from retail to the farm sector. To examine this issue, we conducted a series of interviews of market intermediaries—collectors and wholesalers—in a chili-producing region of East Java to understand their role within the chili marketing chain. The advantage of this approach is that it provides detailed information on the trading practices and the structure of the marketing services component of the market chain. The disadvantage is that we sacrifice breadth to get depth. We do not know if the practices of East Java represent the practices of chili traders in other parts of Java. However, it seems likely—given the frequent communication among chili traders throughout Java (and the larger Indonesia archipelago)--that practices are similar to other chili producing areas.

Chili traders—collectors and wholesalers—are at the center of the Indonesian chili market. They have information from their suppliers and from their buyers. Therefore, these market intermediaries are well-positioned to anticipate price movements and to respond to them. As shown in Figure 2 from White (2007), 90% of the chilies sold by farmers go through a local collector and then a wholesaler. From the wholesaler, half of the chilies go to traditional retail markets and 25% is sold to retailers at a central market. Only small amounts go to supermarkets or processors or inter-provincial trade. Although the chart shows the quantity of chilies that flow from farm to retail, it does not tell us how prices are determined through the marketing chain.

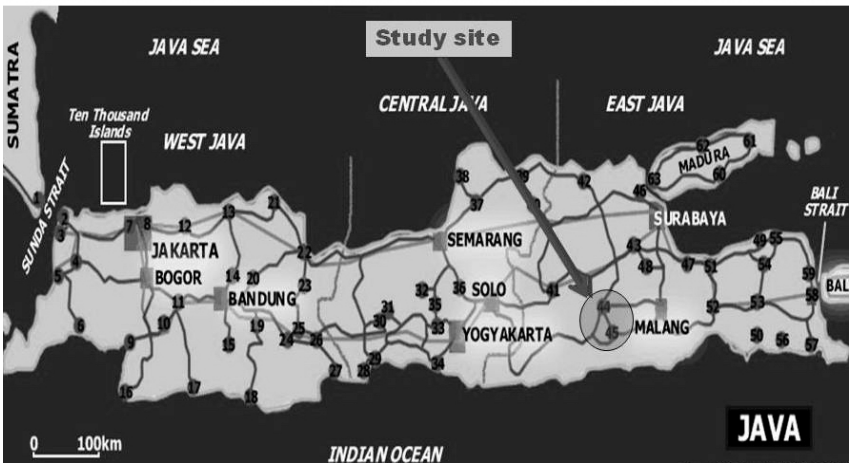
Figure 2. Chili Market Flow Chart for East Java



Source: White,(2007)

We want to understand the role of market intermediaries in setting and adjusting to prices in the marketing chain. To do this, we conducted a series of interviews with chili traders—collectors, distributors and wholesalers—in Kediri and Blitar areas of East Java province—a key chili producing area—in February 2012 (see Figure 3). Interviewees included 2 farmers, 5 collectors, 4 wholesalers and 3 retail vendors. Through our interviews, we sought to understand the economic and competitive conditions that motivated chili trader practices. Survey questions were designed to identify 5 potential factors (see Conforti, 2004; Jaffee et.al., 2008) that could account for the farm-retail price spread:

Figure 3. Study area of Kediri and Blitar , East Java



1. Competitive conditions. We asked a series of questions to determine the market competitive conditions. Who do traders buy from and sell to? Do they have an obligation or a fixed contractual arrangement or do they buy from or sell to anyone? How free are they to change buyers and/or sellers?

   The purpose of these questions was to determine the number of buyers and sellers and the extent to which the decisions of who to buy from or sell to was restricted by contractual arrangements, loyalty, family ties, government regulations or the presence of a dominant buyer or seller which controlled—directly or indirectly—the market price.

2. Lack of economies of scale. Chilies are one of many agricultural products sold in local markets. If the volume of chili business is limited, then there may be limited specialization and price competition and, consequently, high margins. We asked traders: What are your main business activities? What percentage of your income comes from buying and selling chilies?

3. Marketing value-added functions. Traders perform a number of functions that add value to the products they handle for which they need to be compensated. We asked a series of questions about transportation, storage, distribution, and sorting to find out how chili traders added value to the product before it reached the retail level. Questions also sought to quantify the value of these functions.

4. Post harvest losses. A potential major cost of marketing perishable products is post harvest losses. If post-harvest losses are large, they may account for a high farm-retail price spread because the consumer price has to cover the cost of product that does not reach the market.

5. Risk premium. Chili traders face many risk factors but a key one is price volatility. We ask a series of questions to understand how traders deal with unexpected price movements. One way to cover the risk of trading a product with a volatile price is to build in a risk premium that, over time, will cover unforeseen losses from volatile prices.

We examine the interview responses to each of these farm-retail price determinants.

Competitive conditions. Framers and collectors all said that sales are on a cash basis on the day of the sale. Seller-buyer relationships are based on trust and none of the interviewees mentioned any contractual arrangement. One of the collectors said that he would choose an area with large supplies (and hence lower prices) when making purchases. On the seller side of the transaction, farmers in Blitar said that they would observe the quantity harvested in their area before they negotiate price with buyers. These responses indicate that both buyers and sellers at the farm level have flexibility with whom they conduct their business.

Wholesalers buy from individual farmers as well as from collectors. They have a wider distribution area extending to other provinces on Java and to other islands. The two wholesalers interviewed—and even one of the larger collectors—indicated that they frequently shipped chilies to Kalimantan. Sales to processors, however, appear to be restricted to those who can meet the processors' purchase requirements. A number of collectors said that they did not sell to processors because they did not have sufficient financing. They said that processors set weekly prices and payment is made every 30 days. Some collectors said that they did not trust processors noting that sales would sometimes be discounted because the chilies did not meet quality standards. Hence, only a few wholesalers have the financial capabilities and the relationship to maintain sales to processors. As indicated earlier, processing use accounts for only a small percentage of the market so this impediment to chili sales plays only a minor role in the competitive conditions of the overall market.

Government regulations and taxes appear to be largely absent from the chili trade. Market centers in Kediri and Blitar collect a small fee for stall rental but none of the

traders or farmers interviewed made any mention of government fees, standards or regulations.

The chili market in East Java appears to have the competitive conditions for an efficient market. There a large number of buyers and sellers on both sides of voluntary transactions that are unencumbered by long term contracts, licensing or other limiting regulations. This alone, however, does not assure low margins and an efficient market responsive to end-user requirements.

Economies of scale. A lack of sufficient volume can be a significant deterrent to low margins and competition. As noted earlier, chili is a supplemental cash crop grown throughout Indonesia and is rotated with rice production in some regions (Mariyono and Bhattarai, 2009). However, chili is one of the highest value crops in Indonesia and a significant source of income for farmers and market intermediaries. Hence, it was not surprising to learn that there is a high degree of specialization in chili trading. Local collectors, in particular, devote virtually all of their efforts to chili purchase and resale. Some of the larger collectors carried specialization a step further, choosing to only handle one of the 3 major varieties of chilies. Wholesalers handled chilies as well as other commodities (e.g., shallots, tomatoes or beans) but, because these are lower value crops, the prime focus is on chili trading.

The chili market is both high value and high volume and this justifies a level of specialization that assures a reasonably efficient market. Traders have strong incentives to monitor prices throughout the marketing chain and throughout the country and this helps assure competitive margins and a quick response to a change in market conditions. But competitive margins do not necessarily mean ***low*** margins. Traders and other market intermediaries have to cover various costs of assembling chili production and delivering the produce to the major urban centers. The next 3 conditions examine these costs.

Marketing value-added functions. We asked a series of questions designed to solicit information on 3 key marketing value-added functions—transportation and packaging, sorting and storage. Each of these functions represent a cost for the trader—costs that need to be covered the expected price at the time and place of sale. Based on the interviews, we piece together the costs faced by traders for these 4 items.

Transportation and packaging. There are two types of transportation costs—one for local distribution and one for shipping to other islands such as Kalimantan. Packaging is associated with the type of transport and distance to be shipped.

- Local transport was estimated at Rp3000/km for a 5-ton truck and a driver. That means an island transport cost of about Rp 0.6 per km/kg for a fully loaded truck. A 700km trip to Jakarta would cost Rp420/kg assuming no expense for the return trip. Packaging for transport

within Java was negligible. No special refrigerated trucks are required.

- Long distance transport required wooden boxes for transport by truck and boat or truck and cargo plane. The estimated cost to ship 5 tons to Kalimantan by ship was Rp 25 million (Rp5000/kg) and the cost by air cargo was Rp32.5 million (Rp6500/kg).

Sorting. There is no sorting done at the farm level other than selecting the ripe fruit at the time of harvest. As far as we could understand, there was no schedule of premiums or discounts at the farm level purchase. Thus, it was left to the traders to sort chilies based on color and defects. The best estimate of sorting cost was Rp 50,000/day to sort 100kg or a cost of Rp500 per kg.

Storage. None of the farmers, traders or wholesalers mentioned any storage of chilies that extended for more than one day. In fact, every trader said explicitly that they sought to ship our all the product they had purchased by the end of the day.

All together, marketing value added functions are roughly estimated to cost traders between Rp500 and Rp900 for shipments within Java and from Rp5500 to Rp7000 to sort, package and ship to Kalimantan.

Post harvest losses. Local collectors and traders reported post-harvest losses of only 5~6 percent although one of the wholesalers said losses were as high as 20 percent. Although these losses seem low for a product that is highly perishable and is transported in unrefrigerated trucks with no special packaging, the very absence of refrigeration and special handling seems to indicate that losses are not large enough to justify the additional costs of special handling.

Price risk premium. Collectors, traders and wholesalers all said that they added a margin of Rp500 to Rp1000 per kg. to cover their costs and, apparently, their potential risks. Given the volatility of retail chili prices, we would expect traders to build in a somewhat higher margin that would cover the price risk of holding inventories. We learned from collectors and traders, however, that chili sales are on a cash basis and all of them said that they sought to ship out their purchases within a day. This practice is a risk minimization mechanism. Consequently, at any one time, there are only pipeline stocks in the marketing chain leaving very little buffer to absorb changes in consumer demand, fluctuations in supplies at the farm level or disruptions in the marketing chain itself. Persistent and highly volatile retail chili prices are a result.

5. Price Transmission

We corroborate the interview results with an examination of the transmission of prices from the farm to the retail level for the Kediri district of East Java. We have monthly data from 2008 through 2011 for farm, wholesale and retail prices. Much of the recent literature on farm retail price transmission has focused on whether price changes are fully transmitted throughout the marketing chain. Vavra and Goodwin (2005) have an excellent review of the recent theory and empirical literature on the topic.

The focus of much of the empirical research on agricultural price transmission is on the issue of price asymmetries. Simply stated, is the transmission of a price increase through the marketing chain the same as the transmission of a price decrease? These studies of price asymmetries have included a number of studies including Ward (1982), Von Cramon-Taubadel (1998), Aguiar and Santana (2002) and Girapunthong et. al. (2003). The fundamental question is whether market intermediaries use market power to prevent the full amount of consumer price increases from reaching the farm level while, at the same time, passing along the full amount or more of a price increase at the producer level to the retail level.

Our purpose here is intended to be more illustrative than conclusive. With only 4 years of monthly data for Kediri—a single chili-producing district of East Java—we can hardly presume to extrapolate the results to the broader market. Nevertheless, the evidence we have presented strongly suggests a well-integrated market across Java Island. The prevalence of smallholder farmers, collectors and traders of all types buying and selling on a day-to-day cash basis suggests that prices and markets are closely interlinked and this is supported by monthly price series.

We have two sets of prices for the Kediri district of East Java—one for big chilies (cabe besar) and one for small chilies (cabe rawit). Figure 4 shows the monthly farm, wholesale and retail prices for small chilies from 2008 through 2011. (The data for big chilies is similar but is not shown because of space limitations). During this 4-year period we can identify two instances between 2008 and 2009 when prices doubled within a 6-month period. Later, in the second half of 2010 and early 2011, prices twice had a 4-fold increase. We also note that the 3 price series move closely together for all months except June 2009 when the wholesale price inexplicably fell when the farm and retail prices increased.

Figure 5 shows a plot of the price spreads for small chilies and it is aligned with the horizontal axis of Figure 4 in order to allow visual comparison of the two charts. Except for the June 2009 aberration, the wholesale-farm price spread averages Rp1495/kg for the period. Allowing for two transactions between the farm and the wholesale level, this is broadly consistent with our interview results in which collectors said that they added Rp500/kg to Rp1000/kg as a margin to cover their expenses. The retail-farm spread—which includes the wholesale-farm spread--averages Rp3960/kg (or about US$0.41/kg at the current exchange rate of

Rp9600/US$) for the period. The spreads for big chilies are slightly smaller—Rp1101/kg for the wholesale-farm spread and Rp3152/kg for the retail-farm spread.

Figure 4. Small chili monthly farm, wholesale and retail prices for Kediri district, East Java, 2008~2011

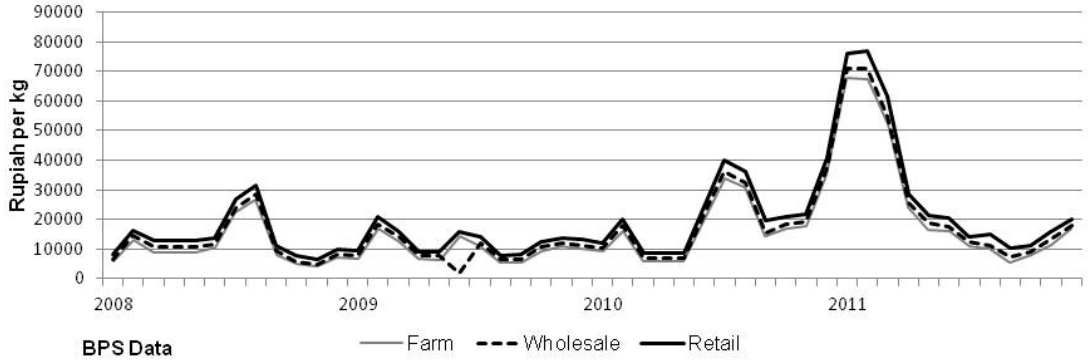
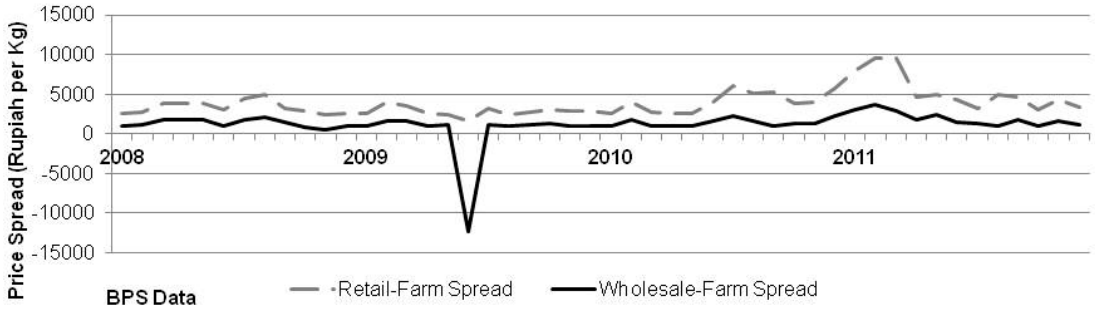


Figure 5. Small chili monthly price spreads, Kediri District, 2008~2011



A visual comparison between the two charts implies a positive relationship between price spreads and the farm price—that is, when prices increase the marketing spreads increase; when farm prices fall, spreads decrease. We can test this for statistical significance by estimating the relationship between the spread and the farm price. We use two alternative dependent variables—(1) the simple price spread in thousand rupiah per kilogram, and (2) the price spread as a percent of the farm price. A comparison of the two results will tell us how traders in the Kediri district behave in setting their margins. The first estimate will show the direct effect of a change in farm price on the price spread in rupiah per kilogram. The second—the percentage margin—indicates whether traders use a fixed percentage mark-up regardless of the price level or whether they adjust the mark-up—either up or down—depending on the level of the price. A negative relationship indicates that the margin increase is less than proportional to a price increase; a positive relationship indicates that the margin change is proportionally greater than the price change.

Tables 3 and 4 show the estimation results for big and small chilies, respectively for Kediri district of East Java. The farm price is significant in all eight of the estimated equations. For big chilies, an increase of Rp1000 in the farm price will increase the

wholesale-farm price spread by only Rp43 and increase the retail-farm price spread by Rp76.

Using the percent spread as the dependent variable, the last two columns of Table 3 show that the wholesale-farm spread has a negative sign indicating that, at this level of the marketing chain, traders adjust their margins less than proportionately with price increase. This is not true, however, at the retail-farm level where the sign is positive.

Table 3. Estimates of Big Chili Wholesale and Retail Price Spreads as a Function of Farm Price, Kediri District, East Java. 2008~2011

		Difference from the Farm Price (1000 Rupiah/kg)		Price Difference as Percent of Farm Price (Percent)	
	Units	Wsle-Farm	Ret-Farm	Wsle-Farm	Ret-Farm
Intercept		0.727	2.506	0.686	0.727
Farm Price	1000 Rp	0.043**	0.076**	-0.028**	0.043**
DV (4/11)†		-0.764*	-2.460**	-0.461**	0.764**
R-Square		0.32	0.43	0.39	0.55

† Dummy variable for data aberration in April 2011. ****s**ignificance at 1%; *significance at 5%. Based on monthly wholesale, retail and farm prices for Kediri district from 2008 to 2011. Data from BPS.

Estimates for small chilies (Table 4) are similar. An increase of Rp1000 in the farm price will generate an increase of Rp37 in the wholesale-farm spread and an increase of Rp104 in the retail-farm price spread. For the estimated equations using price spreads as a percentage of the farm price (the last two columns of Table 4), the farm price coefficient is negative in both cases. This means that traders of small chilies tend to maintain fixed margins that adjust less than proportionately with changes in the farm price.

Table 4. Estimates of Small Chili Wholesale and Retail Price Spreads as a Function of Farm Price, Kediri District, East Java. 2008~2011

		Difference from the Farm Price (1000 Rupiah)		Price Difference as Percent of Farm Price (Percent)	
	Units	Wsle-Farm	Ret-Farm	Wsle-Farm	Ret-Farm
Intercept		0.902	2.300	0.165	0.431
Farm Price	1000 Rp	0.037**	0.104**	-0.003**	-0.006**
DV (6/09)†		-13.721**	-2.076**	-0.987**	-0.221**
R-Square		0.98	0.92	0.91	0.47

† Dummy variable for data aberration in April 2009. **significance at 1%; *significance at 5%. Based on monthly wholesale, retail and farm prices for Kediri district from 2008 to 2011. Data from BPS.

Results suggest that traders in the Kediri district are not major contributors to price volatility. Trader margin adjustments to price changes, in most cases, are less than proportional to the farm price change. Within the Kediri district at least, we can conclude that traders generally pass along any price change from farmers to consumers.

6. Conclusions

Traders play a crucial role in the efficient functioning of any commodity market. They bring buyers and sellers together, assure efficient price transmission and the movement of product to where it is needed most. However, there can be many impediments to a smoothly functioning efficient market. Persistent price volatility in the Indonesia chili market suggests that market intermediaries may be a source of the problem. This study used a series of structured interviews of collectors, traders and wholesalers to investigate five potential impediments to an efficient chili market in East Java: (1) market structure impediments to competition; (2) lack of scale economies; (3) market intermediary value-added functions; (4) post harvest losses; and (5) price risk premiums. Trader responses to interviews indicate a competitive market environment with many buyers and sellers conducting daily cash transactions. As a high value product that is produced and marketed throughout the year, chili merits considerable attention and specialization. Value added functions of traders are mainly sorting and distribution with virtually no storage and no refrigerated shipping. Nevertheless, traders reported only small post harvest losses. There are no "risk premiums" because none of the market intermediaries holds stocks. Participants in the chili marketing system hold only pipeline stocks.

Analysis of vertical price transmission for Kediri district supports the interview responses. Wholesale-farm price spreads are consistent with traders' reported margins. Although the estimation results show that margins are positively and significantly related to changes in farm prices, the adjustment of margins is proportionately less than the price change. This means that traders pass along most of an initial price change without adding to it.

The simple answer to the question, "Do chili traders make price volatility worse?" is "no". Based on the interviews and the price analysis for East Java, chili traders are quite efficient in responding to price changes and quickly moving supplies to other parts of the island. While chili traders to not make price volatility worse, their practice of holding no stocks means that there is little slack in the market to absorb a crop shortfall, a disruption in the marketing chain or an unanticipated change in demand. In this sense, an efficient market comes at a price and that price is the potential for volatile prices.

There are at least two policy options to address chili price volatility in Indonesia. One is to allow imports of fresh chilies from other countries such as Thailand or Vietnam. Although Indonesia imported some chilies from Thailand during the tight market conditions at the end of 2010, Indonesian consumers consider imported chilies to be a poor substitute for local product. The second option is for the

government to subsidize investment in cold storage facilities at strategic points in the marketing chain. It would create a small buffer that would reduce the amplitude of price fluctuations and give farmers more time to respond to tight market conditions.

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