

## **A New Taxonomy of Thin Markets**

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## **Abstract**

The traditional conception of a thin market based on transactions volume remains relevant in many agricultural markets but does not adequately frame emerging thin market issues. As non-price means of pricing goods becomes more common, some cash commodity markets have become residual markets. In some of these markets, not only the volume of transactions but also the representativeness of transactions to those on the related contract market is an important issue. This paper develops a concept of thin markets that accounts for this dimension of market thinness and proposes a research agenda related to this topic.

## **Introduction**

Traditionally, a thin market has been understood to be a market in which the number of transactions over a given period of time is insufficient to ensure efficient price discovery. Peterson identifies three major concerns related to thin markets: first, that prices may not accurately reflect supply and demand conditions in the market; second, that thinness will contribute to higher price volatility; and third, that thinness (due to the magnified impact of individual transactions) increases the incentive for market manipulation.

The traditional conception of the thin market problem is prevalent in the agricultural economics literature. Tomek's work on price discovery in the Denver fed cattle market provides an archetype for thin market investigations of this sort. Thin markets of this traditional variety continue to be a topic of concern. For example, Buschena and McNew have recently investigated the impact of changing transaction volume on price discovery in the dairy options market.

While defining thin markets with reference to transaction volume is still very relevant for many markets, changes in the structure of some commodity markets potentially add an interesting dimension to the issue of thin markets. For example, the prevalence of formula pricing arrangements engenders concern that not just the number but also the type of cash market transactions could influence the efficiency of price discovery in the market. The concern here is that inconsistencies between the characteristics of goods exchanged through negotiated transactions and those exchanged through contracts linked to negotiated transactions could lead to pricing inefficiency similar to that observed in thin markets. The difference is that this inefficiency will not be alleviated by increasing the number of negotiated transactions, per se.

The critical issue is really the number of negotiated transactions that are truly representative of the contracted production.

In the context of evolving market structures, the traditional conception of thin markets (relating as it does primarily to the number of transactions in a given period of time) no longer adequately frames the thin market issue. This research has two primary objectives. The first is to provide a more comprehensive and detailed description of thin markets, one that expands on the traditional understanding of thin markets to more fully incorporate the relationship between transaction volume and market structure issues. The second objective is to define an agenda for future research into thin markets in an environment of increasing non-price market coordination.

### **Research on Thin Markets**

The definition of terms is a longstanding problem in the area of thin markets. Clearly, one shortcoming of the traditional definition of a thin market has always been its qualitative nature. For example, Hayenga et al. define a thin market as one “with few negotiated transactions per unit of time.” The definition of what might constitute an acceptable number of transactions in a given market is necessarily subjective. Tomek wrestles with this problem at length, ultimately using sampling concepts from statistics to calculate a number of transactions that will yield a given level of pricing precision.

Buschena and McNew note that transaction volume is merely a proxy for a more direct measure of pricing efficiency but that the two metrics should be positively related. However, Smith demonstrates with the double-oral auction market that the number of market participants/transactions required to generate perfectly competitive prices can be relatively small as long as each transaction that takes place is at the margin. So, while there may, in general, be a

positive relationship between transaction volume and pricing efficiency, a large number of transactions may not be necessary to ensure pricing efficiency.

Nelson and Turner similarly conclude that price behavior in thin markets is not necessarily inferior to that in a larger market. In an experimental setting, they find no significant evidence of systematic price bias over 12 trading periods. They do note, however, that prices in the thin market could be biased in any individual trading period. They attribute this result to the different reservation prices of the thin market participants in any particular trading period, noting that if price bias is not systematic, over time it will cancel out.

Mueller et al. focus on the potential for price manipulation in thin markets in their investigation of prices on the National Cheese Exchange (NCE). They find that the NCE, a market with few participants and a relatively low volume of transactions, facilitated price manipulation by key market participants. Their work emphasizes the importance of considering thin market concerns within the broader context of the market structure, conduct, and performance (SCP) framework. The NCE represented a residual market for cheese, with the vast majority of cheese marketed through contractual agreements. Prices on these contracts, however, were largely tied to the price established at the NCE. Cheese buyers thus had a very strong incentive to trade on the NCE in such a way as to depress prices on the contracts they held. The thinness of the NCE market facilitated such manipulation. The cheese spot market is not located at the Chicago Mercantile Exchange, but allegations of manipulation remain prevalent (Tomassi).

In a more recent study, Peterson investigates the behavior of traders in another residual market – Egg Clearinghouse, Inc. She notes that the residual market may serve as a useful tool for market participants to use in making inventory adjustments, defining this as an alternative

role for residual markets in addition to (or largely in place of) the traditional role of price discovery. Inventory adjustment as a primary role in the residual egg market is only possible, however, because the price discovery function is largely performed by Urner-Barry price quotes, which serve as the primary benchmark for contract prices in the egg market.

In the cash cheese market, price discovery is of paramount importance because there is no other source of prices to which contracts can be benchmarked. This is why the potential for price manipulation is of such concern in these markets. Price manipulation is not, however, the only concern in such markets. In their discussion of the NCE, Hamm and March note that the NCE only traded block and barrel cheddar cheese, while contract prices on many other types of cheese were tied to this market. This raises the issue of whether or not transactions on the residual market are actually representative of transactions in the contract market.

The issue of the representativeness of transactions on the residual market adds an interesting dimension to the thin market problem. Here, the number of participants in the market or the number of transactions per unit of time is not necessarily the proper focus of investigation. It is possible that a very large number of transactions could occur in the residual market and still not be representative of transactions in the contract market. This issue has been discussed in some detail in recent years with respect to the cash fed cattle market.

In the fed cattle market, captive supplies refer to fed cattle that are controlled by packers through either direct ownership or some form of contract for more than 14 days prior to slaughter. According to USDA Grain Inspection Packers and Stockyards Administration (GIPSA), in 2004 – the latest year for which complete data are available – just over 35% of fed cattle slaughtered were procured as captive supplies. In some months in recent years, captive supply cattle have accounted for as much as 50% of the total fed cattle slaughter. The most

common method used by packers for securing captive supplies is marketing agreements, most of which include a formula tying the contract price to the cash market. As the number of captive supply cattle has grown, interest in potential thin market problems has intensified.

Ward and Choi use data from a fed cattle market simulation to investigate how the precision of price reporting might be affected by a reduction in the number of reported cash market transactions. They find that, within the experimental environment used for their study, even very large reductions in the number of reported transactions had little impact on the accuracy of price reports.

Empirical studies into potential price manipulation in the fed cattle market have, presumably due to the minority status of contracted transactions, focused on the possible use of captive supplies by packers to depress prices in the cash market. In an early study, Elam reports a negative impact of cash forward contracting on cash fed cattle prices, estimating that an increase of 1,000 head in contract cattle shipments was associated with a decrease in the US average price of from \$0.003/cwt to \$0.009/cwt.

Ward, Koontz, and Schroeder find a negative relationship between cash market transaction prices in a given week and captive supplies as a percent of total fed cattle deliveries for the week. However, they also point out that captive supply deliveries and cash price are simultaneously determined, reflecting the fact that feeders decide when to deliver marketing agreement cattle based on their expectations of future short term price changes. Schroeter and Azzam explicitly model the relationship between captive supplies and price expectations, finding a negative relationship between captive supply deliveries in a given week and the expected change in cash fed cattle prices from the prior week.

In addition to empirical studies, more theoretical work has been done on the captive supply issue. Azzam develops a theoretical structural model linking prices in the cash fed cattle market to the contract market. He argues that reduced form models used in most empirical studies do not include enough detail to support the conclusion that observed negative relationships between captive supplies and cash prices are due to non-competitive behavior.

Xia and Sexton develop a theoretical model to explain the impact of top-of-the-market pricing (TOMP) contracts (which would be similar to those used in fed cattle marketing agreements) on cash market prices. They demonstrate that these contracts will lead to anticompetitive behavior when the same market participants are buying in both the contract and the cash market because the presence of TOMP contracts increase the packers' perceived marginal cost in the cash market, causing them to bid less aggressively in that market.

Most of the previous work in the livestock sector has focused on market structure issues rather than directly on the thin market problem. Still, the thin market issue is a relevant point of discussion for two primary reasons. First, as contracting grows in the livestock sector, the cash market could at some point become a residual market along the lines of the cash cheese or egg markets previously discussed. In that case, the potential for price manipulation running in the opposite direction from that studied in most of the previous literature (i.e., with packers using cash market manipulation to depress contract prices) could become a problem. Second, and of more immediate interest, even though the cash market may continue to be the source of a large number (even the majority) of fed cattle transactions, it is important to consider whether or not those transactions are representative. If the type of cattle (in terms of quality and/or consistency) traded in the cash market are not the same as those exchanged through contracts, then the cash

market may be considered thin in terms of representative transactions despite a large number of total transactions.

In a market where the representativeness of transactions is an important issue, the traditional concept of the thin market does not provide an adequate framework for evaluating the market's performance. Reliance on the number of transactions as a benchmark for market thinness necessarily assumes that each of the existing transactions is at the margin. That is, each transaction is representative of the underlying supply and demand conditions for the market.

Smith's work points out the fact that markets may be thin in the traditional sense of a low number of transactions, but with transactions occurring at the margin. Here, price discovery issues, per se, may not be a central concern. Rather, attention should be focused on potential collusive activities or other actions which inhibit the normal functioning of the market. On the other hand, with the increasing use of formula price arrangements in which a contract's final price is tied to prevailing cash market price, the type of transaction occurring in the cash market becomes more important than the number of transactions occurring in the cash market. Specifically, if the quality/type of commodity traded in the cash market is significantly different from the quality/type of that same commodity being priced with formula agreements, then final contract prices are likely to be inefficient. This will be true regardless of how many transactions are occurring in the cash market. Stated more generally, if the cash market becomes a residual market for exchanging units that have not been contracted, then contract prices resulting from pricing formulas tied to the cash market will not reflect the true economic value of the contracted units. Here, "thin" markets are not characterized necessarily by low volume, but by the characteristics of the product traded. Understanding the nature of what makes a market "thin,"

then has serious implications for the appropriate policy response, if any, in markets judged to be thin.

### **Defining a Thin Market**

Clearly, providing a precise definition for a thin market has always been problematic. Structural changes in agricultural markets that have transformed some cash markets from primary into residual markets have made the problem of defining thin markets more difficult. What is clear, however, is that any definition of a thin market should take into account not just the number of market participants or the number of transactions per unit of time but also – in the case of residual markets – the relevance of the transactions in the cash market to those taking place in related contract markets. Moving forward, this issue will likely be far more important than the issues of pricing accuracy that were the primary focus of the early thin market literature.

Figure 1 provides a framework for characterizing markets based on not only the number of transactions but also the relevance or representativeness of transactions. The lower righthand corner of this figure, with a high volume of transactions and also a high volume of representative (marginal) transactions, represents a textbook “thick” market. The lower left corner of the figure represents the traditional thin market, with a low volume of transactions that are, nonetheless, representative of the commodity being trading through some means other than the open market. Moving from bottom to top in the figure illustrates the potential for a market to become thin not just in terms of total transactions but also in terms of marginal transactions. Note that examples are somewhat arbitrarily displayed along the vertical and horizontal continua for illustration purposes.

## **Policy Implications**

The fact that markets may be considered thin either with respect to the number of total transactions or with respect to the number of transactions that are representative of the market taken as a whole (i.e., including both open market and contracted transactions) has important policy implications. Traditional thin markets (such as rough rice or milk futures, which tend to be characterized by a low volume of trading) are susceptible to the types of price discovery issues and problems normally associated with thin markets – that is, pricing accuracy, price volatility, and the potential for market manipulation. Markets that are thin with respect to representative transactions (such as, potentially, the cash fed cattle market) add another dimension to the problem. If the total number of transactions remains large, price discovery, per se, should not be a problem. The problem may be the price being discovered in the open market may not be for exactly the same product being traded through other means. If these markets are linked via pricing formulas (e.g., as in the cheese market or the fed cattle market), this could create significant inefficiency in the pricing of contracted product, muddling price signals and diminishing the quality of communication along the supply chain.

Policy prescriptions in these different types of thin markets could differ considerably. In the traditional thin market, promulgation and enforcement of rules to prevent anti-competitive behavior is very important. This is evident in the experience of the National Cheese Exchange. The development of alternative institutions (public or private) to provide more objective and accurate price information could also be useful. This is consistent with the prominent role played by Urner-Barry price quotes (a private source of information) in the egg market.

In markets that are thin with respect to marginal, but perhaps not total, transactions, policy prescriptions should focus on improving information transmission between the open

market and the contract market. This may involve revising price reporting procedures to include greater detail about the type and/or quality of product traded on the open market. It could involve efforts to promote greater transparency in contract terms or greater regulation of contract terms. Xia and Sexton suggest the proscription of certain types of contract terms, suggesting that TOMP contracts should not be permitted because of the incentive they create for reduced competitive bidding in cash markets.

### **Defining a Research Agenda**

Early research into thin markets (e.g., Tomek) focused on issues of price discovery, specifically dealing with the question of pricing accuracy. More recent work (e.g., Mueller et al. and Peterson) has focused on problems related to thin residual cash markets. Both of these lines of inquiry continue to provide legitimate subjects for study.

Markets that may be thin in terms of representative (but not necessarily total) transactions present a somewhat new and interesting topic of future research. As has always been the case in research into thin markets, defining benchmarks can be problematic. What, for example, should the “true” price in either the residual or the contract market be? Where representative transactions are the concern, one also must contend with the additional problem of defining a “representative” transaction. Will the available data allow the researcher to identify which transactions are representative and which are not? This is probably not likely.

Experimental techniques provide one means of alleviating some of the problems in thin market research (e.g., see Nelson and Turner). This is an especially attractive approach to investigating a residual market where the representativeness of transactions is at issue. Hudson and Anderson employ an experimental approach to evaluate the impact of market structure on

prices, avoiding the noise in empirical data that arises from shifts in supply and demand unrelated to market structure issues. Their analysis includes an evaluation of the impact of contracting on market prices. Their model could be extended to incorporate differences in the type/quality of good traded in cash and associated contract markets.

Further research on the value of information is likely also warranted. The objective here would be to refine price reporting definitions and procedures to more clearly communicate which transactions are relevant to the contract market. Anderson et al. use a fed cattle market simulation to evaluate the impact of reduced public information on price levels and variability. Similar techniques could be employed to evaluate the potential benefits more detailed price reporting.

### **Summary and Conclusions**

The issue of thin markets remains highly relevant in agricultural commodity markets. The traditional notion of a thin market, relating primarily to transactions volume, applies to a number of agricultural markets today. However, as contracting and other forms of integration become more prominent, another dimension of market thinness emerges. In residual cash markets, whether or not open market transactions are representative of transactions on the related contract market becomes an important question. If transactions are representative, then a market may appear thin in terms of transactions volume without displaying the types of price discovery/pricing efficiency problems normally associated with a thin market. On the other hand, if transactions are not representative, price discovery problems like those in a thin market may occur even if the total volume of transactions is quite large. Research is needed to examine

thin market issues in the context of residual markets linked to a larger contract market.

Experimental techniques open up several promising avenues of research along these lines.

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**Figure 1.** Description of Open Markets Incorporating Information on Transaction Volume and Transaction Type

