Cutthroat or Cartel?
An Analysis of Price Competition in Farmers Markets

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Jeffrey Lloyd Horwich

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Dedication

To my son, Sebastian: may he grow into a world of healthy food… at affordable prices.

Abstract

While the civic and nutritional implications of farmers markets have captured researchers' attention, few have focused on how the "markets" in farmers markets actually work. This paper opens a crucial but largely unexplored field of economic inquiry: how are the prices consumers pay at the farmers market determined? An original dataset of farmers market prices, gathered across five cities over a full calendar year, allows a quantitative look at two specific questions: first, how do prices move as more vendors enter and compete to sell a product? Second, what relation do farmers market prices have to prices in conventional grocery outlets? Using a set of simple regressions and a novel meta-analysis technique, I find meaningful and statistically significant relationships between vendor numbers and price for some products, but not for others. More perishable products seem to display the effect much more powerfully, a result which agrees with theory on search costs and product differentiation. Another important finding is that even where median prices do not decline with vendor count, minimum prices often do, suggesting the diligent consumer can benefit. I also find evidence of price collusion in some markets and products. Finally, I find no discernible, consistent relationship between farmers market prices and supermarket prices. In addition to better informing consumers, these results suggest that policy-makers who wish to expand farmers markets as an option for the general public – and especially lower-income shoppers – have some options for fostering a more competitive environment. But even at the farmers market there is no free lunch, as there are likely trade-offs between consumer welfare and economic rents we may value for local agriculture.

Table of Contents

List of Tables

List of Figures

1. Introduction

Conventional wisdom would suggest, and our own personal experience might reinforce, that prices at the farmers market don't much matter.

After all, farmers market shoppers appear to be wealthy and primarily interested in quality, freshness, supporting local agriculture, and the pleasure of shopping in the open air. This portrait has been affirmed by numerous surveys, such as the oft-cited Govindasamy et al. (1998). Yes, money is exchanged. But the American farmers market occupies a more lofty spot, transcending the mere supermarket, as a community institution: Exhibit A of so-called "civic agriculture" (Lyson 2004). It is perhaps as much a place for social transactions as for financial ones; hence the healthy sociological literature about farmers markets matches or surpasses the economic/marketing one.

On the supply side, many farmers who sell at the farmers market aren't seeking or expecting price competition. Surveys find social factors like "I enjoy it" and "visiting with customers" trump the profit motive as farmers' main reason for selling there (for example Lyson, Gillespie and Hilchey 1995). In some markets, a good portion of vendors are part-time, including retired and hobby gardeners. Farmers set their prices according to countless personal formulas and rationales – coordination and collusion not least among them (Griffin and Frongillo 2003[1]). Tellingly, a large portion of farmers might travel to many different markets and never change their price (Ahern and Wolf 2002). Clearly the invisible hand of "The Market" is not unambiguously in charge here.

Small wonder, then, that attempts to systematically explain pricing at farmers markets are meager-to-nonexistent. This paper aspires to open up that line of inquiry, principally by exploring what happens to the price of a product as more vendors compete

[1] These authors do not use arguably pejorative terms such as "collusion" in their findings, though it accurately describes what they report.

to sell it. I will also look, secondarily, at whether farmers market prices bear much relation to what we pay in the supermarket. The crucial tool is a unique dataset of prices covering multiple markets and products over an extended length of time.

But even if we can divine some econometric order within farmers market pricing, there is our opening challenge: Why do we care? Do prices at the farmers market matter, anyway?

They do. First I will note that consumer studies often condemn us to conventional wisdom on this point by failing to treat price as a variable-of-interest. The vast majority are in hot pursuit of social factors: interest in local foods, support for local farmers, demographic profiles. Some surveys simply neglect to ask shoppers about price at all (see Logozar and Schmit 2009; Baker, Hamshaw and Kolodinsky 2009; Hoffman, Dennis and Marshall 2008). Others ask, but then obscure the implications within broader categories (such as "convenience") in the course of market segmentation or cluster analysis (Elepu and Mazzocco 2010). Some studies, of course, do ask about price. I will reserve a wider summary for the Literature Review; suffice it to say now that while price is not typically among the most important factors for farmers market shoppers, it is relevant and becoming more so.

Another technical (and admittedly obvious) point is that markets differ. Markets will naturally vary from more to less price-sensitive depending upon neighborhood, market management, vendor make-up and products on-offer. There may indeed be some markets where vendors can price without heed to customers or other vendors around them and still see adequate traffic. In others, a more competitive dynamic no doubt prevails.

A less obvious point is that different *products* may be subject to different pricing dynamics. In fact, this paper will suggest and demonstrate that they are.

But there are yet more compelling reasons why now, of all times, we might take a keen interest in price. First is the unrelenting growth of farmers markets in the U.S. The number of U.S. farmers markets jumped 16 percent in 2010, adding 858 markets – the largest yearly gain ever (USDA 2011). That continues an unbroken growth trend since record-keeping began. 2010's increase followed a 13 percent gain in 2009. Notably, on the heels of the greatest recession since the 1930s, when consumers were nothing if not price-conscious, farmers markets expanded at record pace.

A recent national survey found 25 percent of U.S. consumers gave farmers markets as their preferred source for fresh produce (Bond, Thilmany and Bond 2006). While it is important to interpret this number in the correct light ("preferring" farmers markets does not mean 25 percent of shopping is actually done there), this is a remarkable level of consumer awareness. Consumers' aspirations to shop at farmers markets signal the potential for strong growth ahead.

As markets grow, so will the number and diversity of shoppers and farmers who participate. On the consumer side, the typical income level seems likely to drop. In fact, it is stated U.S. agricultural policy that this happen. Among the priorities from the USDA's 2008 "National Farmers Market Summit" was that farmers markets "must set up incentive structures that will attract farmers markets to low-income areas, as well as attract low-income residents to farmers markets" (Tropp and Barham 2008). The agency also works actively to encourage and enable markets to accept SNAP (food stamps) and WIC (welfare) coupons. In U.S. FY 2010, more than $7.5 million in food stamps were redeemed at farmers markets and farm stands (USDA Food and Nutrition Service 2011). That was a 75 percent increase from the previous year, though it remains less than one percent of total food stamp redemptions. The USDA aims to add 200 farmers markets or farm stands to its roster of SNAP-ready retailers each year (USDA Food and Nutrition Service 2011). Numerous grants are available, along with technical assistance, to help

markets defray the costs of facilitating customer use of SNAP (USDA Agricultural Marketing Service, USDA Food and Nutrition Service and Public Spaces, Inc. 2010).

These new (more cost-conscious) shoppers might presumably be more curious and more skeptical than their forebears: What actually determines these prices? For those using public assistance, the government would take an interest as well. Put this emerging price consciousness in the context of continued farmers market expansion, and a dynamic question arises: what happens to prices as markets grow? Do more vendors – more competitors – reward the consumer with better prices? Or is price no more related to growth than it is to the color of a farmer's barn?

Farmers naturally have a stake in this question too. Expanding markets will attract new vendors and prompt existing vendors to devote larger shares of their business to the farmers market supply chain. Research into pricing can and should inform the business decisions of current and future entrants.

Finally, the pricing question bears upon the survival of markets themselves, and thus on the future of the "civic agriculture" phenomenon. For all its feel-good qualities, the economic transaction between buyer and seller remains the essential act upon which a farmers market succeeds or fails. And they do fail; the breakneck growth of farmers markets conceals a considerable fragility, embodied in the rate of churn. An analysis in Oregon found one new market closed for every one that survived (Stephenson, Lev and Brewer 2006). As the authors point out, a market's viability is tied to its revenue stream – the "stall fees" it collects from vendors. Any given market survives along a somewhat precarious line: The pricing mechanism must keep customers satisfied, else they'll turn to substitute markets; it must keep farmers satisfied, else they will sell their product in other streams.

As a niche venue for wealthy, idealistic and unusually "other-regarding" (Toler et al. 2009) shoppers, arguably the deal was struck and price competition in farmers markets

seemed largely moot. In the context of present growth and a diversifying customer base, however, there is no assurance this particular equilibrium will persist.

This raises one last provocative question: Suppose the growth and mainstreaming of farmers markets should lead to a scenario in which a more competitive dynamic prevails, customers claim more of the surplus now enjoyed by farmers, and the two transact at something akin to a competitive market price.[1] In that case, will the American farmers market have lost something of its civic "soul"?

I raise this question not to answer it – as if it could be answered objectively – but to put to rest the reply I have often heard in casually sharing this research with others: do farmers market prices even matter? They do, and they will only matter more in coming years. Addressing why they matter and how they work will be the product of a literature which scarcely exists, but which this author would hope to inaugurate. What follows is a relatively straightforward regression analysis (and subsequent meta-analysis) of prices at multiple farmers markets for a discreet set of products. My target is two narrow but critical questions within our grasp: How do vendor numbers affect price? Secondarily, what relationship, if any, does that price have to what we pay in the supermarket?

[1] This description would seem to fit the state of farmers markets in much of Europe, where the open-air market is both commonplace and cheaper (Vecchio, 2009).

2. Literature review: pricing in farmers markets

To the best of my knowledge, the literature on farmers markets (or "FMs", from this point forward) contains no attempt to quantitatively assess the effect of vendor numbers – or of any factor, for that matter – on prices. By way of confirmation, a 2008 synthesis of FM-related research-to-date includes no reference to any work on pricing (Brown and Miller 2008). However, my secondary question – the relationship of FM to supermarket prices – has been taken up in a handful of studies.

Generally speaking, the economic and marketing literature on American FMs (as distinct from the sociological literature, which has limited application here) falls into four categories: consumer surveys, farmer/vendor surveys, market-success studies, and the above-mentioned price-comparisons. In each case, I review the literature as it illuminates the central focus of the present paper: pricing.

Consumer Surveys

Perhaps the most academic energy has been invested trying to understand who shops at FMs, and why. Over time, the portrait has become more mixed, with the most recent work suggesting the typical FM customer may not be terribly different from any other grocery shopper. With respect to price, shopper attitudes are finely nuanced, and often depend greatly on how the question is posed.

The first major round of consumer surveys in the late 1990s set the template for our conventional wisdom about FM clientele. These shoppers, mostly women, were more likely to be in the middle to upper ends of the income spectrum, disproportionately better educated, white, and middle-aged (Wolf 1997; Govindasamy et al. 1998; Eastwood, Brooker and Gray 1999). Surveys in different locations seemed to affirm the basic profile: In San Luis Obispo, California, only 17 percent of FM shoppers had incomes below $20,000, compared with 37 percent of non-FM shoppers (Wolf 1997). In

Tennessee, they were disproportionately higher educated and in the highest income category (Eastwood, Brooker and Gray 1999). In New Jersey, two-thirds were college graduates and from households with no children or grown children; more than half had annual household incomes over an arbitrarily-chosen threshold of $60,000 – a figure which itself was well above the median regional income (Govindasamy et al. 1998).

A more recent batch of consumer analyses undercuts the demographic stereotype, without putting a clear new one in its place. Surveys in Maine (Hunt 2007) and Chicago (Elepu and Mazzocco 2010) found the well-educated, upper-middle-class FM shopper still disproportionate among the ever-growing crowds. But in upstate New York (Logozar and Schmit 2009) and Kentucky/Ohio (Wixson 2011) the typical FM shopper had almost nothing to distinguish her from the rest of the grocery-buying public (who remain majority female, in all venues). Interestingly, the above-mentioned San Luis Obispo survey, updated seven years later, found higher income was no longer a significant characteristic of FM shoppers – though having a post-graduate education had become significant when it previously was not (Wolf, Spittler and Ahern 2005).

These various surveys, from both waves, were limited by their regional scope. When researchers conducted a nation-wide survey in 2009, they found no statistically significant differences in age, education, race, food expenditures or income, except in one case: FM shoppers were significantly more likely to be in the second-*lowest* income quintile (Zepeda 2009). Fascinatingly, the survey also found FM shoppers were no more likely to be concerned about the environment or "local communities" than non-FM shoppers. This echoes a finding that same year that FM shoppers were no more likely than anyone else to display charitable or "other-regarding" attitudes toward farmers (Toler 2009). Aside from her likely gender, clearly today's FM clientele is not so easy to pigeonhole.

FM shoppers' attitudes about price also seem to be a moving target. Returning for a moment to the late 1990s: only 16 percent of FM shoppers surveyed in New Jersey said price was the factor they "valued most" in deciding where to shop; price ranked behind freshness, quality and convenience (Govindasamy et al. 1998). This general result holds up over time, at least across the American northeast: in New Hampshire, FM shoppers gave freshness, "fun activity," "help farmer," product selection, and convenience more often than price as their "most important reason" for shopping there (Manalo et al. 2003). In Maine few FM shoppers agreed that price was their "most important factor" when buying food (Hunt 2007). Customers in upstate New York turned out for freshness, to support local agriculture, reduce environmental impact, and for a sense of community (Logozar and Schmit 2009). Similar results applied in Vermont, with "local food" the leading motivation (Baker, Hamshaw and Kolodinsky 2009).

Price, in these last two studies, was not even included in the menu of choices researchers presented to consumers. In the others, the structure of the question is noteworthy: respondents were asked only to give their "most important" or "most valued" factor. Price was rarely number one. This is quite different from concluding it is *unimportant* to shoppers. Unfortunately, few if any surveys provide much more depth on this question, allowing respondents to rank or otherwise attest to multiple motivating factors. The limited geographic breadth is also worth noting: almost all surveys that have directly asked FM shoppers about their motivations took place in New England, New York or New Jersey.

One study of FM shoppers in Alabama took a different approach, and leaves a different impression. Respondents were given 12 attributes and asked whether they preferred FMs or supermarkets for each. Not surprisingly, this self-selected batch of consumers favored FMs across the board. Interestingly, however, 71 percent preferred the FM for price – a more enthusiastic response than other expected categories such as

atmosphere, variety, and "appearance of produce." Only freshness and "locally grown" received a stronger response, and not by much (Onianwa, Mojica and Wheelock 2006).

This is consistent with other findings countering the conventional wisdom that FM shoppers simply ignore or tolerate high prices for the sake of their ideals. Shoppers in California in 1997 and again in 2005 perceived FMs as a better "value for the money" (Wolf 1997 and Wolf, Spittler and Ahern 2005). In New Jersey 54 percent expected lower prices at the FM (Govindasamy et al. 1998) and in New York 91 percent rated FM prices "good" or "very good" (Logozar and Schmit 2009). Those who choose to shop at FMs, at least, believe the prices they pay are fair.

Are FM shoppers' attitudes toward prices substantially different from the rest of the shopping population? The recent evidence is mixed. Surveyed New Hampshire shoppers said high prices would not discourage them from buying directly from farmers (Hunt 2007); it's hard to imagine consumers saying that about their big-box grocery store. One national survey found that perceiving cost as the most important characteristic of food reduced the likelihood of being a FM shopper by 14 percent (Zepeda 2009). In other words, the extremely cost-conscious tend to stay away.

On the other hand, another national consumer survey found the importance of price and value differed very little among those who shop at FMs frequently, occasionally, and never (Bond, Thilmany and Bond 2006). And some cluster analyses suggest the typical FM shopper may carry less exceptional attitudes than we might think. A 2010 market segmentation of Chicago FM shoppers found the largest segment, nearly one-third, was not the "Recreational Shopper" or the "Serious Shopper" or even the "Market Enthusiast." It was the "Basic Shopper," who cares little for variety, atmosphere or even local provenance. She visits less often but stays longer, scrutinizing for quality and value, and then spending somewhat less than her more enthusiastic and idealistic

fellow patrons. In other words, the primary FM customer doesn't come for fun; she comes to shop.

Farmer/Vendor Surveys

Compared with the consumer literature, surveys of those who sell at FMs are fewer (especially before 2002) and highly varied in what they seek to learn about their subjects. As such, there is little overlap; the studies do not tend to build upon one another, and a review has something of an anecdotal feel. Unlike the consumer literature, it is difficult to distill meaningful changes over time.

With a few notable exceptions, strategies and attitudes toward price have rarely been the focus of inquiry. Viewed in sum, the farmer/vendor literature offers few convincing insights into how FM prices are determined, as only a handful of papers have approached the question in much depth. It does, however, offer helpful context for interpreting the results presented in this paper.

Demographic data on FM vendors is thin. One thing we can reasonably assert is that farming is not a full-time occupation for many of them. In a rare early study Lyson, Gillespie and Hilchey (1995) found that just 18 percent of New York State FM vendors who responded to their survey were full-time farmers (a number which may be biased on the low side, as part-time status may likely be correlated with mail-in survey response). A similar result arose in an Iowa survey five years later (Hinrichs 2001). Another vendor survey in New York found 29 percent full-time growers, 28 percent part-time, and 15 percent retired (Logozar and Schmit 2009) with the remainder presumably non-grower vendors. A survey of vendors in Maine, when restricting the sample only to farmers (i.e. excluding non-grower vendors) found a higher full-time-to-part-time ratio of two-to-one (Hunt 2007).

So clearly FM vendors are vary with respect to full-time/part-time status; beyond that, the paucity of studies limits any further generalization – or any sense of variation

over geography or time. Notably, the above studies also record the non-negligible presence of "non-grower" vendors. Studies tend to treat the designation as a catch-all; it likely includes some vendors who procure their product from wholesale or after-market sources (such as expired but still viable supermarket produce). Though this category of sellers undoubtedly helps shape the competitive landscape within FMs, it nonetheless remains ill-defined and little-discussed in the literature.

FMs are often just one part of a diverse sales strategy. In upstate New York, just six percent of vendors said FMs are their sole source of revenue (Logozar and Schmit 2009). Other sales channels included selling directly to consumers through farm or roadside stands (30 percent), CSA shares (27 percent), u-pick operations (20 percent), and selling directly to grocers (23 percent) or restaurants (11 percent). Case studies by King et al. (2010)[1] found selling into such diverse markets (which might also include schools and consumer "buying clubs") to be a "common feature" of farms that participate in FMs. Many farmers also use mainstream grocers as an outlet for excess supply. The finances of four New York FM vendors studied in detail by LeRoux et al. (2008) showed FMs actually constituted the lowest sales volume; they returned a profit ratio greater than wholesale and u-pick but less than farm-based/roadside produce stands and CSA operations. Vendors in New York State surveyed in the previous decade, however, stated as a general rule that FM revenues represented the largest share of their sales (Lyson, Gillespie and Hilchey 1995); in Iowa, 54% said FM income was somewhat or very important to their family (Hinrichs 2001). This evidence weakly suggests that FM vendors have diversified their income streams somewhat in the intervening years.

On occasion, researchers have directly asked FM vendors why they sell there. The results suggest the strong presence of social factors alongside economic ones. Asked to

[1] The research for the King et al. (2010) case studies generated the dataset used in this paper. The case studies are available online: http://foodindustrycenter.umn.edu/Local_Foods_Case_Studies/index.htm

rate 11 choices, vendors overwhelmingly placed "we enjoy visiting with customers and other vendors" and "we enjoy doing it" at the top (Lyson, Gillespie and Hilchey 1995). These were followed by the economic motivations "we want extra income" and "our other income sources are limited." Iowa vendors put the priority on "providing access to fresh produce, interacting with people at the market and talking about local agriculture" (Hinrichs 2001). Fast-forwarding to 2007, 62 percent of Maine vendors said "social interaction" was their primary motivation; just 36% cited profit (Hunt 2007). Yet in upstate New York, vendors rated "receive retail value" as their top motivation, followed closely by "customer interaction" and "advertise products" (Logozar and Schmit 2009).

The Iowa vendor survey (Hinrichs 2001) also asked farmers a related question about the "benefits" of selling at the FM. Stability, customer feedback, low overhead, and "educating customers" topped the list. Near the bottom (roughly half of vendors rated them "very much" or "much" of a benefit) were increased net income and high volume of sales.

Limited as these results are, they suggest the puzzling notion that FM product vendors might not necessarily care that much about vending their products. As Lyson, Gillespie and Hilchey (1995) put it, in words that cast a considerable shadow over the literature that followed, "from a neoclassical standpoint, farmers markets may not make good economic sense." The presumed primacy of social motivations for both FM buyers and sellers has largely precluded the exploration of the economic mechanisms at work there. These include, foremost, how prices are determined.

That said, a limited literature offers some valuable insights into vendors' price expectations, and their specific strategies with regard to pricing. In a focused survey of California vendors, Ahern and Wolf (2001) asked sellers a number of price-related questions. They asked, for example, whether vendors expected to receive prices for their produce that were higher or lower than what consumers pay in the supermarket. In the

early and late parts of the selling season, 88 percent thought they should receive prices the same or higher than in grocery stores. At the peak of the season, this number fell to 60 percent. In the authors' interpretation, this discrepancy "would seem to support the idea that even in their normative expectations FM sellers recognize the real power of the markets to ultimately determine prices."

Ahern and Wolf (2001) also asked vendors two questions about how they set prices: whether they varied them from market to market, and whether they compared their prices with nearby supermarkets. Forty-nine percent often or sometimes set different prices for different markets; the rest did not. One anecdotal observation relayed by the authors is that "ethnic" (largely minority customer base) markets were regarded by sellers as more price-conscious, and led vendors to set lower prices there.

A question on supermarket price comparisons revealed similar diversity in approaches. Nearly half said comparing prices was "not at all" or "not very" important; 28 percent said it was "very" or "extremely" important. Twenty-seven percent compared prices at least weekly; 23 percent monthly; 21 percent once per season, and the rest once a year or never. A "common response" of vendors who did not do supermarket comparisons was that they employed another tactic: keeping an eye on rival sellers' prices in the market.

Eight years later, a survey in upstate New York asked vendors their top three strategies for setting prices (Logozar and Schmit 2009). Most popular was "cost of production plus mark-up." This was followed (in descending order) by matching other vendors' prices, comparing with grocery stores, pricing *above* other vendors, charging the same as always, pricing *below* other vendors, and Internet-based pricing. Notably, the strategy suggested by basic economic theory, lowering prices, fell near the bottom of the list – even below the seemingly counter-intuitive strategy of setting a price above the competition.

On the matter of pricing expectations and practices, one purely qualitative study merits an extended mention. Griffin and Frongillo (2003) conducted in-depth interviews with 18 FM sellers, again in upstate New York. Of particular relevance to the present study is the unambiguous evidence of collusive behavior among some – though not all – vendors. The authors put it more gently: a "value related to FM vendor etiquette that many farmers discussed was coordination of prices on similar produce items." The authors don't attribute the behavior to monopolistic or explicit cartel-type impulses, but from the "pervasive value…of farmers working together and helping each other at FMs." They conclude "positive selling experiences for farmers…are associated with inter-vendor cooperation, including maintaining product integrity, helping each other during busy customer rushes, and coordinating prices."

They quote one FM farmer: "We want all of us vendors to have pretty much the same price on something. 'Cause we want the customers to come and have a chance to look at everybody's stand and see where they want to get it from."

But just as important as the observation of price coordination is the fact that not all sellers go along with it. The interviewed sellers described their frustration with some farmers, many of whom are "older" and "have a different attitude toward farming." Said one vendor: "To them, if they sell their whole truck out, that's a good day. For us, if we get a good price for our produce, that's a good day." Another: "We'd rather keep the price up to make a profit. They think they're making a profit by selling out the truck at a low price." One has to wonder at the suggestion that older, more experienced farmers are for some reason working against their economic self-interest, or how one might mistakenly "think" he is making a profit; these views are reported out without comment in the paper.

This qualitative write-up of Griffin and Frongillo (2003) is limited in scope; the observations can't be taken as more than anecdotal, yet there is undoubtedly some truth

to them. One vital takeaway is the image of distinct groups of sellers within the same FM environment, operating according to quite different supply models: "cartel" and "competitive" market pricing, in the simplest sense, side by side. This is certainly compatible with the two quantitative surveys above which found a diversity of pricing approaches. As a final note, despite the focus by Griffin and Frongillo (2003) on farmers who preferred coordinated pricing, the actual balance in the market is impossible to ascertain. It is reasonable to wonder if the rigorous and personal nature of the research might have selected for a certain type of more gregarious, socially-inclined FM farmer, more inclined toward "inter-vendor cooperation."

Market success/failure studies

Rather than focus specifically on the attributes of customers or vendors, a handful of recent studies have taken up the question of what makes FMs themselves prosper or fail. Much of this material lacks obvious relevance to the analysis here (amenities, location, manager tenure). But as with consumer and vendor surveys, there are insights in the qualities of successful markets that might provide useful context as we consider how prices are determined.

Stephenson, Lev and Brewer (2006) found that amid the high failure rate of FMs in Oregon (nearly one failure for every two that opened) size was a critical survival factor: markets with more vendors were more robust. This is not surprising; large markets would seem to develop a critical mass of customers, charge vendors higher stall fees, and build upon their previous reputation. But it also suggests, to extrapolate into the context of this paper, that vendors do not – indeed, perhaps, should not – seek to sell in markets where they are the only vendor in a product. For a FM vendor, a literal monopoly or duopoly does not necessarily augur for success; in fact, quite the contrary.

Measures of vendor success or satisfaction, as a proxy for market success, have similarly suggested that bigger is better. Sales-per-market-visitor, in a sample of Iowa

FMs, was higher in larger markets, though the effect was small: customers at larger markets spent about 0.03% more with each additional market vendor (Varner and Otto 2008). An examination of 21 FMs in rural, lower-income areas of upstate New York considered both sales and subjective, self-assessed "satisfaction" as measures of vendor (and thus market) success (Schmit and Gomez 2011). As the authors note, the simple economic assumption of "happiness = profits" may not clearly apply in the FM context, as "vendors may well be satisfied if they simply cover their costs or reach some minimal level of sales." In this case, indeed, larger markets had no statistically significant relationship to actual sales. However, sellers in larger markets were significantly more *satisfied* with the experience.

Finally, a study of FM success in Missouri, using vendor numbers as the measure of success, suggests vendors may not only seek out larger environments (implicit in the authors' definition of a "successful" market) but specifically prefer non-competitive characteristics.[1] The regressions performed by Rimal, Bailey and Onyango (2010) found farmer-vendors prefer markets where wholesalers (who presumably undercut on price) are excluded, where prices must be uniformly maintained throughout the day, and where entry to new vendor entrants is restricted.

This last study is intriguing. It is also preliminary and presented with minimal depth; the authors declined a request to elaborate or provide further data. As with most scholarly work in the area of FMs, research on market success is at an early stage. However, the literature offers enough to complement and corroborate some essential insights from vendor surveys. Principally: Far from being concerned or intimidated by the threat of competition that might come with larger crowds of sellers, many vendors may in fact find safety in numbers.

[1] My own phrasing; the authors do not venture this interpretation.

Price comparisons

A narrow body of studies has addressed whether FMs are more or less expensive than mainstream outlets. Anecdotally, FMs often seem to face a public perception that they are a more expensive way to shop – or at least that one does not shop at the FM expecting a better deal (see Gaudette 2007). Consumer research reviewed above suggests FM shoppers themselves might not necessarily share this view. And the suggestion from a handful of direct price comparison studies, spread across three decades, is that FMs may have lower prices.

The first such study included a visit to 15 of the then-18 certified FMs in California (Sommer, Wing and Aitkens 1980). Researchers also visited, a single time each, national chain supermarkets in the same towns. A composite measure of the mean prices of 358 items found a statistically significant price savings of 34 percent in the FMs; by another measure, supermarket prices were higher 91 percent of the time. Divided into deciles, the mode of the amount of price savings was in the 40 to 49 percent range. Savings were similar for fruits and vegetables; other "miscellaneous" items sold at a smaller discount. For one year-round market, the authors found that the FM price advantage remained in the winter. They also found no notable difference in savings for FMs in larger cities.

Another California study 20 years later found a nearly identical composite price savings of 35 percent in FMs (Ahern and Wolf 2000). The authors collected prices at four FM-supermarket pairs in San Luis Obispo County, over multi-week periods in each of three growing seasons. Of 16 total products, only broccoli was consistently more expensive in the FM; the highest FM savings were found on navel oranges. The authors also recorded the quality of all observed produce; the result was "a pattern of incrementally higher quality" at FMs.

An analysis of variance found the sales venue accounted for 10 percent of the variation in price (in a regression with quality, date, FM location and produce type – not surprisingly, the type of produce comprised the bulk of the effect). The authors hypothesize that fewer supply chain layers and exemption from packaging and other costly requirements allow FM prices to beat supermarkets.

A later study compared prices at 25 FMs in the state of Florida to supermarkets within a five-mile radius (Watson and Gunderson 2010). The authors reported, in aggregate, prices that were 153 percent higher in supermarkets. The difference applied to an extreme degree with herbs, where supermarket prices were nearly six times as high. The FM price advantage was smaller but still notable for citrus fruit and field vegetables. However, berries showed no price advantage. And deciduous fruits, such as apples and pears, were found to be more expensive in the FM. The authors hypothesize that "higher fixed costs, longer maturation periods, and a relatively lower comparative advantage" could explain the different result for deciduous fruit. The authors also observe that the FM price advantage was considerably larger in small towns as compared with urban areas, speculating that in urban areas sellers "may have better information in regards to the appropriate price level of their products."

Less formally, an undergraduate statistics class in Seattle has regularly conducted a price comparison between their local FMs and two area grocery stores (Neighborhood Farmers Market Alliance 2010). The class has consistently found FM prices to be cheaper. In 2008 the per-pound price of produce was $2.98 at the large chain grocery, $2.53 at a natural foods chain store, and $2.36 at the FM. One year later, they expressed their results in terms of the estimated $330 an American family spends each month on groceries: "At the Farmers Market, $330 will get you 152.25 pounds of organic produce; at Whole Foods you can get 131.80 pounds, and at QFC (supermarket) a mere 118.6 pounds for the same $330."

3. The data: opportunities, challenges, a novel approach to analysis

My inquiry here, to recap, reduces to two basic questions: How do vendor numbers affect FM price? And what relationship does that price have to what we pay in the supermarket? These questions are not complex, but addressing them requires data that is not easily come by: discreet, exhaustive observations of prices of separate FM products, at each stall, over an extended period of time. Data of this type are particularly essential to examine the question of vendor numbers. To the extent that FM prices have been gathered before, they have typically been dealt with as means, or as price indexes of a basket of goods (see Sommer, Wing and Aitkens 1980 or Watson and Gunderson 2010). And they have been gathered only regionally, typically over weeks rather than months or years.

This present investigation was motivated in large part by the existence of a unique, primary dataset, gathered by researchers at the University of Minnesota, Oregon State University, Cornell University, the University of California, Davis and the U.S. Department of Agriculture. For approximately one calendar year, recorders visited the same FMs, supermarkets and natural foods stores each week to record prices for a consistent list of products. The final sample included FMs in Minneapolis-St. Paul (2), Portland (2), Sacramento-Davis (2), Syracuse and Washington D.C., along with two supermarkets and two natural food stores in each region.

The products included green-leaf lettuce, spring green mix, blueberries, apples (at least two specific varieties in each location), milk (skim and 2%), ground beef and beef rib-eye steak. Where organic and conventional versions of a product were available (or "natural" and "grass-fed" in the case of beef) they were treated as separate products. Recorders were each given an identical recorder's guide (included here as *Appendix 1*) including universal instructions for standardizing unit weights and measures for each

product. Critically, prices for all vendors in each market were to be recorded, and each individual recorded price was preserved in the data. This permitted a later calculation of how many vendors were selling a product that day. For example, five recorded prices for conventional lettuce in a FM, on a particular date, means five vendors were in the market selling that product at the time of the recorder's visit. (Unlike in supermarkets, however, specific vendors could not feasibly be tracked from week-to-week, given changing stall personnel and the typical lack of branding.)

The dataset was not initially collected with this particular analysis in mind, but as a component of a multiple-case study of local food supply chains (King et al. 2010). In that context, it was used to a limited extent for non-statistical, intra-regional observations about product availability and pricing. However, it became apparent after that initial phase of research that the data might be uniquely suited to look at some broader aspects of pricing dynamics, including those addressed here. One other forthcoming piece of research also uses this dataset in its entirety to examine a quite different question of whether price premiums exist for locally grown products (Park and Gomez 2011).

The dataset is not without its challenges, and these necessarily informed the methods applied to it. First, recorders were not always consistent in their recording of certain product attributes that might have contributed to a regression analysis. The primary example here is ground beef, where percentage-lean and package type were recorded too inconsistently to be used as control variables. (Recorders were instructed, however, only to record prices for ground beef 85% lean and greater, which limits it as a possible error-term factor. And manual observation of the data where these attributes were recorded suggests "tube" or "tray" packaging has little bearing on price). The recorder in one city, Washington DC, also strayed from the specified varietal-separation procedure for apples (creating results deemed useable, but which do require a footnote in

Table 1). I will also note, though the effects appear to be minimal, that on rare occasions recorders might have missed weeks given illness or other circumstance.

Importantly: while recorders were told to note quality-related observations in a "notes" field, no systematic attempt was made to account for produce quality. This might have been a subjective, precarious endeavor in any case. Nevertheless, the absence of a quality variable is important to keep in mind when interpreting the results. A similarly ideal-but-likely-impossible endeavor would have been to include data on actual product stocked and sold, i.e. "quantity." While we know how many vendors are in the market, we do now know the actual quantity supplied, which of course could have some bearing on the market price. Insofar as we are concerned with overall quantity effects, the number of vendors is our available, if imperfect, proxy.

Also absent from the data are big-picture "market" attributes, e.g. overall size of the FM, location-related variables, management and policy variables, time-of-day and day-of-week it was visited (each market in a sample region was visited on the same day each week, but this day naturally varied based upon FM schedule). A post-data-gathering survey of FM managers (included here as *Appendix 2*) was conducted to assist in interpreting results, but this information could not appropriately be applied in a regression analysis of the original data.

Additional sample variations from product to product necessarily shaped the analysis. In the case of blueberries, standardizing of supermarket/natural foods package sizes proved problematic. While FM blueberries are consistently retailed in a "dry pint" size, supermarket package sizes vary tremendously – and the per-unit price differences among them are staggering.[1] The differences between even slightly different package sizes were so great, in fact, that any attempt to convert supermarket blueberries to a standard dry pint price is meaningless, yielding a control variable that does more harm

[1] Note to consumers: buy blueberries in bulk.

than good. The upshot was that FM blueberry prices could not be regressed against a supermarket counterpart as was the case with other products.

Other discrepancies emerged with the gathering of conventional market prices. As a general rule, most products could consistently be found in the sampled supermarkets, but only infrequently in natural foods stores. However, some organic products could only consistently be priced in natural foods stores, and a few products were consistently for sale in both venues. As with blueberries above, this challenge is not a shortcoming of the data, but rather of reality.

The challenging nature of the dataset, in all these aspects, inspired an innovative approach to analyzing it. A typical approach might be to regress across the entire dataset, regressing FM price against vendor numbers, city, market attributes, product dummies, organic dummies, supermarket and natural foods prices, etc. However, the characteristics of the dataset make this unwise, if not impossible. The gaps in conventional market prices would render a severely and arbitrarily limited set of data points, and the lack of product and market attribute data would create an unacceptable amount of endogeneity around the primary variable of interest: the number of vendors selling a product.

The solution applied here was to analyze "product-market" pairs independently. An example of a "product-market" would be "organic lettuce in Portland FM1" or "(conventional) Fuji Apples in Syracuse." This approach removes unobserved between-market and between-product endogenous factors, of which there are admittedly many. But it still facilitates the inclusion of local supermarket and natural foods price data as control variables.

The cost of analyzing separate product-market pairs, of course, is that it prohibits direct quantitative inferences across the entire dataset. This results in a large collection of small, simple regressions, with limited numbers of observations but also limited variables to erode degrees of freedom. These "disaggregated" results are worthy of inspection and

discussion in their own right. I then, however, apply to them various statistical meta-analysis techniques, to assess whether any statistically significant patterns appear across these collected results.

In essence, the approach to gaining insights about the dataset as a whole is to disaggregate, and then re-aggregate. I will reserve a full discussion of the regression model and meta-analysis techniques for their proper section below.

Analysis is restricted to product-market combinations that meet minimum thresholds for observations and variability. Given my primary interest in vendor numbers as a factor in pricing, product-markets in which no more than two FM vendors ever sold a product at one time are excluded. This categorically excludes milk, as well as rib-eye steak in all but one FM. In general, product-markets in which a product was on-offer fewer than ten days are excluded, though one regression with nine observed days is included because of high variability in vendor numbers during that time.[1] "Spring Green Mix" is also excluded from analysis, as recorder guidelines and inherent product variability left too much room for heterogeneity within this single product description.

In the end, this winnowing leaves 23 product-markets in which to reasonably investigate the FM price-to-vendor-number relationship. And it leaves 20 in which the statistical relationship of FM to conventional market prices can be examined.

[1] Given the non-significant regression results in this case, including it in the set of regressions turns out to introduce a conservative bias, if any.

4. The Farmers Market "in theory": a conceptual framework

In the broadest sense, the objective here is to better understand how FMs work. How do prices behave when new vendors enter the market? How does price behavior differ with different products, or when the conditions in the market change? How are shopping and selling at the FM different from the supermarket? As the literature is rather thin on these points, there has been little in the way of structural thinking about FM operations.

While a full-blown economic model would be of little practical use for the present analysis, it will be helpful for later discussion of results to consider the market characteristics that define a typical FM.[1] Proceeding loosely along industrial organization lines, I'll begin with the noncontroversial assumption that the FM embodies some form of imperfect competition. Many basic requirements of a fully competitive market – an arbitrarily large number of firms, free entry, perfect information, homogenous product – are clearly not present. That leaves various market imperfections which may affect how prices respond to increased competition. A basic model of an imperfect market (Cournot) suggests an appropriate hypothesis for FM competition; characteristics such as barriers to entry, search costs and product differentiation help elucidate the particular dynamics of the FM marketplace. In this section I will discuss them in more general terms; later I will revisit them in the context of results.

[1] Note crucially that the "market," in the economic sense, that is relevant to this and any forthcoming analysis is not the actual FM itself, but the market for a particular *product* sold there. Going forward, I will use the word "market" (or the "product-market," where it is rhetorically helpful) to mean the economic market for a given good, e.g. "blueberries in Portland1." And I will continue to use FM when referring to the physical farmers market.

Using the consumer as our vantage point, we might posit in general form the price paid by a consumer *i* for a particular product *j* in FM *m* as some function of the following factors:

$$P_{ijm} = F(V_{jm}, DIF_j, SC_{jm}, SCT_i, COL_{jm}, MC_m, MP_m, CMP_j)$$

Where:

V_{jm} = number of vendors selling product *j* in market *m*
DIF_j = differentiability of *j* (how distinguishable is one vendor's *j* from another's) SC_{jm} = search cost for *j* in FM *m* (function of overall market size and layout) SCT_i = search cost tolerance of *i* (partly a positive function of D_j, as explained below) COL_{jm} = degree of collusion in market *m* for product *j*
MD_m = market details (customer demographics, cleanliness, amenities) MP_m = market policies (on pricing, entry, advertising, etc.)
CMP_j = competitive market price (in the absence of the above market factors, the equilibrium we'd expect from the usual cost and willingness-to-pay factors of supply and demand.)

The first explanatory variable, of course, is the subject of econometric interest here. The next four on the list, though arguably incomplete, nonetheless convey some of the critical imperfect-market factors that are the focus of this section. The next two encompass exogenous factors that may enter into my discussion of results.

The following factors form a basic conceptual framework for considering the "imperfections" of the FM, and thus for interpreting the econometric results of this study: quantity-based competition, freedom of entry, search costs, and product diversification. I will briefly consider each in the FM context.

Quantity-based competition

If we assume the FM embodies some form of imperfect or oligopolistic competitive environment, an initial question might be whether sellers are simultaneously setting price (the "Bertrand" model) or quantity (the "Cournot" model). In a price-setting environment (presuming, for the moment, roughly homogenous products) the well-known theoretical paradox is that a competitive market price results, even with only two

competitors. However, if sellers are modeled as setting quantities to put on the market, firms maximize profits at some point short of a full monopoly price, but higher than the competitive market price (Mas-Colell, Whinston and Green 1995). How much higher depends upon a "wedge term," derived in a simple model[1] as $P'(Q)*Q/n$, which is thus inversely related to the number of competitors n in the market (Nicholson and Snyder 2008). As n increases, the wedge term is driven toward zero and price approaches marginal cost. As marginal industry economic profits approach zero, overall welfare increases to its maximum point as n approaches infinity, with a notable exception for increasing-returns-to-scale industries (Corchón 2001).

The FM presents a strong case, in general, for a quantity-setting example. In fact, Mas-Colell, Whinston and Green (1995) use a farmer sending crops to market as their literal "textbook" example when illustrating a Cournot-type situation: all vendors must travel to the FM to sell their wares; it is impossible to do this without first deciding what quantity to put in the truck – presumably in isolation from fellow vendors. As the remaining discussion in this section conveys, the textbook Cournot case gets muddied once the farmer gets to market. But the dynamic unleashed by quantity-driven retailing may yet have some formative effect on the market outcome. Indeed, the alternative hypothesis posited for our primary econometric test – prices decline with increasing numbers of vendors – is precisely what a theoretical Cournot scenario would predict.

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[1] Consider a closed product-market supplying total quantity Q at market price P, with n identical vendors each supplying $q_i = Q/n$. Each vendor's profit $\pi_i = P(Q)q_i - C_i(q_i)$.

Vendor i maximizes profit with respect to quantity at $\partial\pi_i/\partial q_i = 0 = P(Q) + P'(Q)q_i - C'_i(q_i)$.
Thus at an optimum price $P(Q)$ exceeds marginal cost $C'_i(q_i)$ by the wedge term: $P'(Q)q_i = P'(Q)*(Q/n)$.
As n increases, the wedge term declines, price approaches marginal cost, and profits erode.

Adding differentiated products, heterogeneous prices and other realistic market characteristics adds considerable complication, but does not compromise the basic insight that smaller market share leads *ceteris paribus* to a more competitive equilibrium.

Along with contributing my basic hypothesis, contemplating FM sales in the context of a Cournot game suggests some more nuanced insights. For example, some vendors are surely more "quantity-sensitive" than others. A seller of lettuce, for example, might be quite particular about how much to load on the truck (lest some go unsold and wilt); a seller of apples, on the other hand, need not be so concerned with the quantity-setting game. Might we then expect a Cournot-style dynamic (i.e. as *n* rises, *P* falls) to be more evident in some products than in others?

And then there are welfare implications of returns-to-scale under Cournot. If FM vending/farming has declining marginal costs over some relevant range, progress toward the competitive "optimum" might not be a societal benefit, despite its evident benefits to consumers (Corchón 2001). Within a FM, it seems plausible returns-to-scale could vary by product, as would then the welfare implications of different pricing dynamics.

Freedom of entry

Whether new sellers can enter and exit the market at will has great bearing on market equilibrium; it determines whether a market for a product can become sufficiently large to foster a competitive outcome. The typical FM is clearly not a venue with free entry, and on this point common knowledge will suffice: They are of limited size, usually geographically remote enough from one another that each can reasonably be thought of as a self-contained market environment. Indeed, in areas where more than one market exists (including those in our sample) they are deliberately scheduled on separate days, so as not to overlap. Selling at a FM usually requires an application process, and vendors must sometimes make a commitment for the season; in that sense new entry is literally forbidden for a period of time (though varying numbers of registered vendors may still show up at market on any given day, providing the variation essential to the present analysis). Cost barriers to entry are also a factor. Though backyard and hobby farmers are a feature of some markets, the overhead to enter the market in a substantial way – that is

to say, buying or renting farmland and equipment to farm it – is high indeed, and getting higher (Horwich 2001).

Search costs

Compare shopping for blueberries in the supermarket with shopping for them at a FM: At the supermarket, all of your blueberry options occupy the same limited real estate in the chilled produce section (perhaps five to ten linear feet, if that). At the FM, though, your choices are more spread out – by an enormous factor. Many vendors sell other products as well, making it impractical to organize the market into sections; indeed most FMs feel entirely random in that respect, as stall space is allocated according to unrelated factors.

So search costs are certainly a distinguishing factor here, at least in comparison with conventional grocery shopping. They might seem to vary positively with the size of the FM, as a larger market would seem more onerous to search, though this is speculative without data on the point (e.g. if the same number of blueberry vendors are within any given radius, it might make no difference). Factors such as market layout would have implications for search costs, and thus for pricing. The classic theoretical finding on search costs finds that they push markets toward an implicit cartel outcome, as search costs outweigh the benefit of seeking out a marginally lower-priced seller (Diamond 1971). However, this result descends crucially from an assumption of product homogeneity. Thus I will truncate this discussion of search costs for the moment, as the implications become more intriguing (and appropriate to the FM context) in the presence of product differentiation.

Product differentiation

Certainly there is some degree of highly obvious heterogeneity of product in a FM; tomatoes may be red or orange, giant or bite-sized; farmers of various crops may attempt to distinguish themselves by growing rare or heirloom varieties. Each of these

clearly distinguishable products faces, to some extent, its own downward-sloping demand curve, and its vendor can accrue whatever monopolistic rents accrue from that.

While this is a notable feature of FMs, it is not as interesting as the type of differentiation most relevant to the present analysis, which features data on products that are, *on paper*, indistinguishable. We might think of these as the "commodity" products that constitute a large part of what is sold at FMs. When a bunch of green leaf lettuce is… well, a bunch of green leaf lettuce, or one pound of frozen, grass-fed ground beef looks like any other, how much might product differentiation affect pricing patterns?

It depends, again, upon the product. One avenue of differentiation available to FM commodity vendors involves advertising and presentation. This would seem to be equally applicable to vendors of all products, though it is worth observing anecdotally that vendors of high-value products, such as beef, seem to invest more heavily in advertising and branding. The other critical area of differentiation would be quality, which the FM shopper might judge by appearance, touch, etc. Here some product differences may be quite significant. More perishable products can vary a great deal in quality; lettuce may be on one end of this spectrum, where heat and time (on top of initial quality variation) can take their toll. At the other end you might find frozen ground beef, which (behind any branding) looks much the same as a hunk of meat from the vendor down the aisle.

So, insofar as product differentiation affects market outcomes, we might see some different implications across products. Classic Chamberlinian monopolistic competition projects equilibrium at the competitive market price, but also presumes arbitrarily "large" markets with free entry (Chamberlin 1962), something that ill-describes the typical FM. In a situation with limited entry, the equilibrium price will settle somewhere above marginal cost, with greater differentiation permitting greater rents. This would seem to conform to basic logic.

But things get more interesting when differentiation is considered in the context of search costs. Anderson and Renault (1999), building on Perloff and Salop (1985), show how *in the presence of search costs*, higher levels of product differentiation can actually lead to *less* market power. The intuition is that products with more possible variation inspire (more) consumers to search (longer). The effect is essentially to bring vendors into closer competition with one another. In the present context: If I know I am shopping for a product that can vary from "crisp-and-fresh" to "wilty-with-a-short-shelf-life," I will spend more time traversing the market stalls, looking, touching and smelling. My search-cost tolerance for that product is raised; as a result, every vendor from whom I might buy gets virtually "closer" to the next guy.

On the other hand, if my search is not likely to help me differentiate among my options, if differences can't be easily discerned, I won't bother – a situation that brings us closer to Diamond's (1971) famous paradox, where the presence of search costs leads to monopoly pricing and no searching.[1]

A few additional thoughts before leaving the topic: first, even as a market with search costs gets more "competitive" – both with differentiation, and with n – the limit may not be the competitive equilibrium price. Wolinsky (1986) showed that even as the number of firms grows arbitrarily large, a market of differentiated products will still

[1] In the language of the general theoretical model, the interaction between search costs (SC), search cost tolerance (SCT), level of differentiation of a product (DIF) and price (P) would look like this:

$\partial P/\partial SC > 0$. As a FM gets harder to search – given layout, size, non-posted prices, etc.—the price level will tend to rise. Call this the "search cost effect." In the absence of differentiation, consumers choose not to search and price rises, in theory, to a monopoly level.

$\partial P/\partial SCT < 0$. Price will be driven down as consumers are more willing to endure the search. One reason – perhaps the primal reason – why this might happen is because searching actually yields useful information; products can be usefully compared. That is, $\partial SCT/\partial DIF > 0$. Call this overall effect, $\partial P/\partial DIF < 0$, the "differentiation effect."

Thus, when search costs exist, the search cost effect and differentiation effect are working in opposition. It is unclear, in a general sense, which effect will predominate. The outcome will depend on the characteristics of the products and markets involved.

approach, from above, a price limit above marginal cost.[1] In other words, even if we were to apply the most competitive assumptions to our scenario, the endpoint in our search-cost-prone FM might not be the perfectly competitive one.

Critically, this does not necessarily imply a sub-optimal welfare outcome. Dixit and Stiglitz (1977) demonstrated that in a market *where variety is desirable*, "it is not in general optimum to push the output of each firm to the point where all economies of scale are exhausted" – that is, to the competitive, zero-profit point. To the extent that consumers value choice within markets for FM products, the Dixit-Stiglitz finding is relevant here; for instance, some shoppers may prefer larger or smaller blueberries. To the extent that one major differentiator at the FM – quality and freshness – is probably *not* a dimension on which shoppers value variety (i.e. there is little or no desire for low quality) the implications of Dixit-Stiglitz are limited. (There may, of course, be other civic or social reasons why the social welfare function would value a sub-competitive outcome; I am mindful of this in interpreting the results and policy implications below.)

Finally, it seems to me the presence of search costs and product differentiation in a FM context might give rise to considerable heterogeneity of prices. Any FM shopper cluster analysis from the literature makes clear that consumers have varying search cost thresholds. In the pleasant atmosphere of a FM, in fact, we can't discount the notion that some might even take pleasure in the search, up to a point. In such an environment, different vendors may cater to (or prey upon) groups with different tolerances for searching. In contemplating the economic workings of a FM, it seems possible that some vendors may seek profits by "specializing" in shoppers with different search tolerances and price points.

[1] This result unfolds under an assumption of imperfect information (Wolinsky 1986), which is reasonable in the FM context as it is in most real-world market environments.

Collusion

We also can't discount the possibility that cartel behavior – more gently, the "etiquette" of "coordinating prices" (Griffin and Frongillo 2003) – plays a role in how some markets within FMs function. The qualitative evidence above from Griffin and Frongillo (2003) hardly needs corroboration to seem plausible. And suffice it to say, U.S. antitrust authorities have more important priorities than weeding out price fixing in your neighborhood FM.

The economic model here is simple: vendors collude, tacitly or explicitly, to maintain a product price that maximizes joint profits (Nicholson and Snyder 2008). Consumer surplus is the casualty. Cartel outcomes are inherently unstable (Varian 1992); sustaining a cartel depends crucially on restricted entry of new sellers (a condition covered above) and preventing defections. On that score, two observations add context: First, the FM represents in some respects the ultimate "repeated game" – at least for vendors. Though the subsets will vary, many of the same farmers and gardeners arrive week after week to play the appointed round. "Cheap talk" is no doubt abundant; they know each other and converse about prices; at a certain point, many of them may know each other so well that no conversation is necessary. Would-be defectors need to contemplate showing up next Saturday and literally looking their colleagues in the eye. Maintaining goodwill may pay other dividends; as Griffin and Frongillo (2003) portray, vendors may need assistance in other ways, such as babysitting each other's stalls for brief periods. Though in some sense the game is finite (in cold climates, the outdoor FM season ends) it is repeated the following season, likely with many of the same players.

The other ingredient for defection is the reward. If the cartel price is not "that far" above the competitive equilibrium, in some absolute sense, the first-mover rewards for a defector may not provide much incentive. In addition, in the context of search costs, dropping your prices might have a more limited effect in attracting more customers. If

shoppers aren't searching much (as is perhaps more likely with less differentiated products) few additional people will discover your relative bargain, depleting your possible payoff. Again here, it seems that the product itself may have some bearing on how its vendors price.

Collusion may explain everything about a particular market; it may explain nothing. In interpreting the results presented below, we should again be open to possibilities in the middle. Could FMs, in the real world, have enough stickiness or friction within them – or simply enough human variation – that collusion might explain some vendor behavior in a market, but not all? It seems likely. It also seems possible that more innocuous types of entrenched, static equilibria might yield some cartel-like effects: multiple vendors, for example, might set a price for the season and never deviate despite market forces. Collusion need not always imply nefarious intent.

I will return to the conceptual concepts of collusion, differentiation, search cost, entry barriers and the implications of the Cournot model later, as a framework for discussion of results. Note crucially that while these specific characteristics (and other descriptive or demographic details) are presumed to vary among FMs and even among products, they are assumed here not to vary significantly over time (at least over the one-market-season duration of this dataset). This allows for the analysis of the data as explained in the following section.

5. Market-by-market: the regression model

As described earlier, the challenging characteristics of the dataset provoked the specific strategy for analyzing it. Observations are separated into product-markets (e.g. "organic lettuce in Portland1"). Ordinary least squares regressions are run for each. Then statistical meta-analysis was applied to gain inferences about the dataset as a whole.

I present the individual market model and results first. In this approach, any FM-fixed effects and product-fixed effects (many of which were described in the conceptual model above, but which are not present in the data) fall out, and are thus captured by the intercept term. For each market, the regressions take the forms:

$$\boldsymbol{lnFMPmed_t = \beta_0 + \beta_1 lnNVEND_t + \beta_2 lnSMP_t + \beta_3 lnNFP_t + \varepsilon}$$

$$\boldsymbol{lnFMPmin_t = \beta_0 + \beta_1 lnNVEND_t + \beta_2 lnSMP_t + \beta_3 lnNFP_t + \varepsilon}$$

where: *lnFMPmed* = median recorded FM price (natural log)
lnFMPmin = minimum recorded FM price (natural log)
lnNVEND = number of vendors selling the product (natural log)
lnSMP = median recorded supermarket price (natural log)
lnNFP = median recorded natural foods store price (natural log)

The "t" subscript indicates that observations were recorded in the same week.[1]

For each regression two null hypotheses were tested. These might be thought of as "competition" and (price) "coupling":

$\mathbf{H_0^{competition}: \beta_1 = 0}$

$\mathbf{H_0^{coupling}: \beta_2 = 0}$ (alternately,[2] $\beta_3 = 0$)

Both the median and minimum prices in a FM have intuitive appeal as dependent variables: the median represents some approximation of the prevailing price in the market; the minimum represents the best deal a determined consumer might achieve.[1]

[1] To reduce clutter, the "t" subscript may be omitted in future references.

[2] For most markets, either SMP (β_2) or NFP (β_3) observations were available, but often not both. Whichever variable was consistently recorded and available was regressed against and tested; when both were available, both were used. For one product, blueberries, neither set of observations was deemed usable given package-size variation, and a basic univariate regression was used.

For each market, linear regressions were also run; the findings of significance were essentially identical. The *log-log* model is chosen for presentation because characterizing the relationships as elasticities is more intuitively useful for interpreting and comparing the results of different markets.

The supermarket and/or natural foods price variables in each regression serve a dual purpose. They are, of course, essential to the "coupling" hypothesis: the question of whether FM prices show a correlation with those found in conventional stores. With respect to the "competition" hypothesis, they should also serve to control to some extent for the effects of seasonality. Seasonal fluctuations that might tend to lower prices in the FM would presumably also lower them across other venues (at the peak of the season, for example, supermarkets will also buy their product from closer locations that require less transportation expense). While seasonality might logically be correlated with both FM price and vendor numbers – and we should be mindful of this in interpreting results – including SMP or NFP data should help control to some extent for seasonal effects.

Particularly given the small numbers of observations in some markets, it was prudent to test for heteroskedasticity. Indeed, about half of regressions showed a heteroskedastic variance significant at $p < 10\%$. One approach might have been to simply run heteroskedasticity-robust regressions in all cases. However, robust regression results are typically considered reliable only for $n > 30$, and not all regressions in this set qualify. The determined procedure was to run robust (White) regressions for any market in which heteroskedasticity was detected – essentially as a sensitivity analysis, noting any effects on the results. As it turned out, robust regression in all cases altered the results negligibly, if at all. Thus, in the interest of consistency, non-robust results are reported throughout.

[1] While the maximum FM prices might have constituted a third dependent variable, the results turn out to be uninteresting in a consumer context and lack any such intuitive appeal. They are not discussed here directly, except as they effect the median price variable.

Finally, before presenting results, a brief word about time series techniques. Each data point here represents observations taken in the same week, if not the same day. In that sense, the empirical model is a basic static model time series. It would be natural, of course, to consider a lag-model or other more advanced time series approach to this data. Unfortunately, the nature of the data itself makes this impractical. The problem is missing values: given the nature of FMs,[1] there is simply no guarantee of a "reading" on any given day. Sometimes, even for weeks at a time, there may be no vendors in a market selling a product. While statistical techniques can extrapolate from visible trends to accommodate occasional missing values in time series regressions, this would be a dubious exercise given the seemingly arbitrary gaps in some market series. It could possibly even inject spurious effects into the model.

In addition, the dates where gaps occur, as well as the start and endpoints of each market's "season," are different for each market. This would make it impossible to ever compare the individual time series regressions (testing, for example, for cointegration), something the meta-analysis of the basic OLS regressions does allows me to do.

More generally, there may be something to be said for not asking too much of your data. Though there may be some compromise in terms of explanatory power, in this case a simpler approach turned out to offer the most practical benefit in terms of clarity, credibility, and access to the insights the data does, indeed, have to offer.

[1] And, to a small degree, the occasional missed week by a recorder…

Price competition: Individual market results

The full dataset – covering different varieties of multiple products, across FMs in five metropolitan areas – included dozens of possible product-markets. Applying minimum thresholds for observations and variation yielded 23 markets appropriate for statistical analysis. These are summarized in Table 1, with descriptive statistics and notes.

TABLE 1: PRODUCT MARKETS ANALYZED (SUMMARY)

Market	Product type	Max. vendors[1]	# of days (observations)[2]
Lettuce			
Portland1	Organic	8	31
Portland2	Organic	3	26
TwinCities1	Conventional	27	28
TwinCities2	Conventional	5	17
Blueberries			
Portland1	Conventional	10	14
Portland1[3]	Organic	5	9
Sacramento1	Conventional	4	24
Beef[4]			
Portland1	Ground (Grass-Fed)	3	37
Syracuse	Ground (Natural)	3	45
TwinCities1	Ground (Natural)	4	47
TwinCities1	Rib-eye (Natural)	4	46
Apples			
DC	"Local"[5]	7	19
DC	"Popular"[5]	6	33
Portland2	Fuji	3	14
Sacramento1	Fuji	4	26
Sacramento2	Fuji	8	37
Syracuse	Empire	14	34
Syracuse	Fuji	10	38
Syracuse	Gala	11	30
Syracuse	Golden Delicious	10	28
Syracuse	Red Delicious	12	29
TwinCities1	Haralson	10	13
TwinCities1	Honeycrisp	8	18

NOTES:

1. Markets were excluded from analysis if Max. Vendors < 3. For all markets, range of vendors observed = [1,Max]. Days where # of vendors = 0 are meaningless in the context of this research question and are treated as missing observations.

2. Markets were excluded (with one exception noted below) from regression analysis if observations < 10.

3. While just below the observations threshold, this market was included because of notable variability in the vendor variable. Given the results, its inclusion introduces, if anything, a conservative bias.

4. Beef product type (both ground and steak) was recorded as conventional, natural, grass-fed or organic.

5. Recorders in Washington DC interpreted data-recording standards for apples differently than in other cities. Rather than recording data for specific varieties, they categorized multiple types as "local" or "popular" and tracked these designations. "Local" includes Honeycrisp and Stayman/ Winesap; "popular" includes Gala and Fuji. While this prohibits insights about specific varieties, it was decided this did not render them unviable for analysis of the broader research question.

I applied the regression model described in the previous section to these 23 markets. Table 2 summarizes the findings of statistical significance. Note that the expected result is the *inverse* one: price of a product falls as more vendors compete.

TABLE 2: ARE FARMERS MARKETS "COMPETITIVE"?

Relationships between vendor numbers[1] and farmers market price,[2] controlling when possible for prevailing local supermarket and/or natural foods prices.

Product-Market	Median Price	Minimum Price
Lettuce		
Portland1 (Organic)	(*)	***
Portland2 (Org.)	***	***
TwinCities1 (Conventional)	***	***
TwinCities2 (Conv.)	(!)	(*)
Blueberries		
Portland1 (Conv.)[3]	***	***
Portland1 (Org.)[3]	(*)	(*)
Sacramento1 (Conv.)[3]	***	***
Beef		
Portland1 (Grass-fed)	(!)	(*)
Syracuse (Natural)	!!!	(*)
TwinCities1 (Natural)	**	***
TwinCities1 (Rib-eye)	(!)	***
Apples		
DC ("Local")	(!)	***
DC ("Popular")	(*)	***
Portland2 (Fuji)	(!)	***
Sacramento1 (Fuji)	!!!	!!
Sacramento2 (Fuji)	!!!	(!)
Syracuse (Empire)	(!)	***
Syracuse (Fuji)	(!)	***
Syracuse (Gala)	!!!	!!!
Syracuse (Golden Delicious)	(!)	**
Syracuse (Red Delicious)[4]	(*)	*
TwinCities1 (Haralson)	!!!	**
TwinCities1 (Honeycrisp)	!!!	(!)

KEY:

*** = Expected relationship**

*** p < 1%

** p < 5%

* p < 10%

!!! = Unexpected relationship

!!! p < 1 %, etc.

(*) (!) = Non-significant relationship; direction indicated.

NOTES:

1. Expressed as ln(NVEND).
2. Regressions were carried out using both the median and minimum prices, and their logs. Results of the level and log models varied negligibly. Results here are for the log model, which allows for comparisons of elasticities across products.
3. These regressions do not include supermarket price data, which was suspect given wide range of carton sizes.
4. This is the only regression which includes a significant result for $\beta_{\ln NVEND}$, but does not have an overall regression significance < 5% (P > |F| = .2238).

In the case of median prices, higher numbers of vendors are significantly associated with a lower price in five markets. These cases are concentrated in lettuce and blueberries. In six markets, a significant contrary relationship is found: more vendors selling the product are related to *higher* prices faced by the shopper. These cases are exclusively in beef and apples. Where these correlations exist, both predicted and contrary, they are unambiguous, with all but one significant at $p < 1\%$. These strong statistical relationships are particularly noteworthy given the small sample sizes involved. In just over half of the analyzed markets, no statistically significant relationship was found for the median price dependent variable.

In the case of minimum prices, an overall pattern is more evident. In 15 markets, the expected relationship is found at a statistically significant level: the minimum price in the FM falls with more vendors. Just two markets, both in apples, display a contrary significant relationship. As with median results, where a statistically significant relationship exists it is generally highly significant. Notably all markets in lettuce, blueberries and beef (including those not statistically significant) display a vendor-price relationship in the expected direction.

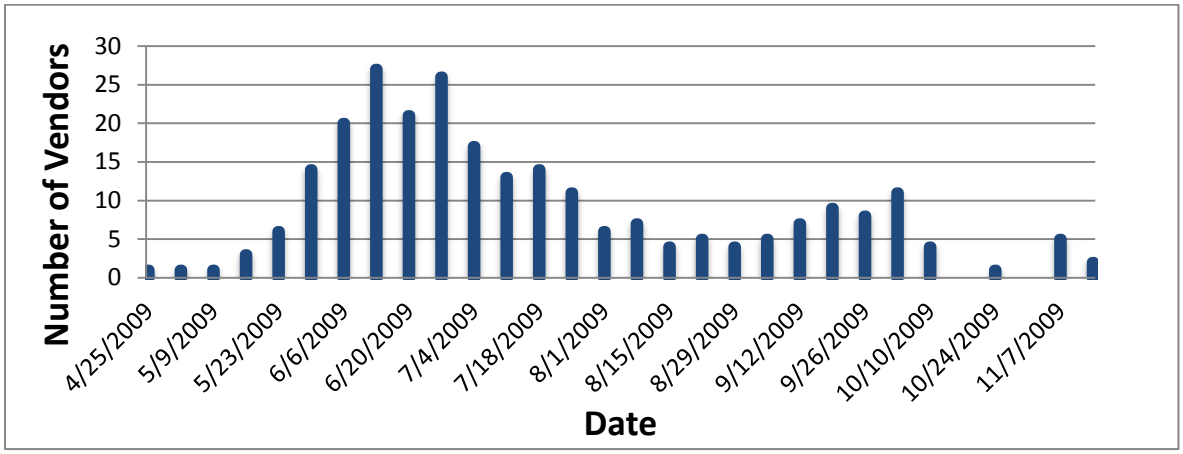
With the exception of one market (as noted in Table 2) all regressions where $\beta_{lnNVEND}$ was found to be significant were themselves found to be statistically significant overall (via F-tests for overall significance) suggesting that the number of vendors is an important component of prices in these markets – especially given the weak results for control variables, discussed below.

Figures 1 through 3 show graphical results for a market representative of those that "worked" – where the hypothesized relationship was evident. The market for

conventional (i.e. non-organic) lettuce in TwinCities1 showed highly significant vendor-price relationships at both the median and minimum price levels.

Figures 1 and 2 respectively show the vendors and prices as recorded by date (observations were made weekly). In Figure 1, it is notable that while vendors do peak in June and July, they continue to fluctuate somewhat through the season.

FIGURE 1: VENDORS BY DATE (TWINCITIES1, LETTUCE)



In Figure 2, it is notable that after the first days of the season, no significant pattern is discernible (trend lines fitted to the data here register minimal R^2 values).

FIGURE 2: PRICE, BY DATE (TWINCITIES1, LETTUCE)

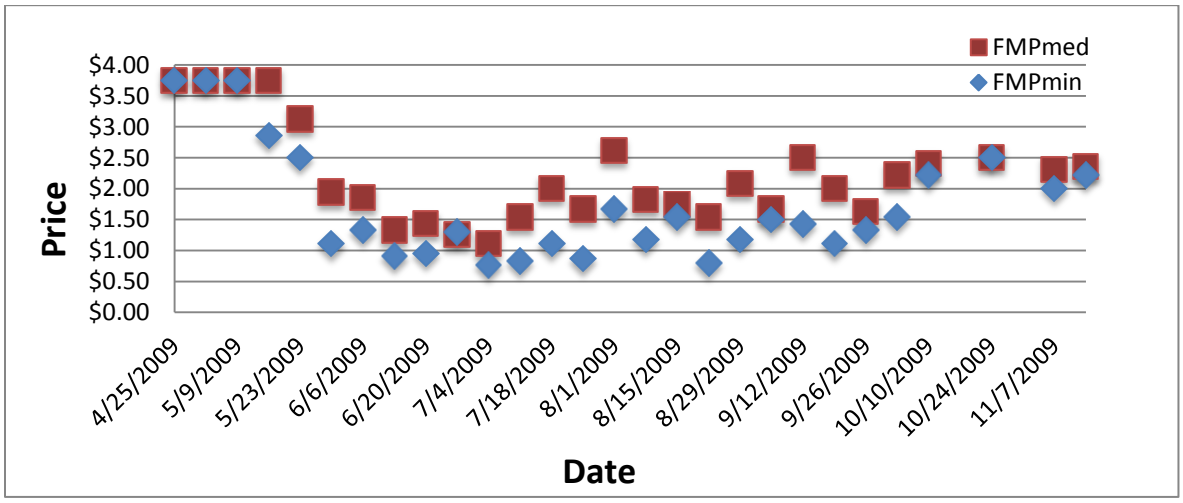
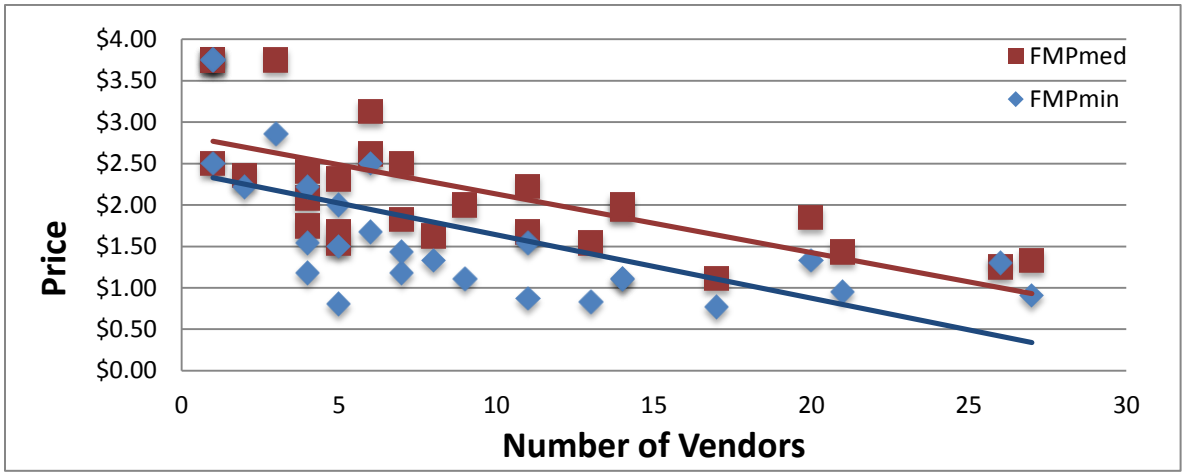


Figure 3 shows the tested hypothesis, between vendor numbers and price. As vendor numbers increase, lettuce prices decline considerably and more-or-less continuously, from a median of $3.75/lb. when just one vendor is in the market (this outcome occurs twice) to a median of $1.33/lb. when 27 vendors are in the market.

FIGURE 3: PRICE, BY VENDORS (TWINCITIES1, LETTUCE)



It is interesting to note, as an anecdotal example, that this "peak" 27-vendor day, June 20, is bracketed by observations with 20 and 21 vendors, respectively. If seasonal factors were determining the price in the market, overriding any competitive factor, one might expect no particular change in price through this peak seasonal period. Median prices, however, are higher on both days than on the (higher vendor) day in the middle. (The next week, when vendors surge again to 26, as expected the prevailing price falls again.)

Next I present a similar set of charts for a market that does not "work" as we might expect. Apple markets in the Syracuse FM were one area where the alternative hypothesis was not consistently evident in the data. For Fuji apples, for example, the median price relationship was not statistically significant, while the minimum price relationship was.

FIGURE 4: VENDORS, BY DATE (SYRACUSE, FUJI)

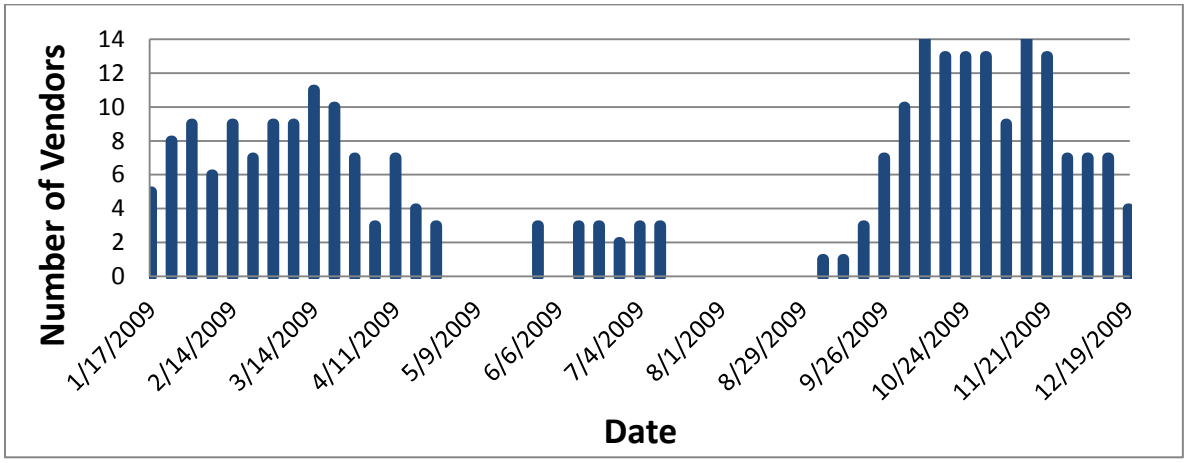
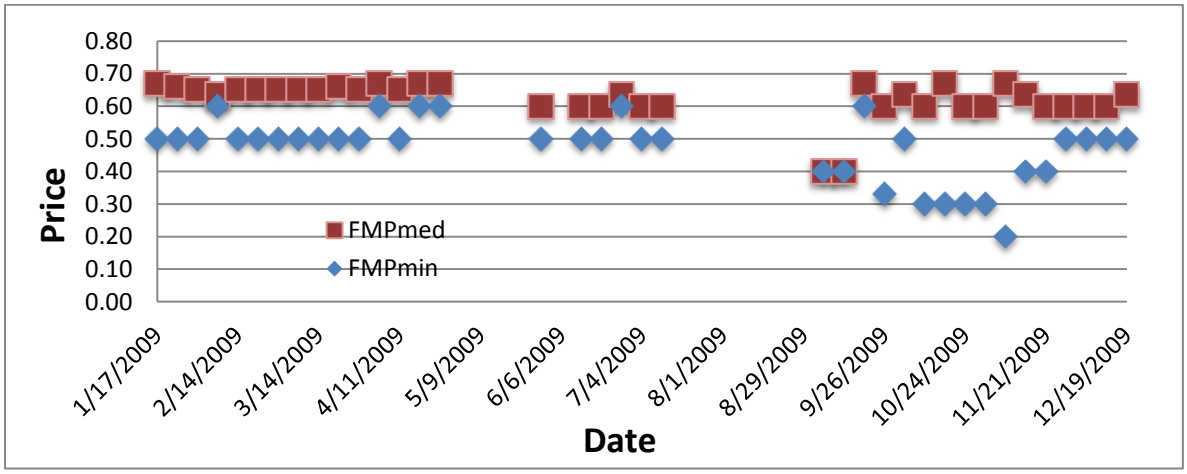
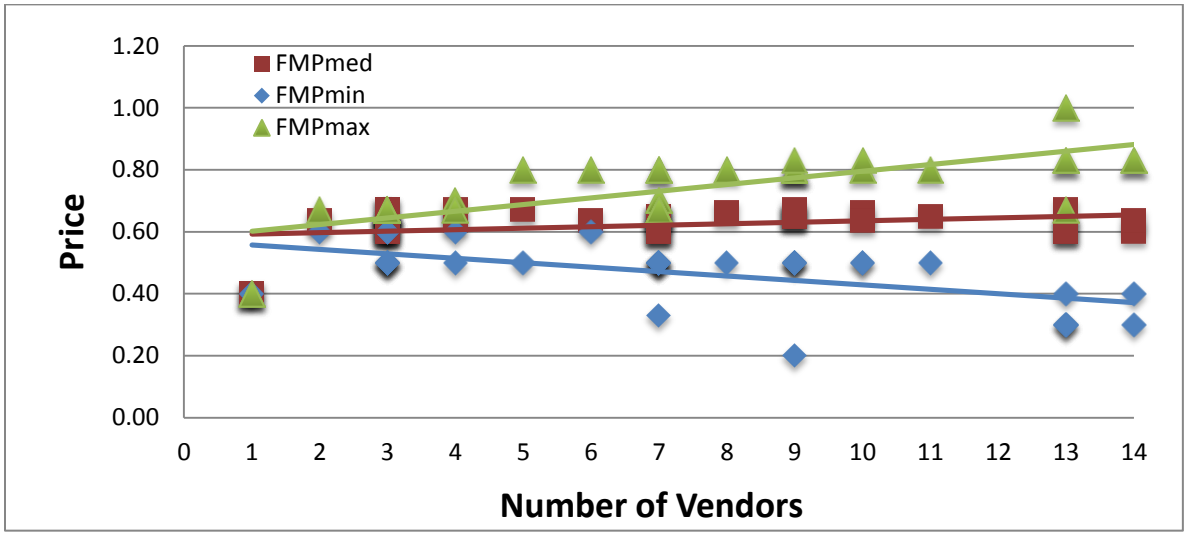


FIGURE 5: PRICE, BY DATE (SYRACUSE, FUJI)



While vendor numbers do vary from week to week, prices remain highly stable through the first half of the year. Fuji apples actually disappear from the Syracuse FM during two periods. When they return in the late part of the year, vendor numbers show a patterned increase. Minimum prices do descend as the market gets most crowded with vendors. Median prices, however, do not. Figure 6, below, by also including this time the FM *maximum* price observations, helps explain why.

FIGURE 6: PRICE, BY VENDORS (SYRACUSE, FUJI)



While minimum prices show a gradual decrease with vendor density, the maximum price – in the same FM, for the same product – more or less mirrors it in the opposite direction. While some vendors are lowering their prices in a market more crowded with sellers, others are raising them;[1] the derived median naturally splits the difference. This is a dynamic common to a number of the markets in which median prices show no movement, or even modest upward movement, with vendor numbers.[2]

As might be expected for different products in different selling environments, the scale of the relationship between vendor numbers and price varied considerably across the markets in this sample. Table 3 contains the regression coefficients for those 20 markets in which there is a statistically significant relationship. Given the log-log structure of the regression, these are approximate elasticities.

[1] Alternately, or concurrently, new sellers may be entering the market with lower and/or higher prices.
[2] Observations like this prompted an analysis for all 23 markets of the "spread" – how the gap between minimum and maximum prices changes with vendors, and over time. While a distinctive spread pattern helps explain markets like the one above, a survey of spread charts for the full set of markets showed considerable variation with no other discernable patterns, and offered no broader insights worth inclusion here.

Table 3 also contains estimates of the theoretical, asymptotic limits of the FM product price variables. These suggest the point that prices would approach, based on this data, as the number of vendors becomes arbitrarily large. These are obtained from a linear, inverse regression (see Table 3, Note 5).

TABLE 3: COEFFICIENT SIZES AND LIMITS

Where findings were significant, how strong were the effects? To what point were they trending?

Product/Market	Median Price[1]	Min. Price[2]	Median Limit[5]	Min. Limit[5]
Lettuce	$\widehat{\beta}_{\ln NVEND}$			
Portland1 (Org.)		**-0.231**		$1.23
Portland2 (Org.)	**-0.287**	**-0.365**	$1.13	$0.93
TwinCities1 (Conv.)	**-0.277**	**-0.420**	$1.70	$1.03
Blueberries				
Portland1 (Conv.)[3]	**-0.245**	**-0.355**	$2.56	$1.83
Sacramento1 (Conv.)[3]	**-0.258**	**-0.465**	$8.94	$6.16
Beef				
Syracuse (Natural)	**0.106**		$4.73	
TwinCities1 (Natural)	**-0.059**	**-0.251**	$4.35	$3.42
TwinCities1 (Rib-eye)		**-0.171**		$9.67
Apples				
DC ("Local")		**-0.117**		$1.52
DC ("Popular")		**-0.096**		$1.91
Portland2 (Fuji)		**-0.330**		$1.26
Sacramento1 (Fuji)	**0.074**	**0.044**	$2.03	$1.94
Sacramento2 (Fuji)	**0.197**		$1.36	
Syracuse (Empire)		**-0.250**		$0.46
Syracuse (Fuji)		**-0.128**		$0.48
Syracuse (Gala)	**0.341**	**0.156**	$0.79	$0.58
Syracuse (Golden Del.)		**-0.172**		$0.43
Syracuse (Red Del.)[4]		**-0.103**		$0.50
TwinCities1 (Haralson)	**0.096**	**-0.128**	$1.67	$1.21
TwinCities1 (Honeycrisp)	**0.093**		$2.39	

Key:

Expected (inverse) relationship

Unexpected (positive) rel.

Coefficients are for the log-log model, and thus represent approximate elasticities.

Notes:

1. Dependent variable: ln(FMPmed) regressed against ln(NVEND) and controls of logs of conventional market prices.
2. Dependent variable: ln(FMPmin) regressed against ln(NVEND) and controls of logs of conventional market prices.
3. These regressions do not include supermarket price data, which was suspect given wide variation in carton sizes.
4. This is the only regression which includes a significant result for $\beta_{\ln NVEND}$, but does not have an overall regression significance < 5%. (P > |F| = .2238).
5. Using the level regression FMP(med or min) = β_0 + β_1/NVEND ; the price will approach a limit at β_0 as NVEND grows toward ∞.

At the top of the list, to choose an example: as the number of vendors selling lettuce in Portland1 rises by one percent, the associated decrease in minimum price is 0.23 percent. In the FM context, it is perhaps more useful to talk in terms of doubling: as the number of vendors doubles, the decrease in price is 23 percent. Another example, at the elastic extreme, is the market for blueberries in Sacramento1, which sees median price decrease more than 25 percent with a doubling of vendors, and minimum price fall by almost half. On the "contrary" extreme, Gala apples in Syracuse show median and minimum price *increases* of 34 and 16 percent, respectively, for a doubling of vendors.

A quick calculation using absolute values confirms what the eye would suspect: lettuce and blueberries are the more elastic products here, followed at a considerable distance by beef and apples (the specific rankings vary depending upon whether median or minimum regression results are the basis for comparison). The presence in beef and apples of elasticities with opposing signs muddies this comparison somewhat, though it remains a fair assessment to say that lettuce and blueberry prices appear considerably more vendor-sensitive.[1] Focusing only on the consumer-welfare-maximizing outcome (lower prices following higher competition), the consistency and magnitude of the effects are thus most notable in the more perishable products.[2]

The price limits reported in Table 3 are of some minor interest. The differences in regional pricing are clearly apparent: note the bargain blueberries in Portland (as compared to Sacramento) and apples in Syracuse. In the large majority of cases, where prices are descending (rather than ascending) to the limit, the limits might be roughly thought of as the best price consumers might get if space were unlimited and vendors increased freely. For the majority of markets here, which appear to "work" as a classic

[1] This statement should be further conditioned by recalling that Table 3 excludes the three markets with no statistically significant result: one each of lettuce, blueberries and beef.
[2] One isolated exception is a decline at the minimum price level for ground beef and steak in TwinCities1.

Cournot-oligopoly-with-differentiation-and-search-costs might, the limit figures in Table 3 might be our best approximation – given available data – of a competitive equilibrium.

Price coupling: Individual market results, and some discussion

In addition to the primary question of price competition among vendors, the data allow a look at what relationship, if any, FM prices might have to those recorded on the same day in nearby "conventional" shopping venues: supermarkets and natural foods stores. Table 4 shows where these significant results were found, along with two other measures of relative pricing. Note that when looking for price coupling, the alternate hypothesis now posits a *positive* relationship between the key variables.

TABLE 4: ARE FM PRICES COUPLED TO PRICES IN CONVENTIONAL MARKETS?

Relationships between FM[1] and supermarket prices[2] (controlling for vendor numbers)

Product/Market	Median FM Price	Min. FM Price	Avg. FM Premium[5]	Days FM less exp.
Green-leaf Lettuce				
Portland1 (Org.)[3]	!	**	16%	26%
Portland2 (Org.)[3]	***	***	-1%	65%
TwinCities1 (Conv.)	(!)	(!)	6%	57%
TwinCities2 (Conv.)	(*)	(*)	1%	53%
Blueberries[4]				
Beef				
Portland1 (Grass-fed)	(*)	(*)	-6%	81%
Syracuse (Natural)	(!)	(!)	10%	11%
TwinCities1 (Natural)	(!)	(*)	13%	15%
TwinCities1 (Rib-eye)	(!)	!	1%	59%
Apples				
DC ("Local")	(!)	***	47%	0%
DC ("Popular")	!!	(*)	-12%	63%
Portland2 (Fuji)	(!)	(!)	56%	0%
Sacramento1 (Fuji)	(*)	(*)	12%	27%
Sacramento2 (Fuji)	(*)	(!)	-30%	92%
Syracuse (Empire)	!!	!!!	-52%	100%
Syracuse (Fuji)	(*)	(*)	-66%	100%
Syracuse (Gala)	!!!	!!!	-54%	100%
Syracuse (Golden Del.)	(*)	(*)	-66%	100%
Syracuse (Red Del.)	(*)	(*)	-54%	100%
TwinCities1(Haralson)	(*)	!!	8%	54%
TwinCities1(Honeycr.)	!	(!)	19%	89%

KEY:

*** = Expected (positive) relationship**

*** p < 1%

** p < 5%

* p < 10%

!!! = Unexpected (neg.) relationship

!!! = p < 1%, etc.

(*) (!) = Non-statistically significant relationship; direction indicated.

NOTES:

1. Consistent with the price competition results, these results reflect regressions using the natural logs of all variables.
2. Logs of the median supermarket prices were used, with one exception (note 3). Med. and min. store prices were often identical or moved in tandem; regressing on both was unnecessary.
3. Median natural foods store prices used.
4. These regressions do not include store price data, which was suspect given wide range of carton sizes.
5. Mean % difference between daily FM median and SM median. Positive % indicates FM prices > SM prices.

In the price competition regressions, the medians of conventional market (supermarket and/or natural foods store) prices were included as control variables. Table 4 simply reflects where significant results were found for the coefficients on those regressors. In most cases this means the supermarket price, though in the case of one organic product, natural foods data was more complete. Note that blueberries could not be subjected to this level of analysis, as their conventional market data was not useable.

The results are underwhelming. In only one market do we find the relationship we might expect if coupling existed: the median prices of organic lettuce in FM Portland1 track the prices found in the local natural foods stores. In a few more cases the *minimum* FM price moves in a statistically significant, positive way with the conventional market price. But in the vast majority of analyzed markets the relationship is either non-discernible or inverse. Viewed in sum, these results give very little indication that FM and conventional market prices are coupled to one another in any generalizable way.

The reasons for this may vary, but in many cases the culprit may be the lack of variation in conventional market prices. Whereas FM prices will fluctuate from week to week, store prices often do not. While store prices are not completely static, they tend to plateau for weeks at a time, adjust, and plateau again. When one variable moves very little, it should not be surprising to find a lack of significance in regression results.

Aside from the regressions, two other calculations were performed to seek additional price-comparison insights from these data. The first measure considers whether products in the FM typically enjoy a premium price over their store-bought counterparts, or represent a discount. For each observation-day the percentage difference between the median FM price and median store price was calculated, using the store price as the base. These values were then averaged over the full sample of days for that market. By this measure, for example, natural ground beef at TwinCities1 was 13 percent more expensive than the average in nearby supermarkets, on average.

The second measure looked for each observation-day at whether the FM median price was lower than the store price. The cumulative measure states what percentage of days in the sample this was true. In this same example, the ground beef on offer in TwinCities1 was cheaper on only 15 percent of days.

The variety of results for both measures offers no categorical support for the notion that FM prices are either higher or lower than those in other venues. In lettuce and

beef, the average price differences are relatively small – negligible in many cases. Though they don't collectively amount to much, there are some isolated examples of patterns in individual markets: shoppers in Portland1 generally pay more for organic lettuce than store-bought, but less for grass-fed ground beef. By comparison, natural ground beef enjoys a fairly consistent premium in the Syracuse and TwinCities1 FMs.

Within apples, the magnitudes render insights more worthy of a shopper's consideration. Apples (Fuji, at least) are always much more expensive than store-bought in Portland2; they are consistently much less expensive in the Syracuse FM. In Sacramento, one FM consistently beats the store price, while the other generally exceeds it. And in DC and TwinCities1, an interesting pattern emerges: the more distinctive, "local" variety of apple is consistently more expensive than store-bought, whereas a more generic variety hews closer the supermarket price.

In summary: Unlike the regression coefficient results for vendor price competition, the individual market results for price coupling are clearly insufficient to reject the null hypothesis. In other words, there is no apparent connection here between FM and supermarket prices. The results of the non-regression measures similarly suggest little in the way of generalizable patterns: according to these data, shopping at the FM is neither a better nor a worse deal, in any categorical sense, than shopping at the store. Given the nature of these results, a meta-analysis of the price-coupling hypothesis would be gratuitous, and will be foregone here.

6. Price competition: meta-analysis results

While the full dataset was pulled apart into the 23 markets above, in order to sidestep unrecorded and thus endogenous factors across FMs, meta-analysis techniques allow me to "put it back together again" and check for significance across the results. The goal is not to settle on a universal vendor-price elasticity number (though such a number does arise from the analysis). The results above show that interpreting the meta-analysis in this way, across different products and FM contexts, would not be very useful. Rather, the objective is to:

> 1) quantitatively confirm whether the overall pattern of results across markets is significant (i.e. could chance alone have served up the market results we see above?);
>
> 2) assess the general direction of this pattern, and its strength (particularly as median price results compare to minimum price results);
>
> 3) compare the different directions and strengths of the vendor-price effect in different critical subgroups (in this case, perishable and non-perishable products).

The meta-analysis approach here is thus a so-called "random effects model" (as opposed to the "fixed effects model") wherein true effects are presumed to vary from study to study, and we are seeking insights into the distribution of those effects (Borenstein et al. 2009).

Admittedly, applying meta-analysis to one's own dataset is a novel approach. Meta-analysis was developed for the much more common empirical desire to glean collective insights from disparate studies. But in this case, the fact that each of my separate "studies" was conducted under an identical study design in fact permits a straightforward method of meta-analysis that is not typically practical in a conventional setting. I follow techniques as laid out by Becker and Wu (2007) and Cooper (2010), both of whom credit aspects of their approach to Hedges and Olkin (1985). In application, the

three techniques I apply turn out to corroborate one another and offer their own nuanced insights into the vendor-price relationship.

The first technique, as described in Becker and Wu (2007), uses a weighted least squares formula to synthesize the slopes of our variable of interest – in this case, $\beta_{lnNVEND}$. The authors state three simple but often unattainable conditions that must be met for slope synthesis methods to be applied. These conditions also apply to the Cooper (2010) method described below. First, the dependent variable must be measured similarly across studies. Monetary outcomes are one example where this condition is typically met; so it is in this case, where the dependent variable is price. Second, the "focal" independent variable must be measured similarly. In this case, we are dealing in all markets with a simple count of vendors. Finally, other (control) variables must be the same – a condition that "is virtually never met" in typical meta-analysis: researchers have the results of studies using various sets of variables, and rarely do they have the ability to re-run the original regressions using a common vector of controls.

In this atypical context, however, I do have that ability. Exercising it means reducing all regressions to the simplest common functional form. In this case, this is the univariate regression for blueberries (where store-bought carton size variation made supermarket and natural foods data unusable). All regressions are re-run in univariate form ($\boldsymbol{lnFMPmed_t = \beta_0 + \beta_1 lnNVEND_t + \varepsilon}$ and $\boldsymbol{lnFMPmin_t = \beta_0 + \beta_1 lnNVEND_t + \varepsilon}$). In most cases, the results are very similar to the multivariate regressions. However, five apple markets do see changes for $\boldsymbol{\widehat{\beta}_1}$ in significance and/or direction.[1] In the most dramatic case this change was the result of a large increase in observations: "local"

[1] Summary of multivariate→univariate changes in results:
Portland2 Fuji median: nonsignificant contrary (!) to nonsignificant expected (*)
Syracuse Red Delicious minimum: significant expected @ 10% * to nonsignificant expected (*)
TwinCities1 Honeycrisp minimum: nonsignificant contrary (!) to significant contrary @ 5% !!
DC "Popular" median: nonsignificant expected (*) to significant contrary @ 5% !!
DC "Local" median: insignificant contrary (!) to significant expected @ 5% **

apples in Washington D.C., in particular, were much more often available in the FM, so dropping supermarkets from the regression increases *n* from 15 to 37 and generates a significant result where previously there was none. Given the much larger *n*, this univariate result could be considered a more informative estimate than the multivariate one reported in the individual market results above (particularly considering that price coupling was insignificant in this market). Other changes where statistical significance was gained or lost at the margin are not troublesome for slope-synthesis, which takes no account of significance, per se, of individual studies.[1]

For each separate regression *i* and its estimated β_{lnNVEND} coefficient $\hat{\beta}_i$, Becker and Wu (2007) prescribe a weight w_i equal to 1/Variance($\hat{\beta}_i$), the variance being both a function (positively) of variability in the data and (negatively) of sample size. Thus the formula for the synthesized "meta" slope *B* is:

$$B_{lnNVEND} = \frac{\sum_{i=1}^{k} w_i \hat{\beta}_i}{\sum_{i=1}^{k} w_i}$$

The variance of *B* is defined as:

$$Var(B_{lnNVEND}) = \frac{1}{\sum_{i=1}^{k} w_i}$$

The standard error for the synthesized slope is thus the square root of this variance.[2]

In addition to applying the formula to the total set of regressions, I apply it to two subgroups: lettuce and blueberries (which I am defining as the "perishable" subgroup)

[1] Indeed the only somewhat troubling change among this batch seems to be "popular" apples in DC. Looking at the data reveals highly static FM median and minimum prices throughout the season, even as vendors come and go. Predictably, this means that even though the vendor-price effect may be statistically significant, it is very small (i.e. close to zero). As such, its effect on the meta-analysis result should likely be negligible.

[2] As Becker and Wu (2007) note, the weights w_i are directly related to sample size via the standard error terms. Thus the $\sum w_i$, and by extension *Var(B)*, should not be additionally conditioned upon *n*. For an application of this slope-synthesis technique in practice, see Bini, Coelho and Diniz-Filho (2001).

and beef and apples (the "nonperishable" subgroup[1]). For median FM price regressions, the results look like this:[2]

TABLE 5: MEDIAN PRICE SLOPE SYNTHESIS

	Total (*n*=23)	Perishable (*n*=7)	Nonperishable (*n*=16)
Slope ($B_{lnNVEND}$)	**0.028**	**-0.112**	**0.040**
Standard Error	(0.004)	(0.014)	(0.004)
P-value	≈ 0	≈ 0	≈ 0

The overall result is contrary, but small: vendor numbers do not relate to large swings in median price, as a general rule. This total effect seems to be the mathematical wash-out between a decent-sized expected effect for perishable products (a negative elasticity of 11%) and an overall contrary effect for nonperishable products (whose heavier representation in the overall sample clearly outweigh their moderate effect size).

Not surprisingly, the minimum FM price regressions show a different pattern:

TABLE 6: MINIMUM PRICE SLOPE SYNTHESIS

	Total (*n*=23)	Perishable (*n*=7)	Nonperishable (*n*=16)
Slope ($B_{lnNVEND}$)	**-0.075**	**-0.332**	**-0.040**
Standard Error	(0.007)	(0.021)	(0.008)
P-value	≈ 0	≈ 0	0.003

Even for nonperishable products, the minimum price generally moves in the direction we would expect with a higher number of vendor competitors. With minimum prices, the effect for perishable products is now quite strong: a doubling of vendor numbers corresponds with a 33 percent drop in minimum price, for the subset as a whole.

[1] Apples are a hardy fruit that can last 90 days or longer if stored properly, though self-life varies somewhat by variety. In this data, at least, ground beef and rib-eye steak are always sold at FMs in frozen form, thus are treated as nonperishable.

[2] The same shading is used in this section, as with the tables of individual market results above, to highlight effects in the expected (i.e. price falls with vendors) and contrary directions.

A second technique from Cooper (2010) is similar, but instead uses r-index (correlation) coefficients rather than the $\hat{\beta}_i$ values. Instead of performing OLS univariate regressions, correlation matrices are generated for each of the 46 median price-vendor and minimum price-vendor relationships.[1] These r-index values are then turned into z-scores by way of a Fisher transformation.[2] The z-score for each correlation, z_i, is weighted by sample size – more specifically, by $(n_i - 3)$[3] – to determine a synthesized *Z*:

$$Z_{\$corrNVEND} = \frac{\sum_{i=1}^{k}(n_i - 3)z_i}{\sum_{i=1}^{k}(n_i - 3)}$$

A 95 percent confidence interval (CI) is found through the following formula:

$$CI_{Z95\%} = Z_{\$corrNVEND} \pm \frac{1.96}{\sqrt{\sum_{i=1}^{k}(n_i - 3)}}$$

As a final step, an inverse Fisher transformation turns these meta *Z* values back into synthesized r-index values, *R*. Here are the results:

TABLE 7: MEDIAN PRICE CORRELATION SYNTHESIS

	Total (*n*=23)	Perishable (*n*=7)	Nonperishable (*n*=16)
***R* (median price and *NVEND*)**	**0.147**	**-0.566**	**0.346**
95% confidence interval	(0.070, 0.223)	(-0.671, -0.438)	(0.266, 0.422)

The directions, predictably, are the same as in the slope synthesis model. The correlation for the sample as a whole is quite low, naturally, given its conflicting component parts.

[1] For this technique, in keeping with the intuitive notion of correlation – and because elasticities are no longer relevant – the non-logged values of prices and vendor numbers were used. In the notation in the equation, the "$" symbol stands in for both dependent variables (median and minimum price).
[2] Because r-index (correlation) values are by definition constrained to [-1, 1], sample estimates begin to take on non-normal distributions as population values approach these endpoints. The standard practice is to normalize correlation coefficients by transforming them into z-scores (a "Fisher transformation").
[3] The use of (n-3) to determine degrees-of-freedom in the context of correlation is not intuitive. It was first derived by Fisher (1921), codified again in Snedecor and Cochrane (1967) and has since been a staple of such meta-analysis.

Viewing the meta-results in terms of correlations makes clear that the negative relationship for perishable products is considerably more powerful than the positive one for the nonperishable subset. In other words, vendor competition is more a general rule, and it is generally stronger, for products like lettuce and blueberries, whereas the sort of "anti-competition" indicated across markets like apples and frozen beef is less consistent.[1]

The correlations for the vendor-minimum price variables are:

TABLE 8: MINIMUM PRICE CORRELATION SYNTHESIS

	Total (*n*=23)	Perishable (*n*=7)	Nonperishable (*n*=16)
***R* (minimum price and *NVEND*)**	**-0.423**	**-0.769**	**-0.290**
95% confidence interval	(-0.486, -0.356)	(-0.830, -0.689)	(-0.370, -0.207)

As before, when considering minimum market prices both subsets – and thus the full sample – express the expected relationship. The correlation is much stronger for the perishable products – indeed, it is quite strong in an absolute sense. The power of this relationship for blueberries and lettuce is enough to pull the full-sample result into stronger territory, notwithstanding the predominance of nonperishable markets in the overall dataset.

As cautioned earlier, the full-sample meta-analysis results should be interpreted conservatively, given the heterogeneity of FM products and the observed effects. But under an intuitively reasonable assumption that perishables make up the majority of products consumers purchase at FMs, these results do suggest that vendor-price

[1] Glancing back at the individual market results, the median price regressions for the nonperishable subset contained one statistically significant exception (ground beef in TwinCities1) and a much higher proportion of markets in which no statistically significant relationship was evident.

competition exists in the FM venue in a general sense. This finding applies convincingly in the realm of minimum prices, and to a less powerful extent in median prices.

A final "homogeneity analysis" technique was applied to the set of regressions, as defined in Cooper (2010) and credited in-part to Hedges and Olkin (1985). My treatment here will be abbreviated, as the process is lengthy and ultimately corroborates the previous subgroup meta-analyses. The first stage of the homogeneity analysis tests for whether the range of results found could be a product of chance alone. If not, the implication is that something systematic is causing the variation within the results. The second stage then considers whether particular, user-specified subgroups are significant in explaining the sample-wide variation. Essentially, the process compares the homogeneity within subgroups to the homogeneity of the full sample, and then renders a best-verdict on whether those subgroups are accountable for the variation.

The process can be carried out using the weighted z-transformations of correlation coefficients, as derived for the correlation synthesis above. The output takes the form of so-called "Q-statistics" which are evaluated for significance against a chi-square distribution.[1] For this dataset, the first stage of the homogeneity test generates full-sample Q-statistics that are highly significant for both median and minimum prices. This indicates the near-certainty of some source of nonrandom variation across markets.

TABLE 9: HOMOGENEITY ANALYSIS SCORES (OVERALL)

	Median prices	Minimum prices
Q_t	**306**	**167**
$p(\chi^2)$ with 22 *d.o.f.*[2]	≈ 0	≈ 0

As might be expected, the number is higher for the median price regressions, where there is a wider difference in "behavior" between the perishable and nonperishable subgroups.

[1] For a full explanation, see Cooper (2010) p. 185-189. The statistic denoted Q_t denotes the statistic used for the first stage (full-sample) test; Q_b denotes the second stage (subgroup significance) test.
[2] The full sample includes 23 separate regressions, thus 22 degrees-of-freedom.

When the perishable and nonperishable subgroups are specifically tested against the homogeneity of the full sample, this second-stage test flags these groupings as extremely significant in explaining the variation in the full sample.

TABLE 10: HOMOGENEITY ANALYSIS SCORES (SUBGROUPS)

	Median prices	Minimum prices
Q_b	**104**	**53**
$p(\chi^2)$ with 1 d.o.f.[1]	≈ 0	≈ 0

Thus while we might imagine other possible subgroups within this sample, the homogeneity analysis would seem to confirm that these two subgroups (lettuce-blueberries and beef-apples) are extremely powerful in explaining the differences among markets when it comes to vendor-price relationships. The added value of the homogeneity test is that it provides strong reassurance that considering products along these lines is a valid line of inquiry.

[1] For the second-stage test, degrees-of-freedom are determined by the number of subgroups tested; in this case, two.

7. Discussion: revisiting the conceptual framework in light of results

In broad strokes, the data suggest this: In markets with a certain level of size and activity,[1] *minimum* price competition is common. As markets grow, new vendors enter with lower prices and/or some existing vendors lower their prices. The *median* market price, however, descends less reliably as the number of vendors increases. In some cases, there is not enough overall movement among vendors to move the general price level to a statistically significant degree. In other cases, countervailing vendor price *increases* offset new or existing entrants who lower their prices. Both price competition effects – minimum and median – are stronger for perishable products than for non-perishable ones.

With regard to the price-coupling hypothesis: the prices in FMs and conventional grocery outlets, at least for the products examined here, appear to be essentially unrelated. This is an interesting and important finding of this research, as it confirms FMs are indeed a market apart, operating according to their own dynamics, rather than a quaint offshoot of the mainstream retail grocery industry. Without minimizing the import of this insight, it is a non-result and thus interpretation of it is quickly exhausted. As such, the remainder of this section will focus on the price competition results.

Before proceeding, some thoughts about causality: Given the non-experimental design and limited controls afforded by the data, the analysis here is necessarily correlational. We can say what price relationships appear to pertain when more or fewer vendors are selling a product. What we cannot say, at a level beyond informed speculation, is the extent to which vendor competition alone is responsible for these price changes. For example, seasonality and vendor numbers are likely correlated, with seasonal factors exerting some effect both on vendor numbers (up) and directly on price

[1] Recall that from the full dataset, only product-markets meeting minimum thresholds for observations and variation in vendor-count were subjected to regression analysis.

(conceivably up or down[1]). A future study might more thoroughly control for seasonal effects.

However, two factors give some comfort in contemplating the vendor/price hypothesis. First, controlling for conventional store prices – a possible proxy for seasonal factors, if they exist – made a minimal difference in the regression outcomes (as compared with their univariate versions). Indeed, the price-coupling results themselves showed FM and grocery prices bear essentially no relation to each other. Second, it is not at all evident that FM prices follow any predictable or intuitive seasonal pattern. Consider, for example, a market such as lettuce in TwinCities1. There is no significant relationship between price and date.[2] Yet the market shows an unmistakable vendor-price relationship at both the median and minimum levels. In this and other markets, prices and vendor-count often move together when no discernible seasonal effect exists.

Secondly, FMs in the same city – perhaps one larger, one smaller, as in the Twin Cities – can see vastly different effects during the same season, with the larger FM seeming to display a much more competitive price environment. While these observations still leave this study far short of asserting any specific degree of causation, they strongly suggest vendor-count has some important effect on price aside from any associated seasonal effect.

Other FM-specific factors likely mediate the degree to which vendor-count might drive prices down: FM size, layout, policies, clientele demographics, etc. The meta-analysis approach of this paper was designed to peer through the cloud of these many confounding factors. It does give us a view of the relationship that we would not otherwise have. The technique does not, however, address the extent to which these

[1] Why the conceivably mixed effect? Down: In-season, quantity rises and production costs may be lower. Up: In-season, product is generally of higher quality.
[2] If needed, the reader can refer back to the charts presented in Section 5.

factors might themselves affect vendor price competition. Surely they contribute to the variation in results we see from market to market.

This presents another challenge to asserting causality, of course. But it also suggests the most policy-relevant question for discussing these results: Where we do see variations in the degree of vendor-price competition – *why?*

To this end, I will revisit the "imperfect competition" factors laid out in Section 4, now in the context of the regression and meta-analysis results. I will supplement the discussion with information from an after-the-fact survey of the FM managers.[1] The survey responses add context to the theory and results, and help inform the handful of policy recommendations to follow.

Quantity-based competition (and a discussion of market size)

Perfect competition is typically an impractical assumption for the real world, and so it is with farmers markets. From the standpoint of consumer welfare, a basic Cournot dynamic may be a best-case scenario given the realities of the FM environment: competition is imperfect, but the shopper benefits from more of it.[2] If this dynamic exists, policy options for improving the lot of the consumer also become clearer.

The results found here lend support to a Cournot-like basis for FM competition, though only in the case of certain products and/or FM environments. While the minimum-price results are noteworthy, the more relevant results here are the median-price regressions: lettuce and blueberries (and one ground-beef market) see median prices descend as vendors increase.[3]

[1] The survey and the raw responses can be found in Appendix 2. Managers responded for all markets except Portland2. Detail and quality of responses varied.
[2] Additionally vendors still extract some surplus from selling in a limited market, which might satisfy the perceived "civic" impulse for FMs to bestow rents on the local farmers who participate.
[3] Note that the basic Cournot model does not explain or account for the presence of heterogeneous prices. For that, our additional conceptual factors are necessary.

One plausible explanation, borne out in the meta-analysis, is that these *products* are somehow categorically different from the others in the sample. The Cournot scenario emphasizes *quantities* produced or designated for sale at-market. It seems likely vendors of perishable products feel a greater need to "sell out the truck" on any given day, thus playing out the predicted theoretical storyline: these vendors who are more quantity-sensitive are "playing the Cournot game." On the other hand, vendors who can pack up their hardy apples and frozen beef for another day are likely playing some other game, less clearly defined.

An alternate, though not incompatible, notion is that something is categorically different about the *markets* themselves. One possibility: could vendor-price competition be more prevalent when markets have more selling days? In fact, however, length-of-season would seem not to be a factor: markets which had a significant and expected result (including that lone beef market) average the same number of observations as those with insignificant or contrary results.[1] Another notion might be that product-markets are more likely to show a Cournot price competition pattern as they get bigger. Indeed, competitive markets[2] do average a higher overall vendor count (4.6 compared to 3.6) and a higher peak level of vendors (approximately 10, compared to seven for the "non-competitive" group). However, one extreme value in the competitive group pulls up the average considerably.[3] So while intuition might suggest longer or larger markets are more competitive, only the second notion is weakly suggested from these results.[4]

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[1] Both groups averaged approximately 28 observations.
[2] "Competitive markets" are here defined as those which show a negative and statistically significant relationship between vendor count and median price.
[3] Lettuce in TwinCities1 is a particularly large market. At one point, vendor counts ranged into the high 20s.
[4] The presumption that *very* small markets are not competitive was built into the analysis, as product-markets with extremely limited observations or which never exceeded two vendors were not included. Given the actual data observed in these cases, this seems an appropriate assumption; however, the extent to which competition might exist or might be fostered in markets of only two vendors might make an interesting future study.

Could *overall* FM size be a factor? This is difficult to assess directly from the data; the total number of vendors *for all products* in a market on each observation day was not recorded. However, some specific intra-city comparisons might be informative. Conventional lettuce was sold, for example, in both TwinCities1 and TwinCities2. The former had significant vendor-price relationships at both the minimum and median levels; the latter had neither. TwinCities1 is generally about three times as large in terms of acreage, vendors and customers;[1] it also logged unusual competitive results for ground beef. TwinCities2, on the other hand, had only this one (lettuce) market with enough potential competitive activity to even merit inclusion in this statistical analysis. Similarly, Sacramento1 is more than twice as large as Sacramento2; the former had a competitive blueberry market, whereas the latter had no blueberry (or other perishable) markets large enough for analysis.

The modest evidence that bigger, more vibrant FMs and specific product-markets see a more competitive dynamic conforms with intuition: there are simply more neighbors from whom to feel price pressure. In a crowd it is also easier for a vendor who wishes to set a lower price to escape the ire of his colleagues (see the pressures illustrated in Griffin and Frongillo 2003). But the proof from this data is limited, and at the very least suggests size is but one of many important factors. Thus product-type (i.e. perishable or nonperishable) remains a potent possible factor, and the other aspects of our imperfect-markets model might offer further illumination.

Freedom of entry

Aspiring entrants to all the FMs in this sample face certain barriers. Since the product is food, all FMs require proof of licensing and almost all require a farm

[1] Overall averages, as reported by their managers. To avoid citation-clutter, FM-specific information in this and following sections can be presumed to come from survey answers or official FM documents (listed in References). Portland2 did not submit a follow-up survey response; however, vendor and other policies are identical to Portland1.

inspection.[1] Other common requirements include an in-person interview and, if the farm has employees, proof of workers compensation insurance. Applications must be accompanied by application fees, though most are modest ($50 is typical). Importantly, current vendors can typically renew for the following year without reapplying or with an expedited application process; new applicants line up behind them for what spaces, if any, remain.

Two application/qualification processes particularly stand out as more and less onerous than the rest. TwinCities2 requires vendors to accept a two-page "Sustainability Statement" specifying farming practices including no synthetic pesticide or fertilizer and no genetically modified seeds. On the other end of the spectrum, Syracuse is the only market that allows vendors from outside the local region, as well as vendors who are reselling crops they have not grown themselves.

The application window varies. On one extreme, Washington DC has been full for years and is essentially accepting no new applications. Some FMs (TwinCities2, both Portland FMs) take applications only during a one-month window each year. Others (TwinCities1 and Sacramento1) appear to accept applications year-round. Only Syracuse allows properly-credentialed vendors to apply in the morning and set up shop immediately, that same-day.

The data suggest more open entry may play some role in stoking competition. The one FM with essentially no entry, Washington DC, had no competitive markets at the median price level;[2] FMs with the greatest ease-of-entry (Sacramento1, TwinCities1) did have competitive markets. The comparison of TwinCities1 and TwinCities2 might again be helpful: the former, with much larger capacity and a less onerous process to accept

[1] The exception is Syracuse, which is unusual in more respects to be discussed below. References to these and other policies come from FMs' published vendor guidelines.
[2] Interestingly, this was the one market manager who rated her FM's vendor environment "quite competitive."

new entrants, seems a more competitive place overall. But as with market size, entry appears far from a complete explanation: competitive markets were present in FMs where entry would seem to be comparatively restricted (Portland). And they were lacking in Syracuse, where entry would seem to be freest of all.

This may be a factor of the types of products dominant in each place (perishables in Portland, apples in Syracuse – pulling in opposite directions from an expected entry-effect). It is also arguably true that entry is fairly restricted for *all* the FMs here, leaving a small amount of variation among policies. Other, more granular measures of freedom-of-entry – as divined from vendor surveys or some observed measure of "churn" – might provide more differentiation among FMs for future study. It is notable that *minimum*-price competition appears across most FMs, suggesting it is quite possible for isolated low-price vendors to enter or emerge. But as "special interest" economic models of licensing might suggest,[1] typical FM restrictions as seen here are likely to lead to inhibited competition and a higher general price level than otherwise.

Search costs and product differentiation

Are some FMs more difficult to search than others? Undoubtedly so, though this is a difficult thing to standardize and measure *ex post*. Where we find lower search costs, all else equal, we would expect greater price competition. Overall FM size could play an ambiguous role, as discussed previously.[2] The relative size of a product-market *within* a FM would seem to be more relevant: searching across prices (and quality) for ubiquitous products like lettuce and blueberries would be easier, all else equal, than comparing prices on products like beef, where fewer vendors might typically be more scattered.

[1] The classic critique of licensing as an entry barrier and exercise of market power is Friedman (1962).
[2] As noted in Section 4, presuming it is generally infeasible or impractical to search an entire FM, what would seem to matter most is the ease of/returns to searching within a given radius (defined by a given shopper's search tolerance). Two FMs of equal *total* size could have identical attributes within a given radius.

Interestingly, apples are a common product and yet there is little evidence of median-price competition. Recalling the theories relating to search costs and differentiability might help explain this. Following Anderson and Renault (1999) customers are more willing to search (their search cost tolerance is higher) for products that are more highly differentiable by quality or by some other means, such as advertising. Apples would seem to suffer on both scores: by dint of their considerable durability, apples might be difficult for shoppers to easily distinguish along quality lines. They are also more of a commodity product, often sold in bulk and arguably more difficult to differentiate through advertising. (As a shopper, when was the last time you considered your *brand* of apple?)

Compare this to the other "durable" product, frozen ground beef. Observation suggests beef vendors typically exert much more effort in branding and advertising, which might explain why at least one beef market shows significant competition.[1] In addition, an early reader of this paper astutely noted that apples, of all FM products here, are often easy to sample. If free samples are a standard part of the apple vendor's toolkit, this could well inhibit searching and thus price competition – "sample and stop." Searching-by-sampling takes longer and, perhaps more importantly, it establishes a social obligation (cost) that could inspire many shoppers to satisfice – especially if price is not the consumer's top priority.

Finally, contrast apples and beef with the perishable products that are arguably quite differentiable on quality: lettuce and blueberries. The results for these regressions in the sample suggest vendors are, in their pricing, considerably more sensitive to the amount of additional competition in the marketplace. This also conforms to theory: one would expect shoppers for more perishable produce to have a higher search cost

[1] Along with milk (which is not included in this analysis) beef products were the only one in the sample for which recorders were able to track specific brands. This conforms with this author's own anecdotal FM observations of beef and milk FM marketing.

tolerance, as the return-to-searching is greater. Thus the price competition for lettuce and blueberries would more closely hew to the "vendors up, price down" dynamic predicted by the Cournot model.

Of course, search costs *ceteris paribus* will still tend to raise prices. Another market-wide factor affecting search costs in a given market is the simple posting of prices. Consistently posted prices would decrease the cost/increase the return to searching, thus fostering competition. While most FMs offer very little guidance on advertising in the vendor's own stall space,[1] most explicitly require posting of prices. TwinCities1 and Syracuse do not, though it is unknown to this author the extent to which prices are posted anyway. An environment in which prices were *not* posted would surely seem to inhibit competition by creating an information asymmetry in favor of sellers.

Finally, market layout might be expected to influence search costs. These effects are difficult to assess given the available data on these FMs. One possible factor: Fewer points of customer entry to the FM might suggest less flexibility of movement, and in that sense proxy for higher search costs. Three of the seemingly less competitive FMs have only three entrances; two more FMs list five or six; one, located in a park, has unlimited points of entry.[2]

Collusion

Cartels, explicit and implicit, are a wild card that will challenge any competitive market design – and frustrate attempts to discern patterns in its workings. Two things can fairly be said from observing these results and the literature: 1) collusion happens in FMs and 2) it is not ubiquitous.

[1] TwinCities2 explicitly states that vendors may not display signage outside their stall (e.g. arrows pointing). One can presume this is an implicitly frowned-upon activity at most if not all markets, given the expected tragedy-of-the-commons result.

[2] Sacramento2, Washington DC, TwinCities2 (three entrances); TwinCities1 (five); Syracuse and Portland1 (two); Sacramento1 (open park). Portland2 did not submit a response.

Signs of collusion arise when looking at the raw data. Consider the markets for apples in TwinCities1 (either variety, Haralson or Honeycrisp, as both behave the same). Both regressions exhibit significant *contrary* vendor-price coefficients because at the peak of vendor numbers,[1] all or almost all vendors have set the same (high) price. A seasonal explanation doesn't add up: ceteris paribus, apples should not be most expensive when they are most plentiful.[2] Quality is a possible factor, though the durable nature of apples discounts this explanation. So do the observations that other fruits (blueberries) do not display any "quality premium" during peak season, and that these *same* apples can actually be had for cheaper on the same day at the FM across town (TwinCities2). If vendors are practicing cost-plus pricing, it seems unlikely all vendors would face identical input costs and ask the same margin; indeed the lack of almost any price heterogeneity in these markets strains credulity. Interestingly, the much smaller TwinCities2, though it was excluded from analysis because it typically has only two vendors, nonetheless offers a wider range of prices than TwinCities1.

Another plausible explanation for the common price movement, it would seem, is a tacit understanding among some subset of vendors as to the price for the day. In the case of TwinCities1's apples, the subsets appear to include almost every vendor in the market.[3] In other markets, a smaller group appears to hold steady while fringe vendors fluctuate around them; Portland1's organic blueberries behave this way, as three vendors holding firm at $3.00/lb. seem to provide little room for the other one or two to depart from this price-point. Notably, collusive pricing in one product-market need not prevail across an entire FM. TwinCities1, while home to these apple markets, also has a highly

[1] Haralson: 10 vendors; Honeycrisp: eight vendors

[2] One early commenter on this paper mentioned a possible "apple festival" effect: when the big harvests come in, it's something of an event, and prices may inflate. This may be an important apple-specific effect. It does not, however, discount the possibility of collusion or otherwise explain why all vendors conveniently ascend to the same price point. Notably, on these same peak dates, Haralson and Honecrisp apples at the local grocery stores are near their *lows* for the year.

[3] A minority of Haralson vendors do price below the others at peak season.

competitive lettuce market. Either some qualities of the product itself or other intangible dynamics of the vendor community could be at play.

Beyond collusion on a common price, another phenomenon suggested by the data might be called "collusion around the status quo". One might think of this as simply a disease of inertia that afflicts small, familiar markets like a FM: essentially, most vendors set their prices and stay there, week after week. These markets might yield competitive results, especially at the minimum-price level, if new vendors enter with lower prices. But the common symptom would be little movement in any given vendor's price from week to week. This dataset, with mostly anonymous vendors, often suggests the pattern but makes it difficult to spot conclusively. The exception is beef, where recorders could consistently follow certain brands. Ground beef in Portland1 and Syracuse provide examples: In Portland1, three vendors appear to ride out most of the season priced at $5.50, $5.49, and $5.99 per pound. In Syracuse, two vendors spend most of the season at $4.00 and $4.75; a third enters at one point with a price-point in the middle. Interestingly, the $4.00 vendor began the season, alone, at $3.75, but *raised* his price $0.25 when a higher-priced vendor entered the market.

To some extent, a largely static pattern of prices is consistent with "cost of production plus mark-up" pricing by sellers (Logozar and Schmidt 2009). Why might it further be considered implicit collusion? Despite the presence of supposedly discriminating shoppers, evidently no one feels any pressure from consumers or fellow vendors to adapt in any way. The market proceeds with a common understanding that nobody rocks the boat (Griffin and Frongillo 2003). As noted above, this kind of arrangement may be easier to sustain when products are not perishable. It may also be more prevalent when, as the literature suggests, FMs are a smaller part of farmers' diversified sales channels (King et al. 2010; LeRoux 2008), when search costs are high, or in FMs where customer demographics make price less relevant in shopping choices.

"Collusion around the status quo" is perhaps not as harmful to consumers as same-price collusion; it does allow shoppers some choice among heterogeneous prices. But the relative lack of vendor response to each other, and to the presence of new vendors in the market, suggests static markets are far from maximizing consumer welfare.

FM managers were asked to self-identify, along a four-point scale, the nature of vendor competition in their market.[1] TwinCities2 selected "cooperative," Washington DC selected "quite competitive," and five selected "friendly competition". For TwinCities2, with its small size and more explicit focus on sustainability and local agriculture, the answer is not surprising. Washington DC's perception of competitiveness may reflect the difficulty of gaining a spot in that FM. The predominant choice of "friendly competition" would seem to reflect a common FM ethos that doing business there should not be race-to-the-bottom on pricing. Yet it is also interesting that, given the choice of two ambiguous middle options, managers chose this over "neither competitive nor cooperative". This suggests competition, to some extent, is a value.

With regard to policy, two FM managers (Sacramento1 and Sacramento2) say they maintain official "no price fixing" rules for their vendors, though the extent and practicality of enforcement is unclear. Most other managers say they provide minimal, if any, guidance to vendors on pricing. One FM, however, makes detailed informal suggestions. The manager of TwinCities2 writes,

> We encourage vendors to price their products fairly for the labor and inputs they put into their products (i.e. don't undervalue or undersell) – and to always educate customer (*sic*) on true costs of food… Vendors are encouraged to not overprice their products… "at or below coop prices" is our strong, often repeated guideline. Vendors must charge the same price to all customers. (See survey responses in *Appendix 2*)

[1] The question was: "Which term best describes the relationship among market vendors who sell a similar product?" Choices were "Quite Competitive," "Friendly Competition," "Neither Competitive nor Cooperative" and "Cooperative."

There is certainly no recipe for collusion here. Management in fact encourages vendors to look outside the FM for a price ceiling, which might provide some check on the practice. At the same time, the notions of "don't overprice," "don't undervalue or undersell," and educating consumers on "true costs" would seem to discourage flexibility. The requirement to "charge the same price to all customers" would similarly seem to discourage price competition to the extent it is interpreted by vendors as requiring price be held constant over time – either within a day or even across days. If vendors are in any way restricted from changing price to react to market conditions, price competition will necessarily be diminished.

One final note of discussion, both related to and apart from the discussion of collusion: An early reviewer of this paper asked whether there is any satisfying explanation, generally, for the seemingly bizarre contrary (and statistically significant) median price movement in some markets. That is, why do we see vendors systematically *raising* their prices as they face more "competition"? This is indeed puzzling; it echoes a similarly counter-intuitive finding in a recent survey that "pricing above other vendors" was a moderately popular strategy that vendors claimed to employ (Logozar and Schmit 2009).

The nature of the product might provide a precondition; in this data, the observed cases are almost all in apples. Products which by their (perishable?) nature beget more competition may preclude this as a strategy. Beyond that, without further qualitative data, one can only speculate. There could be a collusive dynamic: as the population of vendors grows, so perhaps does the likelihood that cartel-coalitions will form within it. A few "bad apples" could create a dynamic that others in the market would feel compelled to follow; or their prices alone could serve to pull up the median. Even a single individual, of course, could pull up the median with a high price – but why do such a thing? This may be "safety in numbers" in action: the more crowded (with vendors and shoppers) a

market becomes, the better odds a high-pricing vendor could sustain that strategy by "specializing" in the subset of shoppers who are not watching for price, or who otherwise have a low search cost tolerance. Future research with a qualitative component would help shed better light on these somewhat surprising outcomes.

8. Concluding thoughts: policy implications and future research

The results of this study suggest price competition – insofar as it is expressed by falling prices as more vendors enter the market – can be improved.[1] The conceptual framework, viewed in light of these results and some additional details about these particular markets, offers some notions for how market managers or policymakers[2] might create an environment where competition is more prevalent and consumer welfare is increased. These include:

- **Work to lower shoppers' search costs.** Consider a more active approach to market layout: place vendors of similar products in a common area, require highly visible posted prices, design pathways through the market that make it easier for shoppers to browse. Consider a conspicuous, regularly updated price board or digital display where shoppers can view prices on-offer market-wide.
- **Make it easier for new vendors to enter the market.** Consider keeping the application window open year-round and eliminating preference for existing vendors. Reduce documentation and other red tape to allow new vendors to enter the market mid-season (perhaps even same-day) and with shorter notice. Actively recruit new vendors for products where little competition exists.
- **Loosen other restrictions that might inhibit price movement.** Explicitly allow and even encourage vendors to lower prices mid-day in response to market conditions. Loosen any advertising rules that may be discouraging vendors from actively marketing their product within the market.
- **Codify and enforce "no-price-fixing" clauses.** Let vendors know that setting collective prices, even on a "friendly" basis, is inappropriate. Managers keep an ear to the ground, watch for upward price convergence, and intervene to address signs of collusion. Repeat offenders are dismissed from the market.
- **Work to grow markets to adequate size**; **merge as necessary.** Many product-markets, even in farmers markets that are decent-sized, are simply too small to encompass much competition (witness the number of potential markets in this dataset too small to analyze). While size does not automatically beget competition, competition is not possible without vendors to compete.
- **Recognize that different products behave differently**. Vibrant competition in one product in a market does not mean that others have similar dynamics. Stoking competition in beef and apples, for example, may require different market layout and vendor entry policies, or closer attention to possible collusion.

[1] In this final section I dispense with "FM" and return to using "market" in the conventional sense.
[2] Policymakers are relevant to the extent that they license FMs to operate, lease/donate space for this purpose, or subsidize the operations of FMs – especially to serve lower-income consumers.

In all cases, of course, managers and policymakers must consider a balance of different values. If economic efficiency and the welfare of consumers are paramount, the above measures can help address those goals. If, on the other hand, the welfare of producers – specifically, the subset producers who gain access to this market – is more important, a manager would want to avoid the measures above lest they cut into the extra rents society might feel are due to small farmers or local agriculture.[1] In that case, higher prices are the civic "tax" consumers are asked to pay at the farmers market. It is up to managers to decide how steep a tax to assess; it is up to consumers to decide whether to participate or not. In this way our discussion has returned to the "soul" of the farmers market, which sits in complex balance with its growth and vibrancy as an economic marketplace. This balance is defined by our values trade-offs between consumers and producers.

Indications for future research

This study is the first attempt, of which I am aware, to investigate the nature and causes of competition in farmers markets. As such, it is admittedly an opening salvo upon which more precise and definitive work can surely follow.

One precondition of such work would seem to be a dataset precisely calibrated to the task. The dataset used for this analysis, as mentioned, was not gathered with this question in mind. A new effort could rectify some of the challenges encountered and broaden the insights. Among other things, a larger number of farmers markets could be surveyed, across more cities and particularly into the southern U.S., which is unrepresented here. Other farmers market staples could be included, such as tomatoes and carrots. A large, standardized set of market and demographic variables should be

[1] Bear in mind: the gains to "local" producers do not entirely disappear even in a competitive outcome. Farmers markets allow farmers to benefit from lower supply-chain costs (no distributers or wholesalers take a cut) and in some cases to receive a premium for freshness and "localness."

recorded to allow multi-market regressions, and care should be taken to minimize missing values and thus allow for more advanced time-series regression techniques. Finally, some attempt should be made to indicate the quality of an item on any given day, along with its price, in order to estimate models which control for this variable.

Alternately, a case-study approach might focus narrowly on the dynamics inside a particular market, using quantitative and qualitative methods to discern the nature of competition among vendors. One might conceivably broaden the scope-of-inquiry to include measures of competition beyond the Cournot-inspired "vendor-count" measure used here, such as measuring the reactions of vendors when one or more of them initiates a price change. With more data and deeper understanding in hand, one useful application might be the development of a farmers market-specific index of market concentration – something akin to the Herfindahl-Hirschman Index – to assist managers and policy-makers seeking to analyze and optimize a market.

A second precondition of further study would naturally be the requisite interest on the part of economists, nutritionists, agricultural interests, policymakers and consumers. This initial study suggests a number of broad insights that might motivate this interest. Among them:

- Competition in farmers markets can range from healthy to absent, both within and among markets.
- In most product-markets, some vendors deviate with lower prices, and savings can be reaped by shoppers willing to shop around.
- The scale of price decreases that accompany an increase in vendors can be significant in scale, though the effect appears to vary among different products.
- Farmers markets do not appear constrained by or otherwise linked to prices or patterns in the broader grocery industry, bolstering them as a separate field of study.
- The distinction between "cooperation" and "collusion" is a hazy one; by either name, it is an important factor in the farmers market environment.

In addition, this paper offers a unique review of the extant literature on farmers markets, filtering disparate studies of consumers, producers and markets through a new lens: price. And it considers the farmers market in something akin to an industrial organization context, describing it as we might any vital space where buyers and sellers meet to attempt to maximize their respective utilities.

The crucial outcome of all of the above, this author would hope, has been to make the leap from a nearly exclusive interest in farmers markets as a civic, social or nutritional phenomenon to considering them seriously as an economic one. As farmers markets grow, both organically and in response to policy, so should our efforts at understanding them from all essential angles.

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Appendix 1: Data recorder instructions

RECORDER'S GUIDE FOR WEEKLY DATA COLLECTION: LOCAL FOODS CASE STUDIES[1]

Gigi DiGiacomo[2]

The object of weekly data collection is to track product availability, product prices, and seasonal variation among supplies for one year in six market locations (two farmers markets, two supermarkets, and two natural foods stores).

It is important to collect data on the same day each week (day to be determined by market and by state – these may vary from market-to-market). Use a new data sheet for each market location each week. If a product is unavailable for one or more weeks, leave this row empty on the *Worksheet* for that collection period. It is also important to record all brands and prices for each product on the worksheet. For example, if a supermarket stocks two brands of organic, whole milk you will need two rows to record each brand and its corresponding price (even if prices are the same). This will help us understand product availability, seasonal fluctuations in the supply of products, and the level of price variability. Several blank rows have been included in the *Worksheet* should you encounter more than one brand, origin or price for the same product and require additional space. Additionally, it may be necessary to incorporate new rows for farmer's market locations if there are more than a handful of vendors for each product. Over time, you will most likely want to customize the *Worksheet* to reflect the products and brands available in your market. If you do so, however, please always be on the look-out for new brands or products as they become available throughout the seasons.

When it comes to price, please record the price/unit – this is the unit in which the product is sold (ounces, pounds or bags). After leaving the store or market, please convert all prices/unit to a price/pound or price/1/2 gallon (in the case of milk). When "club card savings" or "weekly special" price discounts are offered, please record the discounted price for the product. Moreover, when bulk discounts are offered (eg. "Three for $5") as is often the case at farmers markets, please record the price for a single unit (if available) and otherwise calculate the price for one unit based on the bulk discount price. For example, if 4 oz. blueberry containers are offered for $2 each or 3/$5, please record the $2 price. If the $2 price is unavailable, note the 3/$5 and record $1.67 in the price/unit field.

Additional *Worksheet* definitions and recording guidelines specific to each product are provided below.

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[1] This *Recorders Guide* was developed to assist project participants with the collection of weekly price and local product availability data for each of the products studied throughout 2009. Results of the data collection are summarized in individual case studies: apples in Syracuse, NY; beef in Minneapolis-St.Paul, MN; blueberries in Portland, OR; spring mix in Sacramento, CA; and milk in Washington, DC are available at http://foodindustrycenter.umn.edu/Local_Food_Case_Studies.html.

[2] Gigi DiGiacomo is a Research Fellow in the Department of Applied Economics at the University of Minnesota.

APPLES	
Category	Record prices for bulk apples of regular size only (no pre-bagged apples or "school boy" sizes). The only exception applies to farmers markets where apples may be pre-bagged in paper sacks or in peck-size containers (most farmers' market vendors do not offer apples in bulk). If this case, treat the bagged apples at farmers markets as bulk product.
Product Description	You will be collecting prices for 3-4 apple varieties: (1) Red Delicious; (2) A "Top 15" variety; and (3) One or two "Local/Heirloom" varieties. Red Delicious apples should be available in most stores (though not in farmers markets). For the "Top 15" variety, choose one of the following apples which accounts for the most significant, year-round market share in your state: Braeburn, Cortland, Empire, Fuji, Gala, Ida Red, Johnathan, McIntosh, Newton, Northern Spy, RI Greening, Rome, Stayman, and York. This variety is to be determined by you and based on both market observation and conversations with a produce expert who is familiar with apple sales in your area. The "Local/Heirloom" variety is, again, to be determined by you and should represent one or two local varieties produced in your locale and not listed within the "Top 15."
Unit	Record the price of apples/pound when possible. If you are purchasing bagged apples priced by the "Peck" or otherwise from farmers markets, be sure to change the unit accordingly.
Label	Record prices for apples labeled as "certified organic" and all others as "conventional." Describe any other claims regarding production practices in the "Notes" section of your Worksheet. For example, some apples may be labeled as "Pesticide Free" or "Fair Trade Certified." These apples should be treated as "Conventional" with the special claims listed as "Notes."
Brand	It is not necessary to record brand or farm names for apples at any location.
Origin	Record the city, state or country in which the apples were produced.
Price/Unit	Record the price of apples/pound when possible. If you are purchasing bagged apples priced by the "Peck" or otherwise from farmers markets, you will occasionally need to purchase these bagged apples throughout the season/year and weigh them to determine the price/pound for the final data summary (all products, with the exception of fluid milk, will ultimately be converted to a price/pound).
Notes	Record any claims regarding production practices in this section of your Worksheet. For example, some apples may be labeled as "Pesticide Free" or "Fair Trade Certified." This is also the place to note interesting observations about product prices, packaging or quality. Please note these observations and any other product claims clearly on the Worksheet. If you are unsure about whether or not to include something in the Notes, always do so – it is better to have too much information than not enough.

BLUEBERRIES	
Category	Record prices and product availability for all packaged blueberries (plastic containers most common).
Product Description	Record prices for fresh blueberries only (not frozen).
Unit	Most blueberries are sold by the ounce in either 4 oz. packages or 6 oz. packages. However, this may vary in your market. Record prices for one or more sizes when available.
Label	Observe and record prices for blueberries labeled as "certified organic" and "conventional." Record any claims regarding production practices in the "Notes" section of your Worksheet. For example, some greens may be labeled as "Pesticide Free" or "Fair Trade Certified." These blueberries should be treated as "Conventional" with the special claims listed as "Notes."
Brand	Please record the brand when available.
Origin	Record the city, state or country in which the blueberries were produced.
Price/Unit	Same as "Unit" notes above.
Notes	Record any claims regarding production practices in this section of your Worksheet. For example, if you record prices for conventional, blueberries from Argentina that are also labeled as "Fair Trade" please record "Fair Trade" in the "Notes" section. The same applies to products which are produced according to third-party-certified, sustainable production standards such as those by "Food Alliance." This is also the place to note interesting observations about product prices, packaging or quality. Please note these observations and any other product claims clearly on the Worksheet. If you are unsure about whether or not to include something in the Notes, always do so – it is better to have too much information than not enough.

LEAFY GREENS	
Category	Record prices for all bulk and packaged (bag or clamshell) greens (as defined in the "Product Description"). Be sure to circle the appropriate category (bulk or packaged) when recording prices.
Product Description	Collect data for two leafy green alternatives: "salad greens" and "green leaf lettuce." Salad greens are also called "spring mix", "baby lettuce mix", and "mixed lettuce" in different regions. If you encounter more than one of these mixes at a single location, record only the most commonly available mix for your state/region. If the mix you select becomes unavailable for several weeks, record one of the substitute salad green mixes and make note of this. For example, if you choose to record data for the "spring mix" and it is replaced by "field greens" in spring, begin recording prices for field greens at that location and note this on your data sheet. If spring mix reappears several weeks later, return to collecting the spring mix data. If you are uncertain about what mix to select, record data for several mixes initially. You can always eliminate those that are "temporary" or short-term substitutes. Green leaf lettuce, usually sold by the bunch, will be labeled as such and should NOT be substituted with Iceberg, Boston, Bibb, Red Leaf lettuce or Romaine.
Unit	Record the price of greens per ounce or per pound when possible. Initially, record the prices, brands and origins for all sizes available (eg. 5 oz, 6 oz, 1 lb). If the greens are priced/bunch, please be sure to note this in the "Unit" column.
Label	Observe and record prices for greens labeled as "certified organic" and "conventional." Record any claims regarding production practices in the "Notes" section of your Worksheet. For example, some greens may be labeled as "Pesticide Free" or "Fair Trade Certified." These greens should be treated as "Conventional" with the special claims listed as "Notes."
Brand	Record the brand of the distributor/shipper or the farm name where the greens were grown if available. It is not necessary to record farm names for leafy greens at the farmers' markets unless the vendors clearly are marketing a branded or packaged product.
Origin	Record the city, state or country in which the greens were produced.
Price/Unit	Record the price of greens per ounce or per pound. If the greens are priced/bunch, you will occasionally need to weigh bunches in the store to determine the price/pound for the final data summary (all products, with the exception of fluid milk, will ultimately be converted to a price/pound).
Notes	Record any claims regarding production practices in this section of your Worksheet. For example, some greens may be labeled with claims such as "Pesticide Free," "IPM Practiced," or "Fair Trade Certified."

FLUID MILK	
Category	Record prices and product availability for (waxy) cartons of fluid milk (not plastic containers or returnable glass bottles). If there are no half-gallons for a particular category packaged in waxy paper cartons, substitute either plastic or glass (in that order of preference).
Product Description	Record prices and product availability for whole milk and for low-fat, 2% milk. You will not be recording data for lactose-free or other specially-supplemented milk (such as Omega-3).
Unit	Fluid milk is sold in a variety of carton sizes. Please record data for ½ gallons. If ½ gallons are not available (perhaps at a farmers market), substitute the next-smallest size and record the data.
Label	Observe and record prices for milk labeled as "certified organic", "natural", and "conventional." "Natural" is defined by USDA as a "product [which] contains no artificial ingredients or added color and is only minimally processed." This claim will appear on milk labels as "From cows not treated with rBST/rBGH" or "Hormone and Anti-biotic-free." The "Natural" claim may also be linked to production practices and specific claims about animal treatment. Treat all of these products as natural and record any claims regarding production practices in the "Notes" section of your Worksheet.
Brand	Record the brand of the distributor/shipper or the farm name where the milk was produced and/or processed. At famers' markets BE SURE to record the farm name as this will likely be a branded product.
Origin	Record the city, state or country in which the milk was produced or processed and distributed.
Price/Unit	Record prices/half gallon. If ½ gallons are unavailable, convert the price/unit to price/half gallon for final data entry.
Notes	Record any claims regarding production practices in this section of your Worksheet. This would include "From cows not treated with rBST/rBGH", "Hormone and Anti-biotic-free", and "Milk from cows that are pasture fed."

BEEF	
Category	Record prices and product availability for fresh and frozen beef products (specified in the "Product Description"). For ground beef, please initially record prices for 80%, 85%, and 90% lean-ness until you are able to determine the most common product sold in your market/region.
Product Description	Record prices and product availability for pre-packaged products from the refrigerated case (i.e. not from the store meat counter) ground beef which is 80% or more lean (no patties) and for boneless, ribeye steaks. If products (such as ribeye) are not available pre-packaged in the refrigerated case, then you will need to collect data for products from the meat counter and make note of this on the Worksheet.
Unit	Ground beef will be priced/pound, however, ribeye steaks may be priced per ounce or per pound. Be sure to note the correct unit size when recording price data.
Label	Observe and record prices for beef products labeled as "certified organic", "grass fed," "natural", and "conventional." As with "certified organic" and "natural," the "grass-fed" claim is officially defined and regulated by USDA. Look closely at labels for this EXACT language. Only products that meet the USDA "grass-fed" criteria can be labeled as such. All other products should be treated as "conventional" if they are not labeled otherwise.
Brand	Record the brand of the processor or the farm name where the beef was produced and/or handled. At famers' markets BE SURE to record the farm name as this will likely be a branded product.
Origin	Record the city, state or country in which the beef was produced or processed and distributed if available (this may be difficult to determine).
Price/Unit	Same as "Unit" notes above.
Notes	Record any claims regarding production practices in this section of your Worksheet. This would include claims such as "access to pasture" or "antibiotic-free." Please also make note of the percent of leanness for ground beef (eg. 80%, 85%, 90%).

Appendix 2: Market manager survey responses

Presented in alphabetical order. No reply received for Portland2.

1. Hello! Please give your name, and tell us which market you are describing below.

PORTLAND1 [NAME REDACTED]

2. On its busiest days, roughly how many vendors does the market have? Roughly how many customers?

peak participation during the 2010 season was 119 vendors; peak customer count for 2010 was 15,000

3. What is the approximate square footage or acreage of the market?

5501500'x5500'

4. How many customer entrances are there to the market?

6

5. What are the requirements and processes for a new vendor to enter the market? (If this information is captured in a web document, feel free to provide a link.)

Online document which includes a link to the Vendor Handbook: http://www.portlandfarmersmarket.org/index.php/vendors/become-a-vendor/

6. What formal policies are in place, if any, that direct how vendors may set their prices? Do vendors receive any informal guidance or instruction about how to set prices?

The market really dictates prices that vendors establish. Farmers will often inventory their competitors booths to establish their prices for the day. The only pricing requirements we have listed in our Vendor Handbook are as follows: "All items for sale must be clearly marked with their retail price. Prices may be posted on the product with an individual sign or posted as a list of prices on a large sign or board." We do this to insure that the customer understands the price before the point of sale.

7. What rules are in place, if any, regarding the type of advertising/branding/signage vendors may use?

Vendors are required to display a sign at the front or back of their stall space identifying their business name. There are no requirements beyond this as to branding and advertising. The specific language used in our Vendor Handbook is as follows: "Signage including product prices, vendor identification, and organic certification should be clear and visible."

8. Which term best describes the socio-economic/income level of the market's customer base?

Middle-to-Upper Income

9. Which term best describes the relationship among market vendors who sell a similar product?

Friendly Competition

10. Thank you! What is the best phone number to reach you for any follow-up questions, during normal weekday business hours?

[PHONE NUMBER REDACTED]

1. Hello! Please give your name, and tell us which market you are describing below.

SACRAMENTO1 [NAME REDACTED]

2. On its busiest days, roughly how many vendors does the market have? Roughly how many customers?

90 vendors, 7000 customers

3. What is the approximate square footage or acreage of the market?

WE take up a full city block

4. How many customer entrances are there to the market?

No way to count, it is in a park, guessing 20 or so usual

5. What are the requirements and processes for a new vendor to enter the market? (If this information is captured in a web document, feel free to provide a link.)

www.davisfarmersmarket.org information center Rules and Regulations for Sellers Application

6. What formal policies are in place, if any, that direct how vendors may set their prices? Do vendors receive any informal guidance or instruction about how to set prices?

No price collusion, they set their own prices. There are many different prices for the same commodity in the market.

7. What rules are in place, if any, regarding the type of advertising/branding/signage vendors may use?

In the rules in the document above. Organic labeling has to have accompanying State registration and third party certification.

8. Which term best describes the socio-economic/income level of the market's customer base?

Middle-to-Upper Income

9. Which term best describes the relationship among market vendors who sell a similar product?

Friendly Competition

10. Thank you! What is the best phone number to reach you for any follow-up questions, during normal weekday business hours?

[PHONE NUMBER REDACTED]

1. Hello! Please give your name, and tell us which market you are describing below.

SACRAMENTO2 [NAME REDACTED]

2. On its busiest days, roughly how many vendors does the market have? Roughly how many customers?

45 Farmers and 2500 customers

3. What is the approximate square footage or acreage of the market?

Four acres of parking lot/Market area 1 acre

4. How many customer entrances are there to the market?

Multiple or three designated

5. What are the requirements and processes for a new vendor to enter the market? (If this information is captured in a web document, feel free to provide a link.)

Must have obtained a Certified Producer's Certificate with farm Inspection; oral interview application process; space available for commodity that is being grown for sale.

6. What formal policies are in place, if any, that direct how vendors may set their prices? Do vendors receive any informal guidance or instruction about how to set prices?

No price fixing allowed; farmers astute enough to survey the market competition and set prices accordingly.

7. What rules are in place, if any, regarding the type of advertising/branding/signage vendors may use?

Must post prices. Must post identification of produce; Must post Name of Farm, City and County Location of Farm., Must conspicuously post statement "We grow what we sell".

8. Which term best describes the socio-economic/income level of the market's customer base?

Middle-to-Upper Income

9. Which term best describes the relationship among market vendors who sell a similar product?

Friendly Competition

10. Thank you! What is the best phone number to reach you for any follow-up questions, during normal weekday business hours?

[PHONE NUMBER REDACTED] but would not favor any more questions.

1. Hello! Please give your name, and tell us which market you are describing below.

SYRACUSE [NAME REDACTED]

2. On its busiest days, roughly how many vendors does the market have? Roughly how many customers?

260 vendors,26000 customers

3. What is the approximate square footage or acreage of the market?

50 acres

4. How many customer entrances are there to the market?

6

5. What are the requirements and processes for a new vendor to enter the market? (If this information is captured in a web document, feel free to provide a link.)

insurance and any other documents depending on what is being sold and then the vedor may come as a daily that same day, and if they choose to take a lease then one daily fee may be applied to the lease

6. What formal policies are in place, if any, that direct how vendors may set their prices? Do vendors receive any informal guidance or instruction about how to set prices?

there is no policy, we are a public authority and that is considered price fixing. each vendor determines what their product is worth.

7. What rules are in place, if any, regarding the type of advertising/branding/signage vendors may use?

very few if any at all. we do provide signage as to what catagory the vendor is but at this time it is voluntary whether they display it or not

8. Which term best describes the socio-economic/income level of the market's customer base?

Middle-to-Lower Income

9. Which term best describes the relationship among market vendors who sell a similar product?

Friendly Competition

10. Thank you! What is the best phone number to reach you for any follow-up questions, during normal weekday business hours?

[PHONE NUMBER REDACTED]

1. Hello! Please give your name, and tell us which market you are describing below.

TWINCITIES1 [NAME REDACTED]

2. On its busiest days, roughly how many vendors does the market have? Roughly how many customers?

165 vender and 14,000 customers

3. What is the approximate square footage or acreage of the market?

60,000 sq ft

4. How many customer entrances are there to the market?

5

5. What are the requirements and processes for a new vendor to enter the market? (If this information is captured in a web document, feel free to provide a link.)

The grower must raise there product with in 50 miles of the market. Only the grower can sell the product they raise

6. What formal policies are in place, if any, that direct how vendors may set their prices? Do vendors receive any informal guidance or instruction about how to set prices?

The grower recieves guidance by are organization but we do not set the price.

7. What rules are in place, if any, regarding the type of advertising/branding/signage vendors may use?

Growers must have a sign that is 18" x 24" and must display all EBT and WIC sign if they Qualify for the program They can not use the work organic unless they are certifyed

8. Which term best describes the socio-economic/income level of the market's customer base?

Middle-to-Upper Income

9. Which term best describes the relationship among market vendors who sell a similar product?

Friendly Competition

10. Thank you! What is the best phone number to reach you for any follow-up questions, during normal weekday business hours?

[PHONE NUMBER REDACTED]

1. Hello! Please give your name, and tell us which market you are describing below.

TWINCITIES2 [NAME REDACTED]

2. On its busiest days, roughly how many vendors does the market have? Roughly how many customers?

65 vendors and 5,500 customers (we have done several customer counts and 5,500 is an ave. mid-season "busy" day)

3. What is the approximate square footage or acreage of the market?

about 22,000 square feet

4. How many customer entrances are there to the market?

3

5. What are the requirements and processes for a new vendor to enter the market? (If this information is captured in a web document, feel free to provide a link.)

Extensive application and agreement to MCFM sustainability statement. (Please ask for copies of these if you're interested, I would be happy to e-mail a pdf).

6. What formal policies are in place, if any, that direct how vendors may set their prices? Do vendors receive any informal guidance or instruction about how to set prices?

Formal policies are not in place, the market organization does not control pricing. The "rule of thumb" that we advise vendor with is: price products at or below local coop prices (a comparable customer base). We encourage vendors to price their products fairly for the labor and inputs they put into their products (ie. don't undervalue or undersell)-- and to always educate customer on true costs of food. Education is a big priority at our market. Vendors are also encouraged to not overprice their products and strongly encouraged to charge the same price at our farmers market as they would at other farmers markets. Again, "at or below coop prices" is a strong, often repeated guideline. Vendors must charge the same price to all customers.

7. What rules are in place, if any, regarding the type of advertising/branding/signage vendors may use?

Vendors must display signage with their farm or business name. Vendors are required to display prices. Vendors may not display signage outside of their designated booth area (ex. an arrow pointing to their booth). Vendors that are certified organic or participate in the Farmers Market Nutrition Program are required to display associated signage. Vendors that sell under the Minnesota Pickle Bill are required to display associated signage per state requirements. Prepared foods vendors are encouraged to display signage that indicates local sourcing, especially sourcing from farmers within the market. Prepared foods vendors are encouraged to display signage to indicate they are participating in our Zero Waste program (these vendors pay premium prices for compostable serviceware- forks, plates etc.- and are required by the market to serve all products with compostable materials, so we encourage them to credit themselves for their participation through signage, both so the customers recognize an individual vendor's participation in the program and so customers are more broadly aware that the market composts).

8. Which term best describes the socio-economic/income level of the market's customer base?

Middle-to-Upper Income

9. Which term best describes the relationship among market vendors who sell a similar product?

Cooperative

10. Thank you! What is the best phone number to reach you for any follow-up questions, during normal weekday business hours?

[PHONE NUMBER REDACTED]

1. Hello! Please give your name, and tell us which market you are describing below.

WASHINGTON DC [NAME REDACTED]

2. On its busiest days, roughly how many vendors does the market have? Roughly how many customers?

40 farmers and producers. 5000 customers

3. What is the approximate square footage or acreage of the market?

In 2009, approximately 15,000. We have since increased that footprint without increasing the number of vendors because it was waay to crowded.

4. How many customer entrances are there to the market?

In 2009 there were 3

5. What are the requirements and processes for a new vendor to enter the market? (If this information is captured in a web document, feel free to provide a link.)

We have a formal application process that occurs every winter. The Dupont market has been closed to new applicants for a couple of years (we're full), but our application and market rules for our other markets (same process) are available here: http://freshfarmmarkets.org/farmers_producers/farmer_producer_application.html

6. What formal policies are in place, if any, that direct how vendors may set their prices? Do vendors receive any informal guidance or instruction about how to set prices?

None. No guidance at all. It's all up to them.

7. What rules are in place, if any, regarding the type of advertising/branding/signage vendors may use?

We require that all vendors have signs displaying their farm name and prices.

8. Which term best describes the socio-economic/income level of the market's customer base?

Middle-to-Upper Income

9. Which term best describes the relationship among market vendors who sell a similar product?

Quite Competitive

10. Thank you! What is the best phone number to reach you for any follow-up questions, during normal weekday business hours?

[PHONE NUMBER REDACTED]