Search Costs in Identity-Preserved Agricultural Markets

Jeffrey J. Reimer*
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Abstract

Many industries have “match-maker” institutions that help agents make links to one another by reducing search costs. Such institutions are now emerging in niche farm and food markets. In this study I provide an explanation for such institutions with a theoretical model of a niche market channel involving a small producer, retailer, and variety-loving consumer. I focus on the process by which producers are connected to retailers, and show that search costs between producers and retailers can be an important fixed cost of entry. Reduced search costs result in a larger number of matches, and facilitate the growth of niche market channels selling on the basis of producer identity. I examine the role of consumer preferences, retailer bargaining power, and other key features of these markets.

KEYWORDS: marketing cooperatives, monopolistic competition, niche market, product differentiation, search

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1. Introduction

Most agricultural products are fairly homogeneous and go through many distribution layers before they reach the consumer. There is a growing trend, however, for product differentiation to occur at the producer level, and for producers to sell directly to a grocery store, restaurant, or institution (Tropp, Ragland, and Barham, 2008). This is especially true for niche farm and food producers who use identity and location as a selling point (USDA, 1998). In the U.S. approximately 2,700 food retailers make at least some purchases from small farm and food enterprises (Shindelar, 2007).

Such market channels are hindered by transaction costs, however, and in this study I model the effects of one specific cost: the search costs incurred by retailers and producers to find each other and establish a viable relationship. As an example, CSREES (2007) describes a livestock producer in Indiana who markets his pork to restaurants in Chicago. Meeting and getting to know chefs is a major focus of his work, and he travels to the city at least once a week to talk in their kitchens. Search costs can also be high on the retail side, whether the “retailer” is a grocery store, restaurant, or food service provider. For example, the staff of Portland-based New Seasons markets make frequent visits to farms, ranches, and dairies looking for new products to introduce to their shelves (Burros, 2006). Once a product is found, they incur costs in training the producer to meet their specifications.

To capture these effects I merge the monopolistic competition model of Spence (1976) and Dixit and Stiglitz (1977) with a search model from equilibrium unemployment theory (Pissarides, 2000). A small producer sells directly to a retailer, who then packages the product for sale to a consumer with love-of-variety preferences. However, retailers and producers incur search costs to find each other and establish a viable marketing arrangement. When a match is made, producers and retailers bargain over rents, and existing relationships terminate at an exogenous Poisson rate.

I am able to explain the rise of match-maker institutions in niche farm and food markets. There are many such examples. The marketing cooperative Country Natural Beef was formed in 1986 to link small ranchers to natural food stores, restaurants, and food service companies. Chefs Collaborative was created in 1993 as a formal network between chefs and farmers and fishermen. Organic Exchange was created in 2002 as a clearinghouse for organic cotton producers and specialty retailer buyers. Om Organics began in 2002 to forge links between San Francisco restaurants, retailers, and schools, with local producers of meat, dairy, eggs, produce, and seafood. The Food Marketing Cooperative of Pennsylvania was created in 2003 as a broker between small food firms and food retailers around the world.
In addition to explaining the emergence of such institutions, the model allows for comparative statics that consider the impact of changes in: (a) consumer preferences, (b) retailer market power, and (c) the frequency of breakups in marketing relationships. The framework can be used for other applications such as shedding light on initiatives currently being proposed at the federal and state level. For example, the newly passed Illinois Food, Farms, and Jobs Act seeks to promote small-scale edible food production in the state and the forging of connections between specialized producers and retailers (Horan, 2007; Illinois General Assembly, 2007). This study provides a basis for examining some of the economics of such initiatives.

This study differs in important ways from other strands of the literature in agricultural markets and supply chains. For example, there is an extensive literature on farm-retail price spreads in homogenous commodity markets (e.g., Gardner, 1975; Brorsen et al., 1985; Schroeter and Azzam, 1991). This literature emphasizes the effects of factors like processing, transport, market power, and uncertainty on margins. By contrast, I examine consumer-oriented differentiated product markets and show how they can be influenced by difficult-to-measure transactions costs. I show that markups obtained by producers and consumers in niche markets may go towards covering the costs of establishing a marketing arrangement. Search costs can also have non-price impacts such as reducing the number of producers who get to participate.

This study also complements those that examine agricultural supply chains using approaches such as principal-agent theory (e.g., Goodhue, 1999) and incomplete contracts theory (e.g., Reimer, 2006). While this literature is concerned with explaining contracting and vertical integration in mainstream supply channels, I address a problem encountered by producers who may be leaving such market channels to participate in specialty distribution.

Finally, the study also extends the literature on the monopolistic competition model by showing that fixed costs can take the form of search costs when the “firm” on the supply side is divided into separate producer and retailer entities.

2. Model

2.1 Overview

The monopolistic competition model is useful for characterizing markets in which location or producer identity is a source of differentiation, and when a firm’s actions have a negligible effect on rivals. The standard model does not distinguish between producers and retailers or allow for search frictions, however. The labor search model described in Pissarides (2000) accounts for the latter effect, and also recognizes that relationships may dissolve periodically due to
events that undermine their profitability. Most search models are set up for factor markets, however, and pay less attention to the consumer side of the market.

In bridging these two models, I draw on the insights of two other studies that have made connections between them. Ziesemer (2003) is interested in how information technology has affected search in the labor market, and adds some monopolistic competition features to the standard search model as a way to introduce imperfect competition to the analysis. Search costs arise in the labor market, however, and his framework ultimately has little in common with this study. Haaparanta (2000) is more like this study in that he is concerned with costly search in a goods market. However, he builds an international trade model with multiple regions and sectors, and focuses on differences in factor endowments and international trade policy (tariffs, quotas, non-tariff barriers). I develop a closed-economy partial-equilibrium model, and consider the institutions described in the introduction. I highlight similarities with these studies where appropriate.

2.2 Consumers

In the aggregate consumers have love-of-variety preferences. This can happen because individuals prefer to consume many varieties, or because each individual has a most-preferred variety, and there are many such individuals spread over space. It does not matter which story leads to a love-of-variety; all that is needed is a taste for variety in the aggregate (Anderson, de Palma, and Thisse, 1992; Helpman and Krugman, 1985).

I consider a single-product industry that has \( n \) potential varieties, each one associated with a unique supplier. The volume consumed of variety \( k \) is \( x_k, \ k = 1, \ldots, n \), and the utility of a representative consumer is \( Z \). Utility is commonly represented with \( U \) instead of \( Z \), but we reserve \( U \) for use in the search model in line with the conventions in the search literature. The utility function is:

\[
Z(x_1, \ldots, x_n) = \left[ \sum_{k=1}^n (x_k)^{(\sigma-1)/\sigma} \right]^{\sigma/(\sigma-1)}, \tag{1}
\]

where \( \sigma \) is the elasticity of substitution (restricted to be greater than 1, so that the marginal revenue of the supplier will not be negative). When \( n \) is very large, \( -\sigma \) is also the own price elasticity of demand for a given variety. Let \( \dot{Y} \) denote the exogenous income of the representative consumer, and \( p_k \) denote the price of variety \( k \). I ignore transaction costs at the retail level; consumers and retailers engage in friction-free arms-length transactions. The consumer utility-max problem involves maximizing (1) with respect to the budget:
\[
\text{Max } Z(x_1, \ldots, x_n) \quad \text{s.t. } \sum_{k=1}^{n} p_k x_k \leq Y. \tag{2}
\]

This yields the uncompensated demand for variety \(k\):

\[
x_k = \frac{p_k^{-\sigma}}{\sum_{k=1}^{n} p_k^{1-\sigma}} Y. \tag{3}
\]

The representative consumer likes all varieties equally, and production costs are identical across them. This implies a symmetric equilibrium with \(p_k = p\) and \(x_k = x\) (Beath and Katsoulacos, 1991). Since it does not matter how varieties are labeled, from now on the variety index \((k)\) is dropped. Free entry and consumer love-of-variety ensure that there are large numbers of small producers on the supply side who ignore each others’ actions (Beath and Katsoulacos, 1991).

### 2.3 Producer-retailer marketing arrangements

The search part of the model builds directly on Pissarides (2000), and his notation is followed to the extent possible. There are \(L\) producers who seek to have their product marketed through a retailer. Let \(u\) denote the fraction of the \(L\) producers who have no marketing arrangement with a retailer, where \(u\) stands for “unmatched.” Let \(v\) denote the number of retail opportunities as a fraction of the \(L\) producers, where \(v\) stands for “vacancy.” Grocery shelves and restaurant kitchens are rarely empty, yet there may be “vacancy” in the sense that a retailer is searching for a version that can sell better (e.g., one that is locally sourced). When a producer fills a retail vacancy there has been a “match” or “marketing arrangement.” I use these terms in place of “contract” since formal contracts are not always used in value-added markets.

The model is specified in continuous time. The number of matches taking place per unit of time is governed by a matching function (Pissarides, 2000):

\[
mL = m(uL, vL). \tag{4}
\]

The matching function is concave and homogeneous of degree 1, implying constant returns to scale and diminishing returns to search for ever-larger numbers of searchers. The number of matches is increasing in both the number of vacancies and the number of producers looking for a marketing arrangement.

Retailers and producers who match are randomly selected from the sets \(uL\) and \(vL\). The analysis is simplified by working in terms of \(\theta = v/u\), which corresponds to the number of retail vacancies relative to the number of unmatched
producers. \( \theta > 1 \) means that there are relatively more vacancies than unmatched producers. \( \theta < 1 \) means that relatively more producers are searching. Retail vacancies are matched to producers according to a Poisson process with rate:

\[
q(\theta) = \frac{m(uL,vL)}{vL} = \frac{1}{\theta}.
\]

Similarly, unmatched producers obtain a marketing arrangement according to a Poisson process with rate \( m(uL,vL)/uL = \theta q(\theta) \).

The probability of a match depends on the relative number of producers looking for retailers and vice-versa. In particular, as the relative number of retail vacancies increases, matches take place less frequently: \( q'(\theta) < 0 \), with the elasticity of \( q(\theta) \) is a number between 0 and \(-1\) (Pissarides, 2000, p. 7). Due to this search externality the price received by producers with a match, called the transfer price, does not adequately adjust to fully exhaust all opportunities in the marketplace. There is a positive probability that some producers will not match \( [1 - \theta q(\theta) > 0 ] \) and a positive probability of some retail vacancies \( [1 - q(\theta) > 0] \).

Marketing arrangements continue through time until an exogenous event that lowers their profitability. This could be a disease outbreak, new government regulation, or a change in consumer tastes or input prices. Relationships that break up are randomly selected by a Poisson process with rate \( \lambda \). In a steady state the mean number of unmatched producers is constant, and flows into and out of marketing arrangements are equal (Pissarides, 2000):

\[
\lambda (1 - u) = \theta q(\theta) u.
\]

(6) says that the number of marketing arrangements that break up at a given period of time (left-hand side) equals the number of new marketing arrangements that are created (right-hand side). This can be restated as:

\[
u = \frac{\lambda}{\lambda + \theta q(\theta)}.
\]

(7) relates the proportion of producers with no marketing arrangement \( (u) \) to the rate of breakup \( (\lambda) \) and the rate of vacancies being filled \( [q(\theta)] \). (7) is the Beveridge curve in the labor literature (Pissarides, 2000).

2.4 Retailers

The retailer is a simple intermediary between producers and consumers to keep the model from becoming too cumbersome. The retailer could be a grocer, who
aggregates the varieties of various producers under one roof for purchase by consumers. Alternatively, the retailer could be a restaurateur, who transforms the product using other inputs into a dish for sale to patrons.

Retailer expected return from offering shelf space is analogous to how Pissarides (2000) models a firm offering a job to a worker. A retailer is in one of two states: searching for a producer to fill up shelf space or already in a marketing arrangement. The decision to stop searching for a partner is made within the context of an optimal stopping problem that takes the firm’s other, underlying profit-maximizing activities as given. The optimal stopping strategy maximizes the discounted present value of the gain from a match, net of the accumulated costs of search. As is standard with other papers in the search literature, I do not explicitly derive the flow equations, but start with the steady state.

Let $V$ denote the present-discounted value of expected profit from a retail vacancy, and $J$ denote the present-discounted value of expected profit when a producer has been lined up as a supplier. The retailer incurs cost $\mu > 0$ trying to fill a vacancy per unit of time. Letting $r$ be the rate of interest, $rV$ is the rate of return on having a vacant retail shelf space, which is essentially an asset. $rV$ is the steady-state expected value of a change of state $[q(\theta)(J - V)]$ less the cost ($\mu$) of searching for and establishing a relationship with a producer:

$$rV = -\mu + q(\theta)(J - V).$$  \hspace{1cm} (8)

In a perfect capital market, the cost of holding vacant shelf space ($rV$) is equal to the expected return from a change of state $[q(\theta)(J - V)]$ less the cost of filling vacant space ($\mu$).

A retailer with a marketing arrangement has return $(p - w)x$, where $p$ is the retail price, $w$ is the transfer price, and $x$ is the volume produced and sold. Following Haaparanta (2000), the steady-state value to the retailer of having a marketing arrangement is then:

$$rJ = (p - w)x + \lambda(V - J),$$  \hspace{1cm} (9)

which says that the value of a marketing arrangement ($rJ$) equals the instantaneous return less the instantaneous probability of a separation ($\lambda$) times the resulting loss of value ($J$). A version of (9) solved for $J$ will later be used:

$$J = \frac{(p - w)x}{r + \lambda}.$$  \hspace{1cm} (10)

These assumptions guarantee that retailers always seek to fill a vacancy.
Producers and retailers can freely enter and all profit opportunities are exploited in equilibrium. This implies that a retailer’s value of search is zero in equilibrium: $V = 0$. Setting $V = 0$ in (8) and rearranging gives:

$$J = \frac{\mu}{q(\theta)}. \tag{11}$$

The free entry condition for retailers can then be stated in terms of the retailer’s margin by equating (10) and (11):

$$(p - w)x = \frac{(r + \lambda)\mu}{q(\theta)}. \tag{12}$$

(12) says that the net return is driven down to the point where it just equals the costs of establishing a marketing arrangement, adjusted for the expected breakup of the match. Transaction costs ($\mu > 0$) and the Poisson rate of separations ($\lambda > 0$) drive a wedge between what producers get ($wx$) and what retailers get ($px$).

2.5 Producers

I now describe the expected returns of producers. $U$ is an unmatched producer’s present-discounted value of the expected income stream. This depends in part on the expected income stream of a producer with a marketing arrangement, denoted $W$. Letting $\rho$ represent the producer’s cost of establishing a marketing arrangement, we have that:

$$rU = -\rho + \theta q(\theta)(W - U), \tag{13}$$

where $\theta q(\theta)(W - U)$ is the expected capital gain from change of state. Equation (13) has the same interpretation as the retailer’s asset equations (8 and 9). The producer’s productive potential is treated as an asset, and the valuation placed on it by the market is $U$.

I now turn to producer value from having a marketing arrangement ($W$). As in the monopolistic competition model, the utility of each variety and the cost of making it is identical, so their prices and quantities are the same. In the traditional monopolistic competition model the cost of producing $x$ units is typically $F + cx$, where $F$ and $c$ are fixed and marginal costs, respectively. $F$ is typically viewed as the annualization of a once and for all sunk cost or as a recurrent fixed cost that is independent of output. In this study $F = 0$ to focus on
the (implicit) fixed cost of establishing a marketing arrangement. Following Haaparanta (2000), the value to a producer of having a marketing arrangement is:

\[ rW = (w - c)x + \lambda(U - W), \tag{14} \]

where \( wx \) is producer revenue (from selling to the retailer), \( cx \) is the producer’s production cost, and \( \lambda(U - W) \) is the expected reduction in value associated with a breakup of the marketing arrangement.

The free entry condition for producers implies that all profit opportunities have been exploited and there is no additional profit from search: \( U = 0 \). With this assumption (14) can be solved for \( W \):

\[ W = \frac{(w - c)x}{r + \lambda}. \tag{15} \]

Substituting (15) into (14), and assuming \( U = 0 \), yields the free entry equilibrium condition for producers:

\[ (w - c)x = \frac{(r + \lambda)x}{\theta q(\theta)}. \tag{16} \]

Equation (16) says that producer revenues \( (wx) \) less costs \( (cx) \) are driven down to the point at which they equal the costs of establishing a relationship, adjusted for its expected breakup. In other words, there must be a enough of a wedge between \( w \) and \( c \) such that the producer can cover the expected cost of establishing a marketing arrangement.

### 2.6 Maximization of joint surplus

A marketing arrangement exists anytime a producer makes a differentiated product that is marketed by a retailer. There is nothing in the analysis that prevents a retailer from carrying products from more than one producer, and a producer from selling to more than one retailer. However, marketing arrangements are made on a one-to-one basis, and variety \( k \) is marketed by one and only one producer-retailer pair. The producer-retailer pair produces a new variety \( k \) due to love-of-variety preferences and since this provides a degree of market power. Due to free entry all producer-retailer pairs have the same profit level (zero). These assumptions work in the context of identity-preserved niche markets: when the identity of the producer is important and consumers buy from local stores, then each product is somewhat differentiated from everything else.
The above free entry conditions showed how the gap between retail price \( (p) \),
the transfer price \( (w) \), and marginal cost \( (c) \) is influenced by the costs of
establishing a relationship. I now solve for \( p \) and \( w \) and show that they are
additionally related to producer bargaining strength (denoted \( \beta \)) as well as the
price elasticity of consumer demand (denoted \( \sigma \)). \( \beta \) and \( \sigma \) are exogenous and
independent of the processes described by the model.

The surplus from the arrangement is divided between the producer and retailer
using a Nash bargaining solution. This process also determines the retail price \( (p) \)
and transfer price \( (w) \). Producer surplus from the marketing arrangement is given
by \( W - U = W \) while retailer surplus from the marketing arrangement is given by
\( J - V = J \). These are weighted by their respective bargaining strengths: \( 0 < \beta < 1 \)
for the producer, and \( 0 < 1 - \beta < 1 \) for the retailer. The surplus maximization
problem is:

\[
\max_{p, w} Q = W^\beta J^{1-\beta},
\]

(17)

where \( W \) and \( J \) are given by (15) and (10), respectively. With some work the
first-order condition with respect to retail price can be shown to be:

\[
\beta W^{-1}J\left[w-c\right]+(1-\beta)\left[p \frac{\sigma-1}{\sigma}-w\right] = 0, \quad \text{where } \sigma \equiv -\frac{\delta x p}{\delta p} x.
\]

(18)

Upon making further substitutions in (18) involving \( W \) and \( J \) we can get the
transfer price \( (w) \) as a function of retail price \( (p) \), bargaining strength \( (\beta) \), and the
elasticity of demand \( (\sigma) \):

\[
w = p \left[ \beta + (1-\beta) \frac{\sigma-1}{\sigma} \right].
\]

(19)

The first order condition with regard to the transfer price \( (w) \) can be shown to be:

\[
\beta J = (1-\beta)W,
\]

(20)

which is directly comparable to equation (1.17) in Pissarides (2000), with \( U = V = 0 \).
If \( W \) and \( J \) is inserted into (20) the transfer price \( (w) \) is obtained as a function
of retail price \( (p) \) and marginal cost \( (c) \):

\[
w = \beta p + (1-\beta)c.
\]

(21)
2.7 Equilibrium values of endogenous variables

I now solve for the equilibrium values of retail price \((p)\) and transfer price \((w)\) in terms of the underlying parameters. \(p\) is found by setting (19) equal to (21):

\[
p = \frac{\sigma}{\sigma - 1} c,
\]

(22)

where \(\sigma > 1\). This is the standard monopolistic competition markup rule with love-of-variety preferences (Beath and Katsoulacos, 1991). As \(\sigma\) increases, goods become closer substitutes, and retail price and marginal cost converge. The equilibrium transfer price \((w)\) is obtained by inserting (22) into (21):

\[
w = \beta \frac{\sigma}{\sigma - 1} c + (1 - \beta) c.
\]

(23)

Equation (23) is a particularly interesting result that does not arise in the standard monopolistic competition model, in part since it does not distinguish between producer and retailer activities on the supply side. (23) says that as producer bargaining power \((\beta)\) falls to zero, the transfer price paid to the producer converges to the marginal cost of production \((c)\). As producer bargaining strength gets closer to one, the transfer price is closer to the retail price (22).

The clearing condition for the goods market is as follows. Output of each variety \(k\) is equal due to identical cost structures and symmetric love-of-variety preferences \(x_k = x\). To calculate \(x\) in terms of the key underlying parameters, the free entry condition (12) is solved for \(x\), and then the equilibrium values of \(p\) and \(w\) from (22) and (23) are plugged in to get:

\[
x = \frac{(\sigma - 1)(r + \lambda)}{cq(\theta)} \frac{\mu}{1 - \beta}.
\]

(24)

Equation (24) says that the volume of output per marketing arrangement increases as varietal substitutability \((\sigma)\) go up. Output of each variety falls when there is an increase in marginal cost \((c)\) and when matches occur at a faster rate \([q(\theta)]\). The change with respect to retailer bargaining strength \(\beta\) is of undetermined sign, due to the manner by which \(\theta\) (which depends on \(\beta\)) enters the equation.

The ratio of retail vacancies to unmatched producers \((\theta)\) can be found by inserting \(w\) from (23), and \(x\) from (24), into (16):

\[
\theta = \frac{1 - \beta}{\beta} \frac{\rho}{\mu}.
\]

(25)
Equation (25) shows that $\theta$ depends on the costs of establishing a relationship and on bargaining strength. As it becomes more costly for producers to establish a relationship ($\rho$ increases), fewer of them try to do so ($\theta$ rises). As the bargaining strength of producers grows relative to that of retailers ($\beta$), fewer retailers try to establish a relationship ($\theta$ falls).

I now solve for the total number of varieties ($n$). Making use of the fact that $p_k = p$, I substitute (22) into (3) to get the demand for each variety:

$$x = \frac{\sigma - 1}{\sigma} \frac{Y}{cn}.$$  

Equation (26) with (24) and solving for $n$ yields the equilibrium number of marketing arrangements (varieties) in terms of exogenous variables:

$$n = \frac{Y}{\sigma} \frac{q(\theta) 1 - \beta}{r + \lambda} \frac{1}{\mu}.$$  

Equation (27) says that the number of opportunities for producers rises with exogenous consumer spending ($Y$) and the rate at which matches are made ($q(\theta)$). It is attenuated by the degree of varietal substitutability ($\sigma$), the breakup rate ($\lambda$), and search costs ($\mu$).

The total number of producers that can theoretically be sustained in a given product market, $L$, is also endogenous. $L$ encompasses producers with a match ($n$) and without a match ($L-n$). The number of producers with a marketing arrangement has the following relationship with the share of unmatched producers ($u$) and the total number of producers: $L(1-u) = n$. Substituting (7) and (27) into this expression, and making use of $\theta \equiv v/u$, the total number of producers that a market can sustain is:

$$L = \frac{Y}{\sigma} \frac{(1-\beta)\lambda}{(r+\lambda)\mu v}.$$  

$L$ is determined by exogenous consumer spending ($Y$), consumer tastes ($\sigma$), retailer bargaining power, as well as retailer search costs.

I now derive an expression for utility. Since $x_k = x$, (1) can be rewritten as:

$$Z(x_1, \ldots, x_n) = x n^{\sigma - 1} = c^{-1} Y^{\sigma - 1} (\sigma - 1) \sigma^{-\sigma} (r + \lambda)^{-\sigma - 1} \mu^{-\sigma - 1} [(1 - \beta)q(\theta)]^{-\sigma - 1}.$$
A joint producer-retailer free entry condition is obtained by adding the retailer free entry condition (12) to the producer free entry condition (16):

\[
(p - c)x = \frac{(\theta \mu + \rho)(r + \lambda)}{\theta q(\theta)}.
\]  

(30)

Substituting in the expression for \( \theta \) from (25) yields:

\[
(p - c)x = \frac{(r + \lambda)\mu}{(1 - \beta)q(\theta)}.
\]  

(31)

Equilibrium consists of the variables \( u, x, p, w, \) and \( \theta \) that satisfy the flow equilibrium condition (7), the retailer free entry condition (12), the producer free entry condition (16), the retail price equation (22), the transfer price equation (23), and the goods clearing condition (24).

Table 1 summarizes key expressions from the model and some corresponding ones from the standard monopolistic competition model. The first three rows consist of equations that are identical across the two models. These include the expressions for utility \( Z \), consumer demands \( x \), and retail price \( p \). The middle three rows report equations that are not part of the standard monopolistic model. For example, the standard monopolistic competition model does not distinguish between producers and retailers, so there is no transfer price \( w \) received by producers (23). In turn, the standard model does not allow for externalities that keep some producers and retailers from fully participating in these markets (25).

The bottom three equations of Table 1 show how the costs of establishing a relationship are just like the fixed cost \( F \) in the monopolistic competition model. The difference is clear when comparing the equations for number of varieties (27), output (24), and the free entry condition (31). The results of the two models differ only by a constant:

\[
F = \frac{r + \lambda - \mu}{q(\theta)(1 - \beta)}.
\]  

(32)

This makes clear that search costs in value-added market channels are essentially an additional, fixed cost of doing business.
Table 1. Key equations and comparison to monopolistic competition mode

<table>
<thead>
<tr>
<th>Variable (equation number)</th>
<th>Present study</th>
<th>Love-of-variety monopolistic competition model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utility (1)</td>
<td>[ Z = \left[ \sum_{k=1}^{n} (x_k)^{\sigma-1}/\sigma \right]^{\sigma/\sigma-1} ]</td>
<td>[ Z = \left[ \sum_{k=1}^{n} (x_k)^{\sigma-1}/\sigma \right]^{\sigma/\sigma-1} ]</td>
</tr>
<tr>
<td>Demand for a given variety (3)</td>
<td>[ x = \frac{p_k^{-\sigma}}{\sum_{k=1}^{n} p_k^{1-\sigma}} Y ]</td>
<td>[ x = \frac{p_k^{-\sigma}}{\sum_{k=1}^{n} p_k^{1-\sigma}} Y ]</td>
</tr>
<tr>
<td>Retail price for a given variety (22)</td>
<td>[ p = \left( \frac{\sigma}{\sigma - 1} \right) c ]</td>
<td>[ p = \left( \frac{\sigma}{\sigma - 1} \right) c ]</td>
</tr>
<tr>
<td>Transfer (producer) price (23)</td>
<td>[ w = \beta \left( \frac{\sigma}{\sigma - 1} \right) c + (1 - \beta)c ]</td>
<td>--</td>
</tr>
<tr>
<td>Vacancies relative to unmatched producers (25)</td>
<td>[ \theta = \frac{\nu}{u} = \frac{1 - \beta}{\beta} \frac{\rho}{\mu} ]</td>
<td>--</td>
</tr>
<tr>
<td>Total number of interested producers (28)</td>
<td>[ L = \frac{Y (1 - \beta)}{\sigma (r + \lambda) v} \mu ]</td>
<td>--</td>
</tr>
<tr>
<td>Number of varieties* (27)</td>
<td>[ n = \frac{Y (1 - \beta) q(\theta)}{\sigma (r + \lambda) \mu} ]</td>
<td>[ n = \frac{Y}{\sigma} \frac{1}{F} ]</td>
</tr>
<tr>
<td>Output of a given variety (24)</td>
<td>[ x = \frac{\sigma - 1}{c} \frac{(r + \lambda) \mu}{(1 - \beta) q(\theta)} ]</td>
<td>[ x = \frac{\sigma - 1}{c} F ]</td>
</tr>
<tr>
<td>Free entry condition (31)</td>
<td>[ (p - c) x = \frac{(r + \lambda) \mu}{(1 - \beta) q(\theta)} ]</td>
<td>[ (p - c) x = F ]</td>
</tr>
</tbody>
</table>

Notes: The monopolistic competition equations are directly from Beath and Katsoulacos (1991, p. 51-53). * In present study \( n \) is also the number of producers with a match, and the total number of marketing arrangements.
3. Comparative statics

**Result 1: Falling producer search costs**

This is our main result – it helps explain why the institutions discussed in the introduction have emerged in niche farm and food markets. While these institutions are not explicitly represented in the model, one effect is to lower the producer’s cost of establishing a marketing arrangement (\( \rho \)). As \( \rho \) falls, the number of retailers searching for a new product falls relative to the number of searching producers (\( \theta \)). Equation (25) verifies that \( \theta \) falls as producer search costs fall. Equation (28) in conjunction with \( \theta \equiv \nu / u \) verifies that the number of interested producers (\( L \)) must rise.

The rate at which producers are matched to retailers, \( q(\theta) \), increases as \( \theta \) falls since \( q'(\theta) < 0 \) in the matching function (5). The offshoot is increasing numbers of marketing arrangements (\( n \)). The proof follows from equation (27), which shows that \( n \) is a function of \( q(\theta) \). A further implication is that output per match (\( x \)) falls. The proof follows from equation (24), which shows that \( x \) is a function of \( q(\theta) \). The volume per marketing arrangement must go down as \( q(\theta) \) increases because overall consumer expenditure (\( Y \)) is fixed and there are an increasing number of marketing arrangements. This effect can be seen by noting that \( q(\theta) \) is in the denominator of (24), but is in the numerator of (27).

Consumer utility increases when producer search costs fall. The proof follows from equation (29). The partial derivative of \( Z \) with respect to \( \theta \) is negative, so when \( \theta \) falls, utility goes up. The economic intuition is that consumers benefit from the wider variety made possible by lower search costs.

**Result 2: Greater varietal differentiation**

Here we consider what happens if consumers’ elasticity of substitution (\( \sigma \)) falls. This could happen if, for example, consumers are less willing to substitute for products produced outside their locality. Since \( \sigma \) is also the own-price elasticity of demand for a variety, this means retailers can raise price with little reduction in volume. Using equation (22), we see that retail price rises, as the derivative of \( p \) with respect to \( \sigma \) is positive. As long as \( 0 < \beta < 1 \), some of this gain is shared with producers. As a result, there are now more producers (\( L \)) interested in producing for the market. The proof follows from equation (28).

As with Result 1, the number of marketing arrangements rises (equation 27) and the volume produced within a given marketing arrangement falls (equation 24). Consumer utility also rises, which can be verified by taking the appropriate...
derivative of equation (29) and noting that $\sigma > 1$. Overall, there is a decline in aggregate volume in the sector, given by:

$$nx = \frac{\sigma - 1}{\sigma} \frac{Y}{c}. \quad \text{(33)}$$

However, producers with a marketing arrangement receive a higher transfer price, as can be verified from equation (23). The derivative of $w$ with respect to $\sigma$ is negative, which indicates that the transfer price increases as $\sigma$ falls.

If $\sigma$ would increase, consumers are more willing to substitute across varieties, and prices fall as a result (equation 22). The only way that a producer-retailer partnership can sustain the lower markup is to produce in larger volumes and spread the fixed costs of search across more units (equation 24). Fewer varieties are produced (equation 26), since differentiation is less important to consumers and overall consumer expenditure remains constant.

**Result 3: Higher retailer bargaining strength**

The issue of downstream bargaining strength has long been of concern to agricultural producers. Here I consider what happens if the retailer has disproportionate bargaining strength in the division of surplus from a marketing arrangement. In particular, suppose the producer share of surplus ($\beta$) falls, all else the same. The transfer price ($w$) falls, as the derivative of $w$ with respect to $\beta$ is positive (equation 23). Retail price ($p$) does not change because it is affected by consumer elasticity of substitution and by marginal costs but not $\beta$ (equation 22).

Since retailers benefit, relatively more of them search for new products ($\theta$ increases). The proof is by equation (25), in which the derivative of $\theta$ with respect to $\beta$ is negative. The rate at which producers are matched to retailers, $q(\theta)$, falls since $q'(\theta) < 0$ in the matching function (5). It is unclear how a rise in retailer bargaining strength affects the number producers willing to match, since the sign on the determinant of $L$ with respect to $\beta$ cannot be determined due to the presence of $v$ in (27).

**Result 4: Higher rate of breakup**

Here I consider what happens if the rate ($\lambda$) by which marketing arrangements break up increases, all else the same. This might happen due to rapid change in the industry, such as exogenous shifts in consumer tastes, input prices, technology, or government regulation.
First look at equation (7), which concerns the fraction of producers who are unmatched \((u)\). The derivative of \((u)\) with respect to \(\lambda\) is positive. This implies that as \(\lambda\) increases, the fraction of unmatched producers increases as well. The number of searching retailers \((v)\) also increases since \(\theta \equiv v/u\), in conjunction with the fact that \(\theta\) is unaffected by \(\lambda\) (see equation 29).

The rise in the breakup rate increases the volume of each marketing arrangement \((x)\), which is verified by equation (24). In addition, the rise in the breakup rate decreases the number of marketing arrangements \((n)\), which is verified by equation (27). The interpretation is that if the probability of separation increases, those who remain in the market respond by expanding their sales; firms have to make enough of the relationship while it exists.

Consumer utility falls when the rate of breakups increases. The proof follows from equation (29); the partial derivative of \(Z\) with respect to \(\lambda\) is negative. Consumers are hurt when there is less variety. For example, the higher breakup rate may mean that consumers can no longer buy a local brand; the local producer has gone out of business.

**Result 5: No search and no breakups**

In this last case I consider what happens when two defining features of the model—search costs and breakups—no longer exist. In particular, suppose a given marketing arrangement never fails \((\lambda \to 0)\) and that it is entirely costless for retailers and producers to find each other and establish a marketing arrangement \((\mu \to 0, \rho \to 0)\). This eliminates the fixed cost of search and any sort of externality associated with establishing a marketing arrangement.

The results are exactly what happens in the monopolistic competition model when fixed costs in that model converge to zero (Beath and Katsoulacos, 1991). Looking at equations (24) and (27), firms become very numerous and very tiny, with the number of varieties going to infinity \((n \to \infty)\) and output per firm going to zero \((x \to 0)\). This is an unrealistic case, of course, but useful for revealing the structure of our approach and how it relates to the standard monopolistic competition model.

**4. Conclusions and implications**

Many industries have institutions that help participants find each other to make a market. For example, stockbrokers reduce search costs between buyers and sellers in financial markets, and employment referral agencies reduce search costs between employers and workers in labor markets (Gabre-Madhin, 2001; Ziesemer, 2003). Similar “match-maker” institutions are emerging in niche farm and food markets.
I provide a rationale for this phenomenon in a model of a niche producer who tries to sell directly to a retailer. In this setting, differentiation for love-of-variety consumers allows producers and retailers to get markups over marginal costs. However, these markups are needed to offset the transaction costs of establishing a marketing arrangement. In turn, externalities from this process prevent some producers from getting a marketing arrangement.

Match-maker institutions can be viewed as reducing search costs between producers and retailers in niche farm and food markets. I show that lowered search costs speed up the rate at which producers are matched to retailers. This results in a higher number of marketing arrangements, with less produced per match. Consumers also benefit from the wider variety. For example, they may now be able to purchase a specialty product from a small producer outside the area. In short, match-maker institutions have arisen because they are a boon to market participants and overcome a form of market failure inherent to niche markets. I also show how consumer demand lies at the heart of these markets. For example, increasing consumer taste for locally produced products could be interpreted as a fall in consumers’ elasticity of substitution; they are less willing to substitute for products produced outside their locality. In this case, the number of marketing arrangements rises and the volume produced within a given marketing arrangement falls.

There are other interesting aspects of these markets that are left out of the model, of course. However, there is much room for future work in this area, as this form of marketing appears to be growing rapidly, yet has received little attention in the literature.

5. References

CSREES (Cooperative State Research, Education, and Extension Service), 2007. Sustainable Agriculture Farm and Ranch Profiles. URL: www.csrees.usda.gov/sustainableagriculture.cfm


