# ARE STRUCTURAL CHANGES IN THE AGRI-FOOD SECTOR CAUSING THE INSTABILITY OF PAROCHIAL AG-PRODUCERS?

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A Thesis

presented to

the Faculty of the Graduate School

at the University of Missouri-Columbia

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In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

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JULY 2009

The undersigned, appointed by the dean of the Graduate School, have examined the thesis entitled:

ARE STRUCTURAL CHANGES IN THE AGRI-FOOD SECTOR CAUSING THE INSTABILITY OF PAROCHIAL AG-PRODUCERS?

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a candidate for the degree of master of science, and hereby certify that, in their opinion, it is worthy of acceptance.

Professor Harvey James Jr.

Professor Peter Klein

Professor David O'Brien

# ACKNOWLEDGEMENTS

I would like to thank Dr. Harvey James Jr., Dr. Peter Klein, Dr. David O'Brien, and Dr. Joel Hartman for suggestions and comments. I would also like to thank the National Agriculture Statistics Service for their assistance.

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ARE STRUCTURAL CHANGES IN THE AGRI-FOOD SECTOR CAUSING THE INSTABILITY OF PAROCHIAL AG-PRODUCERS?

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ABSTRACT

Parochial (Amish and Mennonites) agriculture producers have been known for their stability (historically large numbers) (Kollmorgen, 1943). Though, more recently, the percentage of parochial members who are ag-producers has been steadily declining. Game theory modeling suggests that parochial networks can be evolutionary stable, because of improved cooperation that promotes trust, despite constraints to scale efficiencies that may hinder economic performance (Bowles and Gintis, 2004). This study examines if the Parochial ag-producer declines are a result of structural changes (production contracts and new generation cooperatives) that have improved cooperation, and promoted trust, in large-scale anonymous agri-food trading relative to direct trading using parochialism. Findings suggest that structural changes to the agri-food sector may be a source of parochial ag-producer instability.

# Chapter I

# INTRODUCTION

Recent literature has described a decline in number of parochial (Amish and Conservative Mennonite) ag-producers (Kraybill and Nolt, 1995; Meyers, 1991; Lowrey and Noble, 2000). The conventional reason for the decline is an increasing population of parochial members and an increasing scarcity of farmland due to urban sprawl. The notion is the combination has pushed land values beyond an economically viable point for ag-production. Thus, parochial members are leaving established settlements (Cross, 2004), developing cottage industries, or engaging in other occupations (Kraybill and Nolt, 1995; Meyers, 1991; Lowrey and Noble, 2000). Using a method described later, this study examined seven select counties where large parochial settlements exist and found that the number of parochial ag-producers-- who had 250 acres or less and reported their primary occupation as farming-- dropped dramatically between the 2002 and 2007 agriculture census[1]. However, within these same counties the number of non-parochial ag-producers who met the same criteria appeared to be stable or had increased (See Table 1). This observation begs the obvious question: if land prices are being driven passed an economically viable point for ag-production then why are parochial farms declining,

[1] It would be reasonable to assume that parochial ag-producers don't respond to the ag-census because of their beliefs. Response to the ag-census is required by law, though 25% to 30% are estimated to not respond. Regardless, whether there is a lower rate of response between parochial and non-parochial producers doesn't matter when determining the differences in stability, unless for some reason parochial producers responded to the 2002 census differently than the 2007 census.

while similar non-parochial farms are not? If the conventional reasoning is sound, then non-parochial farms with similar characteristics to those of parochial farms should have suffered the same fate. In our analysis they don't appear to be, which suggests that an alternative explanation is needed.

**Table 1. The stability of Parochial farms from the 2002 and 2007 Agriculture Census**

| | Amish Farms 2002 | Amish Farms 2007 | Amish Stability Ratio | Mennonite Farms 2002 | Mennonite Farms 2007 | Mennonite Stability Ratio | Non Farms 2002 | Non Farms 2007 | Non Stability Ratio |
|---|---|---|---|---|---|---|---|---|---|
| Elkhart | 275 | 147 | 0.53 | 266 | 160 | 0.60 | 128 | 162 | 1.27 |
| Holmes | 673 | 390 | 0.58 | 299 | 190 | 0.64 | 131 | 152 | 1.16 |
| Johnson | 92 | 60 | 0.65 | 183 | 90 | 0.49 | 240 | 231 | 0.96 |
| Lagrange | 634 | 250 | 0.39 | 147 | 102 | 0.69 | 94 | 144 | 1.53 |
| Lancaster | 1356 | 993 | 0.73 | 1986 | 1475 | 0.74 | 368 | 787 | 2.14 |
| Washington | 55 | 33 | 0.60 | 111 | 57 | 0.51 | 268 | 227 | 0.85 |
| Wayne | 338 | 173 | 0.51 | 418 | 258 | 0.62 | 227 | 241 | 1.06 |

| | Mean Stability | | t-test | t statistic | P value |
|---|---|---|---|---|---|
| Amish | .572 | | Amish- Non | -4.16 | .0013*** |
| Mennonite | .614 | | Mennonite- Non | -3.95 | .0019*** |
| Non-Parochial | 1.28 | | | | |

The purpose of this study is to explore an alternative hypothesis to the differences in stability of parochial ag-producers and non-parochial ag-producers. The supposition that is being explored is non-parochial ag-producers are more stable because of two reasons: (1) differences in the institutional characteristics of parochial and non-parochial farms (beliefs on uncertainty and contract enforcement) and (2) because of recent structural changes (production contracts and new generation cooperatives) in the agri-food sector.

New Institutional Economics (NIE) literature has proposed several theoretical frameworks to explain institutional stability, the connection to economic performance, and institutional change (North 1990, 2005; Grief 1989, 1994, 2006; Bowles 2004).

Institutional structures constrain or give incentive to rational economic actors through rules, norms, beliefs, etc., that economize on transaction costs—arising from asymmetric information, opportunism, and vaguely defined property rights. Institutional structures can differ because of a society's culture of beliefs regarding uncertainty—specifically, collectivist versus individualist beliefs (Grief, 1994) that are embodied in religion (Cohen and Hill, 2007). Institutional structures typically differ in their method of contract enforcement; individualist societies develop formal hierarchical institutions (i.e. contracts, courts, and organizations), while collectivist societies use informal institutions such as collective punishment and exclusion (i.e. parochialism, ostracism, and shunning). It is thought that Individualist and Collectivist institutional structures can co-exist because each structure has a distinct competitive advantage in trade. Collectivist societies have an advantage when transactions are personal-- because of trust-- while individualist societies, utilizing contracts, can gain a competitive advantage in impersonal trade-- because of scale.

How and why institutions change is not well understood, or easily predicted, beyond a connection to economic performance (North, 1990; 2005). Some efforts have been made to identify the economic factors that promote institutional stability and model how changes to those factors can lead to institutional changes (Grief, 2006; Bowles, 2004). Bowels and Gintis (2004) use a one shot prisoner's dilemma framework and evolutionary game theory to model parochial network stability and the conditions that cause changes in network size. They define parochialism as "exclusionary practices" that promote high levels of cooperation. Their model determines that parochial network

stability is dependent on the efficiencies gained from high levels of cooperation in personal trade-- because of trust-- through observation by traits. The model suggests that movement away from the parochial network will occur if the efficiencies gained through parochialism are less than the efficiencies gained from scale, or if the same level of cooperation can be achieved outside the parochial network in what they describe as the "anonymous market".

This study finds that parochial ag-producers aren't different from non-parochial producers in short-term economic performance (probability of receiving a cash gain and distribution of sales) when controlling for farm size, primary occupation of the operator, and locality, but were far more unstable from 2002 and 2007. We suggest that the differences in marketing strategy we found-- Parochial producers are more likely to directly sell for human consumption (personal trading) and less likely to use a producer cooperative (impersonal trading)-- diminishes the long-term payoff to parochial producers given structural changes in the agri-food sector that have improved cooperation in the "anonymous market" and promoted trust. Because the long-term payoff is lower for parochial ag-producers, we suggest they aren't replicating in the agri-food market. Rather parochial ag-producers are seeking alternative occupations and investing resources in alternative enterprises besides agriculture land for ag-production.

# Chapter II

# PAROCHIAL NETWORKS

### *Amish and Mennonites use an All Cooperate Strategy and Exclude*

An alternative institutional structure to formal institutions is improving information and contract enforcement using parochialism. Amish adherents, and to a lesser extent Mennonite adherents, have long been associated with collective enforcement institutions (e.g. parochialism, ostracism, shunning) to promote trust (Hostetler 1995; Kraybill, 1989; Kraybill and Nolt, 1994)[2]. The foundations of the collectivist institutional structure grew out of Anabaptist beliefs developed during the Protestant Reformation. The basic beliefs were condensed into 18 articles in 1632 titled *the Dordrecht Confession of Faith*. *The Dordrecht Confession of Faith* states a contract between two parties should be either yea or nay, based on trust, and enforced by a community with similar beliefs. Formal contracts wouldn't be necessary because it is the expectation that adherents will fulfill their obligations to the fullest extent without a need for complex formal contracts or hierarchical enforcement institutions, such as a state judicial system[3]. If an agent was to defect in an agreement or transaction, the *Dordrecht Confession of Faith* states no action should be taken against them—thus a *tit-for-tat* strategy is explicitly forbidden-- a belief that would prevent Amish or Mennonites from

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[2] "…the Amish culture rests on oral communication and verbal agreements based on trust, not written legal documents." (Kraybill and Nolt, 1994)

[3] Article XV. *The Dordrecht Confession of Faith* (1632)

using contracts and a court system to enforce cooperation[45]. In order to protect themselves from agents who defect, or have defected in an agreement, adherents are to avoid contact with outsiders and utilize shunning or ostracism to prevent internal defection[67].

In the late seventeenth century, Anabaptists disagreed on the extent of exclusion and degree of shunning (Nolt, 1992). The disagreements divided the larger Anabaptist group into two identities: Amish and Mennonites. Members who believed in a stricter following of principles, exclusion, and greater degree of shunning have commonly been identified as Amish; and those with a looser following of principles, more inclusion, and less severe punishment are commonly known as Mennonite. A survey (Yoder, 1993) of Amish, Mennonites, and Reformed adherents in Iowa found that both Amish and Mennonites are less likely to use the court system than Reformed-- the Amish more so than Mennonites (see table 2). Additionally, Amish and Mennonites are less likely to use formal organizations to improve cooperation and were more likely to exclude based on whether a person has shared beliefs.

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[4]Article XIV. *The Dordrecht Confession of Faith* (1632)

[5] 'The Anabaptists…were…"unalterably opposed to instituting suits at law." Revenge and retaliation were unacceptable forms of Christian conduct.' (Kraybill, 1993)

[6] Article XVII. *The Dordrecht Confession of Faith* (1632)

[7] "The Amish do not deny that conflict is inevitable in human relations, both within their community and dealing with the world. Their mode of dispute management is modeled on pacifist, non legalistic practices." (Kraybill, 1993)

**Table 2. Michael Yoder, 1993. "Anabaptists and Calvinists four centuries later: an Iowa case study."** ***Mennonite Quarterly Review***

| **Percentage who answered yes to questions; Respondents were from Kalona (Washington County) and Orange City (Sioux County) Iowa** | | | | | |
|---|---|---|---|---|---|
| | Amish | Conservative Mennonites | Mennonites | Christian Reformed | RCA Reformed |
| | | | | | |
| If called to testify in a court of law, I would prefer to affirm, rather than to swear | 100% | 100% | 93% | 86% | 63% |
| If you have a legitimate grievance against a fellow Christian, it is wrong to file a lawsuit against that person. | 100% | 83% | 67% | 47% | 11% |
| Belong to Community Organizations | 0% | 26% | 40% | 42% | 51% |
| It is Important to Avoid Close Contact with Unbelievers or persons of different faith | 52% | 39% | 7% | 7% | 5% |
| Respondents who said they were Farmers | 61% | 22% | 9% | 5% | 5% |

The differences in beliefs on uncertainty and contract enforcement have been found to be important in understanding differences in economic performance and stability across a wide range of societies.

### *Amish and Mennonite Ag- Producers*

Amish and Mennonite ag-producers have been known for their stability (Kollmorgen, 1943) and differences in production methods (Cosgel, 1991; Reschly,2000; Stoltzfus, 1973; Kraybill, 2001; Kraybill and Hurd, 2006; Hostetler, 1993). A widely cited example is during spring planting, when an Amish producer can be observed using a custom planter being pulled by draft horses, a Mennonite producer using an older tractor with steel wheels, and non-parochial ag-producers using modern equipment. Hostetler (1964) explains that Amish non-mechanization, as well as differences in language and dress, are "symbols" (traits) to distinguish members of the network from outsiders, and to maintain a 'consistency of cultural beliefs'.

Differences between Amish and Mennonite ag- producers and non-parochial ag-producers have been found to extend beyond "symbols" (traits) and include: enterprise diversity, size, markets, and acceptance of government aid, but not economic performance. Hosteltler (1993) described Amish producers as maintaining a smaller-scale but wide diversity of livestock and crop enterprises compared to non-parochial producers, who are more apt to pursuing a low-cost strategy of expansion and specialization. Curry (2000) studied focus groups of different Protestant Religions in Iowa, he determined the German Reformed (Calvanist) community in Wellsburg had a low communal index (individualist), the largest farms, and the least enterprise differentiation. In contrast, Curry (2000) found German Mennonites in Wayland had a high communal index (collectivist), smaller farms, but were doing 'relatively well due to their large turkey production'. Moreover, Amish and Mennonite producers seem to be

more reliant on domestic markets and engaged in direct selling at farmers markets (Wilde, 2001; Lucas, 2004; James, 2005) where they are perceived to have a competitive advantage because of their 'identity' (Gale, 1997). Unlike non-parochial ag-producers, Amish and Mennonite producers are wary of being involved with any state program for agriculture. In accordance with their beliefs, many Amish and Mennonite producers don't participate in USDA programs or receive government subsidies for agriculture production (Kraybill, 1993). In spite of these differences, a 2001 Ohio county level study (Bender; 2001) compared the economic performance of counties which contain Amish with other counties; the study found net farm income of counties with Amish were better or equivalent to most other counties despite the small farm size-- a result of 'high value animal products marketed and low labor costs'.

***Amish and Mennonite Ag Producers have decreased in number***

Despite evidence that Amish and Mennonite farmers are doing well economically, there has been a steady decrease in the number of Amish and Mennonites engaged in agriculture production. Lowrey and Noble (2000) estimated the number of Amish farmers have declined in Holmes County, Ohio, by 26.12% from 1973 to 1997. Meyers (1991) found that the number of Amish who farm in Elkhart and Lagrange county, Indiana, declined by 24% between 1970 and 1988. Kraybill and Nolt (1995) describe the movement in Lancaster County, Pennsylvania and suggest the same elements that precipitated the decrease in Lancaster County can be observed across the Midwest.

# Chapter III

## THE AGRI-FOOD SECTOR, THE "ANONYMOUS MARKET", STRUCTURAL CHANGES AND TRUST

In the agri-food sector, there are essentially three types of interacting agents: the ag producer (farmer), the consumer, and intermediary organizations. The goods being transacted are ag-commodities/food. Ag producers have the choice of whom to trade surplus agriculture goods with, consumers or intermediary organizations. In the "anonymous market", most producer transactions are made with organizations (Producer Owned Cooperatives and Investor Owned Firms), and a smaller number are made between the producer and consumer directly (e.g. farmer's markets). Historically, formal organizations economized on transaction costs by coordinating consumer demands with producer ag-commodities and processing at a large-scale. Scale efficiencies were passed on to the consumer through a lower price, larger supply, and a greater diversity of products to choose from. However, recent changes in consumer preferences and an increased awareness of long-term effects to health have caused consumers to demand more specific attributes, production methods, and greater traceability for their food products.

Today's agri-food transaction between interacting agents resembles a type of prisoner's dilemma game. When the optimal transaction results, there is mutual cooperation between agents. However, when there is defection, there is a trade but the trade did not lead to the optimal payoffs for each agent. For example, producers lack information on consumer preferences that can extract a premium and lack enforcement of

consumer commitment if a more specified good was produced for the consumer. On the other hand, consumers lack information on the producer's methods and lack ability to enforce investment in quality or methods they approve of. Consumers' uncertainty exists because of possible long-term consequences of some producer methods (e.g. genetically modified organisms, pesticides, etc.). The issue has been exacerbated by vaguely defined property rights regarding labeling and the consumers' right to know (e.g. Caswell, 2000). All of which create transaction costs that can limit the gains to trade in the agri-food trade. Thus institutions are used to economize on the transaction costs that enable gains from cooperation that exceed the costs of the institution. When these institutions encourage trade at a Pareto superior equilibrium they garner trust from both agents.

Without trusted institutions to promote cooperation between the producer and consumer, producers would perceive consumer demands for specifications and traceability as too restrictive. If the consumer opportunistically defected in the transaction, the costs of finding an alternative buyer to pay a sufficient price for the added specification would be high (e.g. Williamson, 1975, 1985) . Thus, most agri-food transactions traditionally were governed using homogenous quality standards and spot markets. This allowed the producer the ability to find alternative markets at a low cost, but the consumer was left with unfilled demands. As production using homogenous quality standards and spot markets became more competitive and unprofitable, producers sought "value added" production where value from more quality specifications and niche demands could be captured at the farm level (e.g. Sykuta and Parcell, 2000).

The recent structural changes in the agri-food industry have enabled organizations to shift from homogenous quality standards and spot markets to governance structures that improve cooperation between producer supplies and consumer demands (MacDonald et al., 2004; Martinez, 2002; Boehlje, 1999; Barkema et al. , 1991). This study identifies two important structural changes to formal institutions that have improved cooperation and promoted trust in the "anonymous market": (1) production contracts and (2) new generation cooperatives. MacDonald et al. (2004) estimated that production contracts now govern 36% of the value of agriculture production compared to 12% in 1969. They cite 3 major reasons for a continued increase in contract adoption:

> *For a number of reasons, contracts are likely to govern a growing share of agricultural production over the next decade. First, demand for differentiated agricultural products to meet specific consumer preferences should continue to grow, and such products are generally produced under contract. Second, pressures will mount to ensure traceability of products for health and consumer concerns, and contracts provide one way to ensure traceability. Third, pressure to reduce environmental degradation associated with agricultural production will likely result in upgraded production technologies and require tighter management of production systems through contracting.*

The other structural change to improve cooperation between the ag producer and consumer is the New Generation Cooperative (NGC). Between 1988 and 1996, Cook and Tong found that more than 80% of upper Midwest cooperative startups had "non-traditional" organizational characteristics— characteristics that distinguish NGCs from traditional cooperatives (Cook and Illioupolous, 1999). Coltrain, Barton, and Boland (2000) define the purpose and membership of NGCs:

> *One way for small and midsize farms to remain viable businesses is to increase income to their operation by participating in profitable value-added processing and marketing activities…NGCs have been established by producers to increase their share of the consumer dollar and to add value to their basic commodities through processing and forward linking to the market place by selling processed products instead of raw commodities… Many consumers prefer and trust food that is produced and sold by farmers. By moving up the food chain, NGCs take advantage of this opportunity.*

Cook and Sykuta (2001) provide a framework to why producer owned cooperatives, particularly NGCs, can be a better organizational form than production contracts for improving cooperation. The assumption made here is that both forms will continue to improve cooperation and promote trust, despite anonymity and large-scale marketing.

# Chapter IV

# THE CONCEPTUAL FRAMEWORK

This study identifies two alternative institutional structures that can economize on transaction costs in an agri-food trade. The first is parochialism, which uses observable traits to identify cooperating trading partners with some probability (Bowles and Gintis, 2004). The second is contracts and organizations, which enables impersonal trading on a large-scale. Both types of institutional structures can co-exist if Parochialism provides an equivalent long-term payoff to trading—where parochialism balances high costs and small-scale with high levels of trust compared to formal institutions large-scale, low costs, and institutional trust.

The model this study uses as a conceptual basis was formalized by Bowles and Gintis (2004). Using a one shot prisoner's dilemma framework and evolutionary game theory, the Bowles and Gintis (2004) model suggests a parochial network will exist when parochialism improves information and promotes high levels of cooperation in trade. This study does make a slight adaptation to the model developed by Bowles and Gintis (2004)-- though, the general propositions and construct are the same. In a market with all cooperators, all defectors, and inspectors a parochial network will exist, given parochialism can improve the probability of trading with a cooperating agent. The inspectors use parochialism to improve mutual cooperation by observing signals in the form of agent traits (e.g. race, language, sex) using what they call an "ascriptive filter". The degree of parochialism is defined by the number of traits an inspector uses to identify

a cooperating trading partner. Agents not using an "ascriptive filter" are considered outside the parochial network and in the "anonymous market". The long-term payoff achieved in a parochial network is dependent on the probability that parochial traits represent an accurate signal of the agents' strategy (cooperate or defect). The model theorizes that the degree of parochialism improves signal quality, decreases communication difficulty, and promotes trust between the agents that both will cooperate (neither will defect).

However, the tradeoff to greater trust is a smaller network to trade with (a result of the exclusionary practices based on traits). Hence there are costs to scale for being a part of a parochial network, and the costs monotonically increase with the degree of parochialism. If the agents of a parochial network reduce their degree of parochialism-- to compensate for loss of scale-- the quality of signal will decrease and costs of ascertaining the opposing trading partner's correct strategy will increase. Hence as network size becomes larger there are increasing costs to signal quality. Therefore various parochial network sizes can remain in equilibrium; where the benefits of the parochial network (payoffs from cooperation) exceed the costs of signal quality and costs to scale-- assuming agents can costlessly move from networks.

Where the long-term payoffs match exists an equilibrium parochial network population and anonymous market population. When there are changes in payoffs to cooperation or defection, number of agents playing cooperate, or the probability of identifying an agent correctly, there are changes to parochial network size relative to the "anonymous market". Agents will either move to the parochial network, or move away

from the parochial network and trade in the “anonymous market” depending on what provides the better long-term average payoff. In our adaptation of the model, inspector consumers are changing from identifying signals of cooperating agents using parochialism of agent traits to indentifying signals from product labels in the “anonymous market”. The supposition is that production contracts and new generation cooperatives are improving cooperation in the “anonymous market” and are signaling this cooperation through labels (e.g. “organic”, “free range”, “fresh”, etc.). Identification of cooperating agents can be achieved anonymously using labels with some probability. Thus, if the labels anonymously signal cooperation with the same probability as agent traits do, then inspector consumers will switch to the “anonymous market” where they can gain both trust and scale efficiencies. Assuming the parochial network can’t change or adapt to further improve their long-term payoff to cooperation or improve costs to scale then there will be a decrease in the population of inspector consumers engaging in trade with parochial producers relative to non-parochial producers in the “anonymous market”.

When the parochial network can co-exist in the long-term (see Figure 1 and 2), the all cooperators represent the parochial producers, the inspectors represent parochial consumers, and the all defectors represent the non-parochial producers and consumers in the “anonymous market”. In this case, the anonymous market is selling raw commodities for food where little attention is being given to consumer demands on production methods, traceability, or quality. This would be the state of the Agri-food market prior to the introduction of the new generation cooperative and wide use of production contracts. The long-term co-existence of a parochial direct trading network would be assured

because the gains from cooperation would outweigh the gains from scale that can be achieved in the "anonymous market". Inspectors would find it in their interest to directly trade in the parochial network using observable traits to identify cooperators. And parochial inspectors and parochial producers would replicate at the same rate as non-parochial producers and consumers in the "anonymous market".

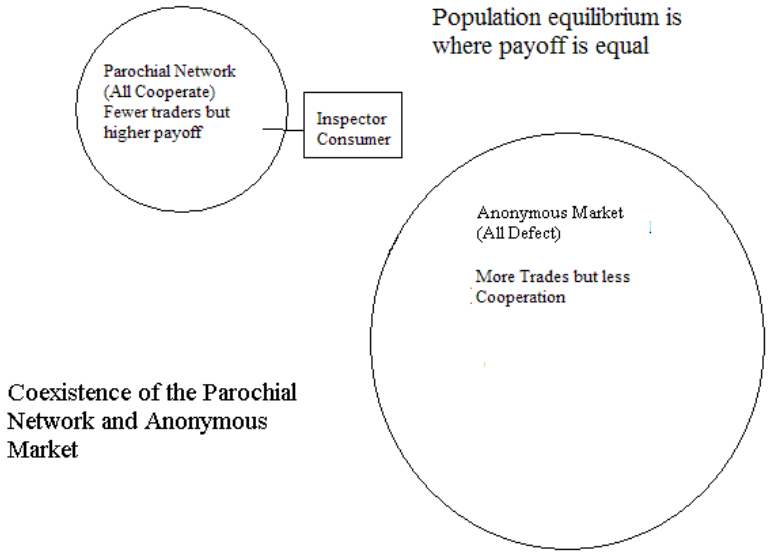



**Figure 1. The coexistence of an Anonymous Market and Parochial Network**

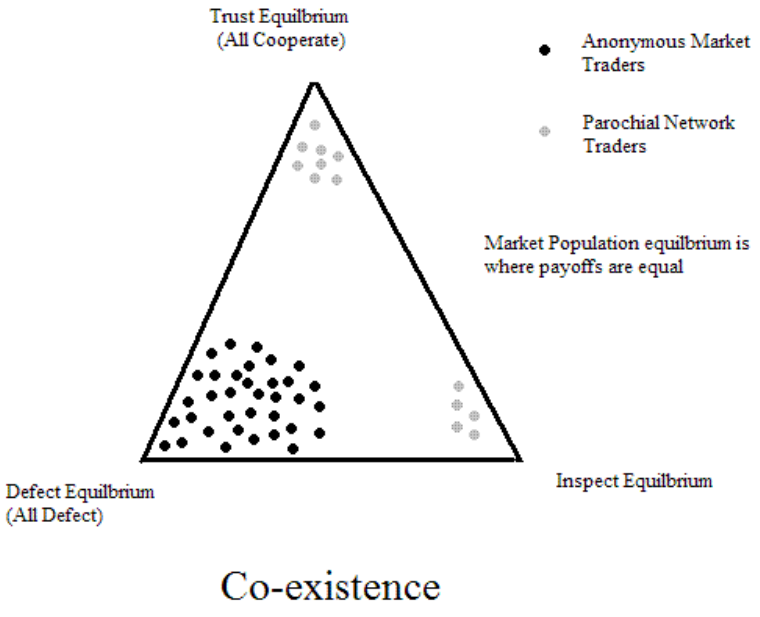



**Figure 2. Simplex illustrating population of All Cooperators, All Defectors, and Inspectors during Co-existence**

As contracts become more restrictive and organizations change to improve cooperation between agents in the "anonymous market", then agents using contracts and organizations will capture more gains from trade than agents in a parochial network (payoff to "anonymous market" participants includes the scale efficiency plus the trust efficiency, while gains from trade to parochial agents just include the efficiency from trust). Overtime, the higher average payoff to non-parochial traders will allow them to replicate at a faster rate than parochial traders. The result is a rising population of non-parochial producers and a decreasing population of parochial producers within a market-space, assuming parochial producers don't mutate or adapt their institutional structure (see figure 3 and 4).

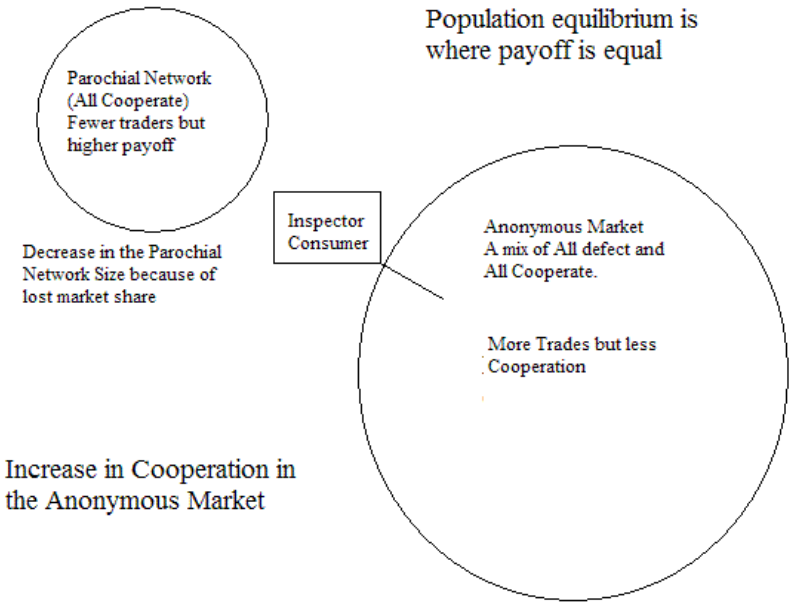



**Figure 3. Change in equilibrium between the Parochial Network and the Anonymous Market**

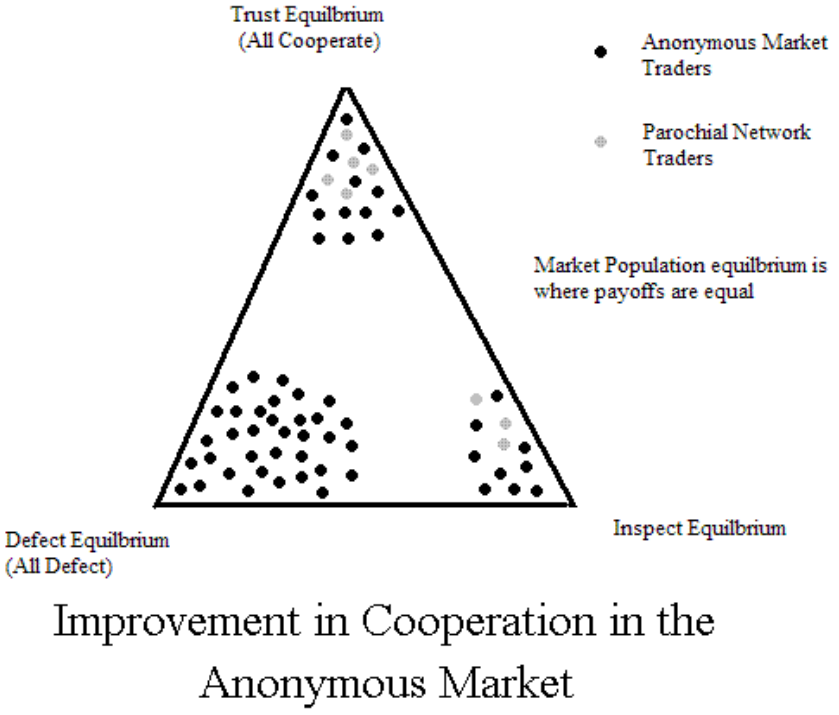



**Figure 4. Change in population in the market as a result of the change in equilibrium**

To simply explain the conceptual framework, imagine an inspector consumer who has preferences for a particular producer method (e.g. free range turkey). Suppose that consumer perceives that a parochial producer with a certain set of observable traits (horse and buggy, plain dress, dialect, etc.) shares his beliefs on production methods (free range) with some probability. Let's also suppose a less expensive turkey is available to purchase at the local Supermarket. The supermarket will also buy the parochial farmer's free range turkeys for less, though a lot more of them, and will sell the consumer a turkey for less plus stuffing—which the consumer wants. Now, if the consumer is uncertain of the methods used to produce the turkeys at the supermarket then he may seek out a parochial farmer to directly purchase from him. In this example it would be rational for the consumer and the parochial farmer to engage in a direct trade, given the expected utility of the consumer eating a free range turkey is greater than the costs of seeking the farmer and the forgone costs of not going to the supermarket and buying stuffing. Now imagine the next year a New Generation Cooperative called Free Range Turkeys is created. The rules of the cooperative are such that they ensure producers use free range methods and the cooperative sells via the Supermarket Free Range Turkeys for the same price as the parochial farmer. Let's assume the consumer perceives the Guaranteed Free Range label signals the same probability of obtaining a free range turkey as the traits of a parochial farmer do. Then the rational choice for the consumer is to now purchase his turkey from the Supermarket where he can buy stuffing as well. The question is then: how does the parochial farmer respond to the lost market share, will he start selling to the supermarket, join the cooperative, or exit the market?

The expectation is that parochial farmers are not different from non-parochial farmers in short-term economic performance, but are different in long-term average payoffs. The reason there are differences in long-term average payoffs is because of institutional differences in marketing strategy and structural changes. Parochial producer's advantage is expected to be in personal trade because of institutional advantages that are signaled by observable traits. They aren't expected to have an advantage by trading anonymously using formal institutions (e.g. production contracts or producer cooperatives). The assumption is that parochial producers long-term average payoff are lower than non-parochial producers because of changes in the agri-food sector, thus parochial farm numbers are declining relative to non-parochial farms who perceive a higher long-term payoff and are willing to make a larger long-term investment; which is tantamount to replication in the evolutionary game theory model developed by Bowles and Gintis (2004). Thus the first hypothesis is:

***H1**: Amish and Mennonite Producers' short-term economic performance is not significantly different than Non-Parochial producers. (Matching Short-term Payoffs)*

Like Curry (2000) and Bender (2001) found we expect parochial producers to have equivalent short-term payoffs, which is consistent with the model. And further suggests the only reason we observe differences in exit or entry rates (i.e. Table 1) between the parochial and non-parochial groups is because of differences in long-term average

payoffs. We suggest the first reason there are differences in long-term average payoffs is because of beliefs of using formal institutions to trade. Thus the second hypothesis is:

***H2****: Amish and Mennonite Producers are less likely to use formal institutions (contracts and cooperatives) for trade than Non-Parochial producers.*

In contrast, parochial producers know their advantage is in personal trade because of observable traits that signal a high level of cooperation. Thus the third hypothesis is:

***H3****: Amish and Mennonite Producers are more likely to engage in personal trading than Non-Parochial producers.*

Because structural changes are occurring in the agri-food sector we suspect the growing value of the parochial personal trading network has been limited relative to the growing value of the "anonymous market". Thus we have the fourth hypothesis:

***H4****: The long-term value of the Parochial Network is less than the long-term value of the "Anonymous Market"*.

Our supposition is that these four hypotheses fit the evolutionary game theory model and provides an alternative explanation to declines in the number of parochial farms relative to the number of non-parochial farms of similar size and characteristics.

# Chapter V

# METHOD

An ideal data set to test the conceptual cause of parochial instability would be time series data of farms, their sales, expenses, income, non-farm income, enterprises, location, and the respective governance structure used to market ag-production for each enterprise throughout a reasonable period (20 years). The data set would also include the operator's religion, religiosity, and observable traits, if any, that can be associated with that religion. Also consumer data would be needed to determine changes in consumer habits, beliefs on the nature of their food products, beliefs on uncertainty in food production, and how that impacts where they procure their food. To a limited extent the farm sales, expenses, income, enterprises, location, and some types of marketing strategies are available in the USDA Ag-Census data in 5 year time periods. Unfortunately, demographic information on operator's religion is not available in the Ag-Census data. Also concerns for respondents' privacy limit data availability and some techniques for analysis. Other data that is available is consumer food expenditures and changes, through national surveys conducted by the USDA.

To empirically test the conceptual framework, data from the 2002 and 2007 Agriculture Census Survey was used. Every five years a census is conducted of all U.S.

famers by the USDA; response rates have been estimated at approximately 70-80%[8]. A special tabulation was conducted by the National Agriculture Statistics Service (NASS). To preserve respondents' privacy only farm counts and binary data were used in the analysis.

Since Amish and Mennonite producers were the identified parochial subjects, seven counties with large populations of Amish and Mennonite producers were selected. Non-parochial producers reside in the seven counties as well. To reduce the potential for selection error and to control for exogenous influences (e.g. weather, resource variation, location to markets, etc.) only the seven counties were used for comparison. The counties chosen include: Lancaster, Pennsylvania, Holmes and Wayne, Ohio, Lagrange and Elkhart, Indiana, and Johnson and Washington, Iowa. To further control for resource endowments and off farm income, the sample was restricted to farms with 250 acres or less, and required the primary occupation of the operator to be farming. These controls also somewhat controlled for production scale effects (distinct from marketing scale). The controls allow examination of differences, if any, in short-term economic performance, marketing strategy, and stability between parochial and non-parochial producers *cetaris paribus*. The expectation is that parochial producers will not be distinctly different in short-term economic performance, but will be distinctly different in marketing strategy and long-term payoffs to those strategies-- thus distinctly different in stability.

[8] "Multiple response rates were calculated, but these have not been published. Appendix A of the *2002 Census of Agriculture Volume 1 Chapter 1: U.S. National Level Data* report lists a minimal response rate of 75 percent"

The biggest challenge of the analysis was to distinguish degree of parochialism (i.e. Amish producers from Mennonites and Amish and Mennonites from non-parochial producers). Given the data available to make such distinctions, Amish farmers were determined to be farms that possessed 3 or more horses and did not receive government payments, Mennonites were distinguished as only not receiving government payments,[9] and non-parochial producers were determined to exhibit neither of these characteristics. The criteria for degree of parochialism isn't as precise as would be desired[10], however it did preserve the formal definition of degree of parochialism explained by Bowles and Gintis (2004):

> *We cannot in general compare the degree of parochialism between arbitrary filters. We can, however, determine which of two filters that differ only in one entry is more parochial. For instance, we cannot say that excluding Jews or excluding blacks is more parochial, but we can say that excluding Jews and women is more parochial than simply excluding Jews. By extension, we can compare two filters if their differences can be expressed by a series of such comparisons. In other words, ascriptive filters partially order the set P of parochial networks. Given networks N € P consisting of b(N)-parochial agents*

[9] Since there would be an incentive to receive government subsidies at a low cost, an acknowledgement of not doing so would suggest some type of resistance to government programs. In addition, producers who receive government payments are public record, therefore easily identifiable by other parochial members, who may shun or punish those that do.

[10] Perhaps better variables for parochialism that effect trust in transactions are language, dress, congregation, etc. but since these variables weren't available in the ag-census survey, the best available proxies were used.

*and M € P with b(M)-parochial agents, we say M is more parochial than N if b(M) > b(N), so every member of M would be admitted to N.*

The use of horse inventory has been shown to be a good proxy for identifying Amish producers from other producers (Lowrey and Noble, 2000). Although groups such as Old Order Mennonites use horses and groups such as New Order Amish do not. There certainly exists potential sampling error, where Amish, Mennonites, and non- parochial producers are in each of these categories, but the amount is assumed to be small and equally distributed to not bias the results. For simplicity, producers with 3 or more horses and not receiving government payment will be identified as Amish, producers not receiving government payment will be identified as Mennonite, and non-parochial producers will be identified as exhibiting neither of these traits. The study is by no means trying to suggest that these characteristics accurately reflect groups that identify themselves as Amish, Mennonites, and non-parochial producers. Rather, the study is trying to approximate the degree of parochialism, which is roughly correlated with groups that identify themselves as Amish and Mennonite, and those that don't.

Table 3 reports the distribution of farms obtained from the 2002 Ag Census data using the specified sample criteria and method for determining parochialism. Table 4 shows the number of adherents who were identified in these counties as Amish or Mennonite in the 2000 Religious Congregation and Membership Study conducted by the Association of Statisticians of American Religious Bodies (ASARB), and obtained from the Association of Religious Data Archives (ARDA).

**Table 3. Farm distribution using Parochialism method (2002 Ag-Census)**

| Counties | Lancaster | Holmes | Wayne | Johnson | Washington | Elkhart | Lagrange | Total |
|---|---|---|---|---|---|---|---|---|
| Amish | 1356 | 673 | 338 | 92 | 55 | 275 | 634 | 3423 |
| Mennonite | 1986 | 299 | 418 | 183 | 111 | 266 | 147 | 3410 |
| Non | 368 | 131 | 227 | 240 | 268 | 128 | 94 | 1456 |
| Total Farms | 3710 | 1103 | 983 | 515 | 434 | 669 | 875 | 8289 |

**Table 4. 2000 ASARB Religious Congregation and Membership Study obtained from ARDA**

| | Amish; Other Groups-- Number of Adherents (2000) | Mennonite Church USA-- Number of Adherents (2000) | Mennonite; Other Groups-- Number of Adherents (2000) | Old Order Amish-- Number of Adherents (2000) | Old Order Mennonite-- Number of Adherents (2000) |
|---|---|---|---|---|---|
| Elkhart | 44 | 8765 | 1047 | 4758 | 855 |
| Lagrange | 0 | 1621 | 206 | 5994 | 0 |
| Johnson | 0 | 894 | 0 | 0 | 0 |
| Washington | 0 | 1086 | 102 | 621 | 0 |
| Holmes | 1218 | 1789 | 464 | 6202 | 0 |
| Wayne | 304 | 3670 | 431 | 4554 | 373 |
| Lancaster | 13 | 19740 | 2507 | 11590 | 7668 |

**www.theARDA.com**

When we combined the number of adherents in the 2000 ASARB Religious congregation and membership study as either Amish or Mennonite, we found that number is significantly correlated with the number of farms we identified as Amish or Mennonite using the parochialism method (See Table 5). The correlation does show that the method is acceptable for identifying Amish and Mennonite producers. Furthermore, the relationship gives an estimated percentage of adherents whose primary occupation

was farming 250 acres of land or less in 2002. For the Amish, it was estimated at 10.8% and Mennonites at 6.1%[11].

**Table 5. Correlation of Parochialism Method with Religious Congregation and Membership Study**

**Correlations**

| | Total Amish Farms | Total Mennonite Farms | Amish Adherents (Religious Census) | Mennonite Adherents (Religious Census) |
|---|---|---|---|---|
| Total Amish Farms (Ag Census) | 1.000 | .860* | .955** | .800* |
| Total Mennonite Farms (Ag Census) | .860* | 1.000 | .773* | .956** |

To test the aforementioned hypotheses two types of means testing were used. Both tested the means between the two parochial groups and the non-parochial groups. The first means test calculates Cohen's *d* (1992) at a grand level and at a county level, and determines level of effect given Cohen's (1992) criteria. The first method assumes a binomial distribution with variance $p(1-p)$. The second method was used to test differences in stability. The ratio of remaining farms in each county was analyzed using

[11] The coefficient is another check on how well the parochialism method retrieved Amish and Mennonite farms. The coefficient may suggest that the Parochial method is biased too low relative to the true population of Parochial farms. Lowrey and Noble (2000) estimated 21.42% of the Amish Population were in agriculture in Holmes County, Ohio in 1997 and Meyers (1991) estimated the Amish farmers to be 37% of the Amish population in Elkhart and Lagrange County, Indiana in 1988. Though, it is difficult to determine if the rate is too low given that the other studies were performed in earlier periods, and it has been well documented that there is a decrease in Parochial members' primary occupation as farming.

a simple t-test to determine if the changes in number of farms were different between the parochial groups and non-parochial group.

Cohen's *d* (1992) is a method used in behavioral sciences to estimate the effect size independent of sample size. The purpose is to have a standardized estimate of effect magnitude for a variable on a population. The equation for Cohen's *d* when testing the difference between two means is:

$$\text{Cohen's } d = (m_c - m_a) / \sigma$$

Since the sample size and variance of the two groups aren't equal, a pooled standard deviation was used in the denominator:

$$\sigma = \sqrt{[(n_c-1)\sigma_c^2 + (n_a-1)\sigma_a^2] / (n_c + n_a)}$$

Cohen (1992) describes the criteria for effect size as small, medium, or large; medium was referred to as "likely to be visible by the naked eye", small as "not trivial", and large as equal distance from medium as small was from medium. The corresponding test criteria for a Cohen *d* score in an independent means test is: small (.2), medium (.5), and large (.8)

# Chapter VI

# RESULTS

The first difference we wanted to test was whether parochialism had any effect on economic performance. The conceptual framework assumes that the existing population has matching payoffs to all players. Only when the long-term average payoff is less would we see different rates of replication that can effect market population (i.e. Table 1). To test the effect of parochialism on economic performance two variables were used: (1) whether the farm had a cash gain or cash loss and (2) whether the farm had sales $25,000 or less, $25,000-100,000, or $100,000 or more. Table 6, 7, and 8 report the effects of parochialism on economic performance using Cohen's *d* and criteria, the mean, the variance, and the sample size of each group in each county. Table 6 reports for all counties there was no effect from parochialism on the probability of receiving a cash gain.

**Table 6. Effect of Parochialism on Farms reporting cash gains**

| Geographic Area | Amish | Amish- Non | Non-Parochial | Mennonite -Non | Mennonite |
|---|---|---|---|---|---|
| | *Mean (Variance) Sample size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* |
| **All counties:** | 0.76 (0.18) 388 | 0.039 ***No Effect*** | 0.74 (0.19) 298 | -0.067 ***No Effect*** | 0.71 (0.21) 747 |
| **Washington** | 0.86 (0.12) 7 | 0.529 ***Medium (+) Effect*** | 0.63 (0.23) 52 | -0.139 ***No Effect*** | 0.59 (0.24) 29 |
| **Johnson** | 0.67 (0.22) 9 | -0.041 ***No Effect*** | 0.69 (0.22) 35 | -0.296 ***Small (-) Effect*** | 0.54 (0.25) 37 |
| **Wayne** | 0.77 (0.18) 26 | 0.254 ***Small (+) Effect*** | 0.66 (0.23) 29 | 0.053 ***No Effect*** | 0.68 (0.22) 72 |
| **Holmes** | 0.77 (0.18) 70 | -0.130 ***No Effect*** | 0.82 (0.15) 17 | -0.255 ***Small (-) Effect*** | 0.70 (0.21) 44 |
| **Lancaster** | 0.80 (0.16) 181 | -0.086 ***No Effect*** | 0.83 (0.14) 117 | -0.199 ***No Effect*** | 0.75 (0.19) 507 |
| **Elkhart** | 0.67 (0.22) 39 | -0.103 ***No Effect*** | 0.71 (0.20) 28 | -0.227 ***Small (-) Effect*** | 0.62 (0.24) 39 |
| **Lagrange** | 0.66 (0.22) 56 | 0.023 ***No Effect*** | 0.65 (0.23) 20 | -0.370 ***Small (-) Effect*** | 0.47 (0.25) 19 |

Table 7 and 8 report that parochialism had no effect on the amount of sales a farm had. Both measures showed some effects in local areas. The overall conclusion of the tests suggest parochialism at a global level had no effect on the probability of receiving a cash gain, and no effect on the amount of sales a farm received. This is consistent with the conceptual framework that the short-term payoffs to both the parochial producers and non-parochial producers match.

**Table 7. Effect of Parochialism on Farms receiving $100,000 in sales or more**

| Geographic Area | Amish | Amish- Non | Non-Parochial | Mennonite - Non | Mennonite |
|---|---|---|---|---|---|
| | *Mean (Variance) Sample size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* |
| **All counties:** | 0.35 (0.23) 5300 | -0.129 ***No effect*** | 0.41 (0.24) 3275 | -0.085 ***No effect*** | 0.37 (0.23) 5652 |
| **Washington** | 0.36 (0.23) 86 | 0.446 ***Small (+) effect*** | 0.17 (0.14) 451 | 0.377 ***Small (+) effect*** | 0.35 (0.23) 165 |
| **Johnson** | 0.33 (0.22) 147 | 0.424 ***Small (+) effect*** | 0.16 (0.13) 438 | 0.069 ***No effect*** | 0.18 (0.15) 270 |
| **Wayne** | 0.06 (0..06) 491 | -0.558 ***Medium (-) effect*** | 0.26 (0.19) 465 | -0.065 ***No effect*** | 0.23 (0.18) 667 |
| **Holmes** | 0.19 (0.15) 1043 | -0.300 ***Small (-) effect*** | 0.32 (0.22) 276 | -0.388 ***Small (-) effect*** | 0.16 (0.14) 476 |
| **Lancaster** | 0.56 (0.25) 2272 | -0.352 ***Small (-) effect*** | 0.73 (0.20) 1127 | -0.535 ***Medium (-) effect*** | 0.47 (0.25) 3413 |
| **Elkhart** | 0.34 (0.22) 394 | -0.114 ***No effect*** | 0.39 (0.24) 283 | -0.253 ***Small (-) effect*** | 0.28 (0.20) 419 |
| **Lagrange** | 0.16 (0.13) 867 | -0.322 ***Small (-) effect*** | 0.29 (0.21) 235 | -0.275 ***Small (-) effect*** | 0.17 (0.14) 242 |

**Table 8. Effect of Parochialism on Farms receiving $25,000 to $100,000 sales**

| Geographic Area | Amish | Amish-Non | Non-Parochial | Mennonite-Non | Mennonite |
|---|---|---|---|---|---|
| | *Mean (Variance) Sample size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* |
| **All counties:** | 0.32 (0.22) 5300 | 0.008 ***No effect*** | 0.32 (0.22) 3275 | -0.189 ***No effect*** | 0.23 (0.18) 5652 |
| **Washington** | 0.34 (0.22) 86 | -0.078 ***No effect*** | 0.37 (0.18) 451 | -0.310 ***Small (-) effect*** | 0.24 (0.23) 165 |
| **Johnson** | 0.37 (0.23) 147 | -0.019 ***No effect*** | 0.38 (0.22) 438 | -0.113 ***No effect*** | 0.33 (0.24) 270 |
| **Wayne** | 0.31 (0.21) 491 | -0.199 ***No effect*** | 0.40 (0.16) 465 | -0.455 ***Small (-) effect*** | 0.20 (0.24) 667 |
| **Holmes** | 0.40 (0.24) 1043 | 0.021 ***No effect*** | 0.39 (0.16) 276 | -0.440 ***Small (-) effect*** | 0.20 (0.24) 476 |
| **Lancaster** | 0.25 (0.19) 2272 | 0.178 ***No effect*** | 0.18 (0.18) 1127 | 0.125 ***No effect*** | 0.24 (0.15) 3413 |
| **Elkhart** | 0.27 (0.20) 394 | -0.323 ***Small (-) effect*** | 0.42 (0.19) 283 | -0.422 ***Small (-) effect*** | 0.25 (0.24) 419 |
| **Lagrange** | 0.43 (0.24) 867 | 0.112 ***No effect*** | 0.37 (0.19) 235 | -0.254 ***Small (-) effect*** | 0..26 (0.23) 242 |

The next difference we wanted to test was whether parochial producers used formal institutions to trade. The assumption is that parochial agents use collectivist enforcement institutions for contract enforcement-- not formal institutions. The 2002 and 2007 Ag Census survey had two variables available to test whether parochial producers used formal institutions: 1) whether the farms had adopted a production contract and 2) whether the farm receives a patronage refund check from a producer cooperative. Surprisingly, table 9 reports that parochial producers have adopted production contracts at the same rate as non-parochial producers on a global level. Only in Lancaster County did we observe a small negative effect on contract adoption because of parochialism.

**Table 9. Effects of Parochialism on farms adopting a Production Contract.**

| Geographic Area | Amish | Amish-Non | Non-Parochial | Mennonite-Non | Mennonite |
|---|---|---|---|---|---|
| | *Mean (Variance) Sample size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* |
| **All counties:** | 0.07 (0.07) 5469 | 0.009 ***No effect*** | 0.08 (0.07) 3400 | -0.073 ***No effect*** | 0.10 (0.09) 5742 |
| **Washington** | 0.05 (0.04) 88 | -0.068 ***No effect*** | 0.06 (0.06) 495 | 0.359 ***Small (+) effect*** | 0.18 (0.15) 168 |
| **Johnson** | 0.05 (0.05) 152 | -0.080 ***No effect*** | 0.04 (0.03) 471 | 0.030 ***No effect*** | 0.04 (0.04) 273 |
| **Wayne** | 0.04 (0.04) 511 | -0.049 ***No effect*** | 0.05 (0.05) 468 | -0.044 ***No effect*** | 0.04 (0.04) 676 |
| **Holmes** | 0.11 (0.10) 1063 | 0.180 ***No effect*** | 0.06 (0.06) 283 | 0.139 ***No effect*** | 0.09 (0.08) 489 |
| **Lancaster** | 0.05 (0.04) 2349 | -0.241 ***Small (-) effect*** | 0.11 (0.10) 1155 | 0.081 ***No effect*** | 0.13 (0.11) 3461 |
| **Elkhart** | 0.12 (0.10) 422 | 0.157 ***No effect*** | 0.07 (0.07) 290 | -0.151 ***No effect*** | 0.05 (0.05) 426 |
| **Lagrange** | 0.10 (0.09) 884 | 0.061 ***No effect*** | 0.08 (0.07) 238 | -0.090 ***No effect*** | 0.06 (0.06) 249 |

However, parochialism did have a negative effect on farms receiving a cooperative patronage— the effects were small at the global level and medium, small, and large at the county level (see table 10). This finding would suggest that parochial producers are less likely to engage in anonymous large-scale trading, unlike non-parochial producers.

**Table 10. Effects of Parochialism on receiving a cooperative patronage refund.**

| Geographic Area | Amish | Amish-Non | Non-Parochial | Mennonite-Non | Mennonite |
|---|---|---|---|---|---|
| | *Mean (Variance) Sample size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* |
| **All counties:** | 0.10 (0.09) 5469 | -0.298 ***Small (-) effect*** | 0.21 (0.17) 3400 | -0.476 ***Small (-) effect*** | 0.11 (0.10) 5742 |
| **Washington** | 0.16 (0.13) 88 | 0.073 ***No effect*** | 0.13 (0.12) 495 | -0.501 ***Medium (-) effect*** | 0..05 (0.05) 168 |
| **Johnson** | 0.13 (0.11) 152 | 0.037 ***No effect*** | 0.11 (0.10) 471 | 0.231 ***Small (+) effect*** | 0.18 (0.14) 273 |
| **Wayne** | 0.01 (0.01) 511 | -0.641 ***Medium (-) effect*** | 0.19 (0.15) 468 | -0.883 ***Large (-) effect*** | 0.05 (0.05) 676 |
| **Holmes** | 0.02 (0.02) 1063 | -0.728 ***Medium (-) effect*** | 0.12 (0.11) 283 | -0.659 ***Medium (-) effect*** | 0.03 (0.03) 489 |
| **Lancaster** | 0.19 (0.15) 2349 | -0.364 ***Small (-) effect*** | 0.34 (0.23) 1155 | -0.855 ***Large (-) effect*** | 0.14 (0.12) 3461 |
| **Elkhart** | 0.08 (0.08) 422 | -0.288 ***Small (-) effect*** | 0.18 (0.15) 290 | -0.726 ***Medium (-) effect*** | 0.06 (0.06) 426 |
| **Lagrange** | 0.04 (0.04) 884 | -0.415 ***Small (-) effect*** | 0.11 (0.10) 238 | -0.833 ***Large (-) effect*** | 0.04 (0.04) 249 |

The third difference we tested was whether parochial groups were more likely to engage in personal trading where observation by traits can give them a competitive advantage over non-parochial producers. The ag-census survey had one question that allowed examining differences in personal trading—whether the farm sold directly for human consumption (i.e. at farmer's markets or road side stands). Table 11 reports that both Amish and Mennonite farms were more likely to directly sell than non-parochial

producers in the combined counties. Washington and Johnson County, Iowa had large and medium effects for the Amish compared to non- parochial, and most other counties had small positive effects or no effects. Like the model presumes, parochial farmers would be more engaged in direct trading where observation of traits can give them an advantage of signaling a cooperating agent.

**Table 11. Effect of Parochialism on farms directly selling for human consumption.**

| Geographic Area | Amish | Amish-Non | Non-Parochial | Mennonite-Non | Mennonite |
|---|---|---|---|---|---|
| | *Mean (Variance) Sample size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* | *Cohen d* ***Result*** | *Mean (Variance) Sample Size* |
| **All counties:** | 0.16 (0.14) 4405 | 0.227 ***Small (+) effect*** | 0.09 (0.08) 2678 | 0.253 ***Small (+) effect*** | 0.18 (0.15) 4278 |
| **Washington** | 0.40 (0.24) 77 | 0.878 ***Large (+) effect*** | 0.06 (0.06) 286 | 0.073 ***No effect*** | 0..08 (0.08) 120 |
| **Johnson** | 0.25 (0.19) 138 | 0.523 ***Medium (+) effect*** | 0.07 (0.06) 339 | 0.217 ***Small (+) effect*** | 0.13 (0.11) 228 |
| **Wayne** | 0.17 (0.14) 398 | 0.236 ***Small (+) effect*** | 0.09 (0.08) 423 | 0.301 ***Small (+) effect*** | 0.19 (0.15) 529 |
| **Holmes** | 0.14 (0.12) 860 | 0.223 ***Small (+) effect*** | 0.07 (0.06) 247 | 0.182 ***No effect*** | 0.13 (0.11) 376 |
| **Lancaster** | 0.16 (0.14) 1823 | 0.171 ***No effect*** | 0.11 (0.09) 951 | 0.260 ***Small (+) effect*** | 0.19 (0.16) 2516 |
| **Elkhart** | 0.15 (0.12) 372 | 0.210 ***Small (+) effect*** | 0.08 (0.07) 240 | 0.336 ***Small (+) effect*** | 0.20 (0.16) 347 |
| **Lagrange** | 0.16 (0.13) 737 | 0.142 ***No effect*** | 0.11 (0.10) 192 | -0.037 ***No effect*** | 0.10 (0.09) 162 |

### *Long-term Payoffs*

To estimate the value and change in value of the parochial direct trading network, we performed a linear regression using the county level direct sales for human

consumption regressed on the parochial population and the larger population. The purpose was to examine if there is more trust developing in large-scale "anonymous marketing" compared to personal direct marketing—judged by value of sales. In order to obtain an estimate that is important to this study, we conducted an ordinary least squares (OLS) regression in the areas of interest in the Midwest (Illinois, Indiana, Iowa, Ohio, Missouri, and Pennsylvania). The amount of direct sales per county was obtained from the 1997, 2002, and 2007 ag-census, and county population figures were from the ASARB 2000 Religious Congregation and Membership Study. Table 12 reports the estimated coefficients, standard error, and t-statistics for adjusted[12] direct sales per person and per parochial[13] person. In the 10 year period, a parochial member in a county added an estimated 139- 150 dollars in direct sales, while a member of the larger population added approximately 1 dollar to 90 cents. The coefficient for Parochial population was roughly stable (lower in 2002 but higher in 2007) over the 10 year period, while the coefficient for the larger population decreased by approximately .13 cents.

[12] The county sales were adjusted for inflation to 2002 dollars. Inflation rates were obtained from the U.S. Bureau of Labor Statistics. For 1997 and 2007 the adjustment rate was 1.12 per dollar and .87 per dollar, respectively.
[13] Parochial is defined as either Amish or Mennonite.

**Table 12. County Direct Sales regressed on population and parochial population**

| DEPENDENT VARIABLE | INDEPENDENT VARIABLES | UN-STANDARDIZED COEFFICIENTS | STD. ERROR | T-STATISTIC *** P <.01 |
|---|---|---|---|---|
| N=524 counties | | | | |
| 1997 Direct Sales (adjusted for inflation to 2002 dollars) $r^2$= .512 | 2000 Parochial Pop. | 141.41 | 7.33 | 19.29*** |
| | 2000 Population | 1.05 | .109 | 9.58*** |
| 2002 Direct Sales $r^2$=.563 | 2000 Parochial Pop. | 139.07 | 6.46 | 21.51*** |
| | 2000 Population | .99 | .096 | 10.39*** |
| 2007 Direct Sales (adjusted for inflation to 2002 dollars) $r^2$= .477 | 2000 Parochial Pop. | 149.80 | 8.01 | 18.70*** |
| | 2000 Population | .92 | .119 | 7.737*** |

**Figure 5. USDA-ERS. Food at Home: Total Expenditures**

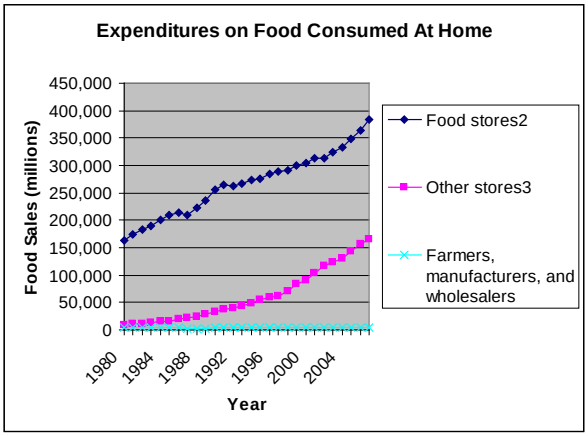
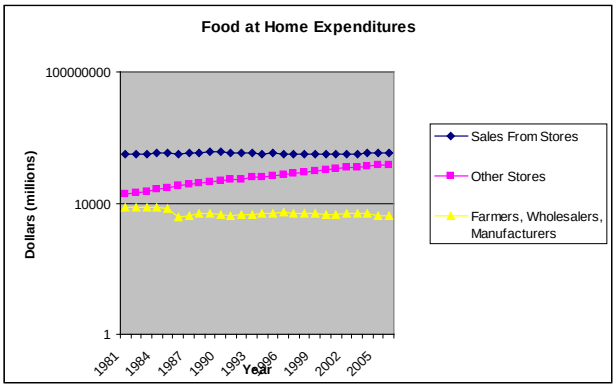



**Figure 6. The log of Food at Home: Expenditures, adjusted for inflation to 2002 dollars**



The regression values appear to be consistent with findings in surveys done by the USDA- Economic research service, which show a steady to decreasing amount of consumer expenditures for food bought directly from the farmer since 1981 (see Figure 5 and 6). During this same time period, the surveys showed a steady increase in sales for food expenditures at stores—which for purposes of this study represents the "anonymous market". Trends from Table 12 and Figure 5 and 6 suggest that long-term payoffs will more likely favor non-parochial producers, given their differences in institutional structures and marketing strategy.

***Data limitations***

Though the major crux of the argument contrasts parochial producers using direct trading compared to anonymous trading, it is also true that parochial producers are engaged in anonymous trading to a certain extent[14]. It may be argued that a large portion of parochial producer sales are in fact sales in the "anonymous market", much like non-parochial producers-- if you compared the percentage of direct sales to the total marketing sales from a county. Our response would be two fold: first the direct selling for human consumption statistic may only be a proxy to get at personal trading using observable traits. In local areas it may be common knowledge that certain shops may sell

[14] Ag census county profiles and literature (James, 2005; Cross, 2004) suggest a large portion of Amish farms sell milk (mostly Grade B for cheese) to local cheese making businesses, cattle, hogs, poultry, eggs, etc. James (2005) gives an excellent account of the income and costs when deciding if an Amish producer should engage in farming. In the account, a large portion of the potential sales is in the sale of milk to the local cheese cooperative and the bulls for beef, but the remaining income is clearly not enough to pay the mortgage and to support a family. James (2005) suggests to the potential Amish producer to directly sell maple syrup, possibly vegetables, and work part-time as a construction worker.

local cheese for example that everyone knows was produced by parochial producers with some probability. Consumers can monitor the parochial producers using draft horses, their dress, etc. and can be assured that they are indeed cooperating trading partners even though the transaction is technically done anonymously. Second, the purpose of the study is to explain how different institutional structures can co-exist, and then how one can precipitously lose population while the other increases in population. Parochial producers obviously have more constraints and rules on ag-production methods that can hinder their efficiency and ability to market their product on a large-scale, yet these additional rules and constraints-- until recently-- have not made them less viable compared to non-parochial producers. In a competitive market there must be an economic efficiency that is offsetting those costs, and we suggest that economic efficiency is trust that reduces transaction costs in an agri-food transaction. Further, if some exogenous change decreases the parochial producer's efficiency relative to non-parochial producers then a parochial producer's viability is uncertain without major institutional changes.

# Chapter VII

# DISCUSSION AND CONCLUSION

## *Discussion*

Using a large aggregate data set, and specific counties and sample, this study found support for the conceptual theory to why there would be differences in stability between parochial producers relative to non-parochial producers. The only result that did not match our expectations was parochial producers adopting production contracts at the same rate as non-parochial producers. This could be trivial, since there was a relatively low-rate of contract adoption in the counties of the analysis. Or it could be evidence of a belief change by some parochial producers to remain viable farming operations. Regardless, the results showed that parochial producers had equivalent economic performance, were more likely to directly sell, and less likely to use a producer cooperative, but most important were more unstable than non-parochial producers, while controlling for other factors such as farm size, occupation, locality, etc. A reasonable inference could be made that the important difference between parochial producers and non-parochial producer's stability is their institutional structure and marketing strategy, and the advantages they entail, not the scarcity of affordable land and an increasing parochial population *per se*. Furthermore, understanding that structural changes to formal institutions are taking place in the agri-food sector – that improves the cooperation between ag-producers and consumers and promotes trust in large-scale anonymous trading-- would predict that the long-term payoff of parochial farmers—whose

advantages are in personal trade from trust-- would be relatively lower than the long-term payoff to non-parochial producers. This analysis-- at the very least-- did not refute that prediction-- at best—supported the alternative explanation. There certainly are a lot of remaining questions; given more data and different techniques the conceptual theory may be without support or need to be modified. Though, the conventional reason doesn't seem to be a sound explanation to the decline of parochial farms, without an equal decline to non-parochial farms.

Given there is movement away from the parochial network, what effect is this having on parochial producers? There has been some anecdotal evidence that Amish and Mennonites ag-producers may be changing their institutional structure and establishing formal organizations (e.g. auction barns and cooperatives) to market ag-products on a large-scale in the "anonymous market"-- more similar to non-parochial producers (Szkotak, 2008; Snook, 2007; Lucas, 2003, 2004; Wilde, 2003; Cross, 2004; James, 2005). But the more likely change has been described by Kraybill and Nolt (1994), Meyers (1991), and Lowery and Nobel (2000) such that parochial producers are changing their primary occupation from agriculture production. Evidence of this can be seen in Table 13, which reports the number of farms that had horses in inventory for the same counties we analyzed before. The stability ratio shows that the number of farms with horses has been far more stable—if not increasing—since 1987 in these counties. Assuming the number of farms with horses is largely correlated with Old Order Amish and Old Order Mennonite farms, then this data would suggest that the instability of

parochial producers in our analysis was due to the restriction that the operator's primary occupation had to be farming.

**Table 13. Number of Farms with horses in inventory (Ag census data)**

| | 1987 | 1992 | 1997 | 2002 | 2007 | Avg. Stability Ratio (20 yrs.) |
|---|---|---|---|---|---|---|
| **Lancaster** | 1621 | 1577 | 1692 | 2243 | 2349 | 1.10 |
| **Holmes** | 869 | 855 | 851 | 1176 | 966 | 1.05 |
| **Wayne** | 457 | 412 | 441 | 669 | 633 | 1.11 |
| **Elkhart** | 437 | 463 | 517 | 711 | 755 | 1.15 |
| **Lagrange** | 874 | 852 | 893 | 1117 | 991 | 1.04 |
| **Washington** | 139 | 90 | 119 | 154 | 149 | 1.06 |
| **Johnson** | 229 | 188 | 218 | 249 | 238 | 1.02 |

Hence, parochial members aren't leaving the parochial network, or leaving their farms *en masse*. Nor do they seem to be changing their strategy and using formal institutions to market ag-products on a large-scale[15]; rather they appear to be shifting their resources to producing non-ag products.

***Conclusion***

Kraybill and Nolt (1994) report that a majority of Amish entrepreneurs, they surveyed, perceive their advantage over Non-Amish entrepreneurs to be dependability of employees (71%), productivity of employees (61%), quality of artisanship (59%), and lower cost of advertising (69%). In a survey of public perception of Amish products, they showed large majorities of people think that Amish products have more value (91%), artisanship (88%), quality (86%), and uniqueness (73%), than non-Amish products. This study suggests these advantages are increasingly disappearing in agri-food production for parochial producers, a result of structural changes to formal institutions.

[15] Simple t-tests of changes in marketing strategy from 2002 and 2007 showed no discernable changes in strategy for parochial or non-parochial producers.

Furthermore, the structural changes have and will increase the long-term payoff to non-parochial ag-producers relative to parochial ag-producers. Expectation of a lower long-term payoff has precipitated parochial ag-producers to change their occupation and type of transaction. The conceptual framework would predict that the changes in occupation and transactions would be to markets where there are considerable more transaction costs that can't be economized on using formal contracts at low cost. Markets with transactions of this type may allow parochialism to be an evolutionary stable strategy because of improved information and contract enforcement that promotes trust.

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