

Historical Review of Research Covering Economies of Size

**Technical companion report to
"Economies of Size Considerations for the Hiawatha Fund"**

September 30, 2004

Written for:

**Hiawatha Fund
University of Minnesota—Experiment in Rural Cooperation
Southeast Minnesota Sustainable Finance Initiative**

by Ken Meter
President, Crossroads Resource Center

PO Box 7423
Minneapolis, Minnesota 55423
(612) 869-8664
kmeter@crcworks.org

Historical review of research covering economies of size

Contents

EXECUTIVE SUMMARY	3
HISTORICAL REVIEW OF RESEARCH COVERING ECONOMIES OF SIZE	10
WHAT ECONOMIES OF SIZE HAVE BEEN IDENTIFIED IN THE FARM ECONOMY?	10
<i>Madden shows that small farms are efficient</i>	<i>10</i>
<i>Explaining the persistence of smaller farms.....</i>	<i>12</i>
<i>Entrepreneurship is more complex on farms.....</i>	<i>13</i>
<i>Forces that favor enlargement of farms</i>	<i>14</i>
<i>Viewing farm operations in a more complex manner</i>	<i>15</i>
<i>"Farms get larger to gain larger incomes."</i>	<i>17</i>
<i>Special Seminar tackles economies of size issues</i>	<i>19</i>
<i>Access to capital looms important</i>	<i>20</i>
<i>Research biases.....</i>	<i>20</i>
<i>Should economies of size be measured for a single firm or for a group of firms?</i>	<i>21</i>
<i>Dispersing the benefits</i>	<i>22</i>
<i>The size of a firm is set by its need for capital</i>	<i>23</i>
<i>Research on social networks in rural communities.....</i>	<i>24</i>
<i>Office of Technology Assessment checks in.....</i>	<i>25</i>
<i>Corn farms</i>	<i>25</i>
<i>Soybean farms.....</i>	<i>26</i>
<i>Wheat, rice and cotton farms</i>	<i>27</i>
<i>Scholars predict farms will get larger</i>	<i>27</i>
<i>Hog farming.....</i>	<i>29</i>
<i>More recent analysis of economies of size in the farm sector</i>	<i>33</i>
WHAT ECONOMIES OF SIZE HAVE BEEN IDENTIFIED IN THE RURAL BUSINESS ECONOMY?	38
<i>The efficiencies of local banking.....</i>	<i>40</i>
<i>Rural retail firms</i>	<i>42</i>
<i>Surrounding farm and nonfarm businesses with networks</i>	<i>44</i>
WHAT ECONOMIES OF SIZE HAVE BEEN IDENTIFIED IN THE FOOD PROCESSING INDUSTRY?...	48
ECONOMIES OF SIZE CALCULATIONS FOR SPECIFIC INDUSTRIES	55
<i>Meatpacking.....</i>	<i>56</i>
<i>Poultry processing.....</i>	<i>57</i>
<i>Produce</i>	<i>58</i>
<i>Dairy processing.....</i>	<i>59</i>
<i>Grocery warehouses.....</i>	<i>61</i>
WHAT ECONOMIES OF SIZE HAVE BEEN IDENTIFIED IN RURAL SERVICES?	63
<i>Rural schools</i>	<i>63</i>
<i>Other rural services.....</i>	<i>64</i>
CONCLUSION	64
ENDNOTES	66

Executive Summary

This technical report is a companion piece to "Economies of Size Considerations for the Hiawatha Fund."¹ This outlines research findings from a historical review of academic and other literature applying to economies of size. The companion report provides the context for this study.

Our research focused on five main topics.

1. What economies of size have been identified in the farm economy?
2. What economies of size have been identified in the rural business economy?
3. What economies of size have been identified in the food processing industry?
4. What economies of size have been identified for specific food industries?
5. What economies of size have been identified in rural services?

Economies of size have been analyzed at some depth by prior academic researchers. The essential finding is that farms, rural businesses, food processors and retailers have all become larger than economies of size would dictate. Where economies of size exist, they have been shaped by social policies. Further, many firms have expanded beyond their most "efficient" size due to a wealth of other economic factors.

This review of the academic literature shows that firms have become larger not because of economic efficiency, but rather due to a cluster of more important influences: (a) access to capital; (b) federal taxes, incentives and subsidies; (c) advertising presence; (d) accumulation of power by larger firms; (e) artificially low energy costs; and (f) economic infrastructure that fosters expansion. Underlying all of these is society's assumption that larger is more efficient. However, that assumption is more robust than the economic reality.

As we consider this issue, it will be important to make one distinction. Economists distinguish between economies of *size*, economies of *scale*, and economies of *scope*. An *economy of size* occurs when a firm becomes more efficient by getting larger. An *economy of scale* is a special case of this, in

which a firm gets larger by increasing the relative proportion of all inputs in the same proportions. Such an expansion would mean that a larger firm is essentially using the same mix of inputs and technology in the same proportions as it did at a smaller scale. Finally, *economies of scope* cover a firm's output. If a firm can sell more than one product from the same set of inputs, it may gain marketing efficiencies by using the same marketing materials to sell a number of products at once.²

Our research suggests that Hiawatha Fund can find excellent, small-scale investment opportunities. Some of the region's small firms are among the most efficient in the nation. In many cases, small firms hold an advantage over larger firms. Even in sectors where large firms appear to be dominant, there are opportunities for small firms to build a niche. In some cases, large firms look to very small companies to supply them with valuable inputs. Moreover, small firms can carve out distinctive niches that larger firms are not able to fill.

Several regions globally have become successful by networking the large and the small. This allows those firms that do achieve true economies of size to spread the benefits of those economies of size to their neighbors. In Italy's Emilia-Romana, for example, large clothing factories selling to global markets contract with individual households to produce essential, high-quality components. An export-based gourmet food industry has leveraged the advantages of small-scale farming and processing.

Ultimately, this analysis concludes that the region's *network of relationships* is just as important as the economies of size gained by specific firms. If social and economic networks foster the growth and stability of smaller firms, they are more likely to prosper. If social and economic structures favor the large, the large are more likely to survive.

Currently, large firms extract wealth from the region. From the standpoint of the region, extractive large firms are not efficient. A strong region will be built, not on subsidizing extractive industries, but by creating networks that capitalize on the benefits of large when it is a benefit, and also leverage the strengths that small-scale production can contribute.

Key Findings

1. Economies of size (ES) in the farm economy

- Small farms—one-to-two person operations—realize most economies of size.
- Some research suggests that *diseconomies* of size may set in once 15 hours of labor are hired per month, which means larger farms will be less efficient.
- Farms that can hire out contracted services, or offer these services to their neighbors, can work very efficiently at a small size.
- Significant questions remain about the accuracy of economies of size measurements.
- Farms have become significantly larger for reasons other than economies of size. Several other factors appear to be more important. Among these are (a) access to capital; (b) federal taxes, incentives and subsidies; (c) advertising presence; (d) accumulation of power by larger firms; (e) artificially low energy costs; and (f) economic infrastructure that fosters expansion.
- Many qualities of a firm besides size affect efficiency for any given firm, including (a) existing equity owned in the business; (b) current market penetration; (c) market niches filled by competitors; (d) nearby clusters of compatible industries; (e) potential complementary uses of the firm's "waste" products; (f) level of concentration in the industry; (g) opportunity costs of capital and labor; (h) loyalty of consumers; and (i) availability of raw materials. Many of these are highly specific to a given firm.
- While one can measure economies of size for a specific firm at one particular time, it is not clear that this type of measurement should be applied to a group of firms, a sector, or an industry, because each operator will value farm costs differently.
- Since factor costs change with time, it is difficult to compare size calculations made at different points of time.
- Quantitative modeling of size economies may reflect the assumptions of the modeler more than the actual conditions of a given firm.
- Many academic studies appear to have assumed that economies of size existed, and this assumption may have outweighed the actual evidence compiled.

2. ES for rural businesses

- Little research was located on this subject.

- Very small towns (population 400 to 1000) appear to be capable of supporting a cluster of small businesses—even supporting more than one firm for certain types of businesses.
- Most rural banks are near or have reached the most efficient size already.
- The average bank in the U.S. is 1,000 times the most efficient size—and clearly these have become larger for reasons other than efficiency.
- Banks can reduce costs by forming relationships of trust with consumers—something small-town banks are well-poised to do. Trust in effect, creates efficiencies.

3. ES in food processing

- Food processing firms grew large in the 1970s for reasons that had nothing to do with economies of size.
- At the time, food industries became the largest manufacturing firms in the nation.
- Now, food manufacturing is the sixth-largest industry.
- 85 % of food industries lack competitiveness, and this concentration has raised prices to consumers.
- Some firms, such as meatpacking, are now considered "more efficient" because they have lowered wages. This may be efficient for the firm, but certainly is not efficient for the rural community where workers live.

4. ES in specific food industries

- The top five food retailing firms now command 49% of the U.S. market.
- The top two food retailers are Wal-Mart and Sam's Club, which began to sell food in 1988.
- Wal-Mart's rapid entry shows that ES are not the dominant factor, or the previous large firms would have kept new entrants out.
- Large-scale feedlots appear to gain economies of size.
- Although it may not be valid to calculate ES for a group of firms, economists have identified economies of size in the meatpacking and poultry processing industries.
- The poultry processing industry, in particular, seems to be able to grow larger and still remain efficient.

- One limit to the size of meat and poultry processing firms is likely to be the environmental costs of concentrated manure (unless this can be channeled into commercial use).
- New technologies in produce handling that promote longer shelf life have helped the produce industry become more concentrated.
- In 1993, one-third of all produce raised in the U.S. was produced under contract.
- One study of dairy processing found that economies of size existed for plants in the South operating with volumes of from 10-30 million pounds of raw milk per month.
- Food warehouses reduced costs by mechanizing as long as volume is kept high. When volume is low, manual labor is more efficient.
- Economies of size may favor small, dispersed electricity plants. One key is to produce energy close to where it will be used, since transportation costs are high.

5. ES for rural services

- Often, small schools in both rural and urban settings have been found to be more efficient when rated in terms of number of students who graduate.
- Nursing homes do not appear to gain efficiency by getting larger.
- Research into the economies of size for universities have been inconclusive.

6. The advantages held by small firms include:

- Greater involvement by management in day-to-day operations, so that managerial decisions more closely reflect the complexities of changing conditions.
- Ability to reduce costs by communicating more informally with co-workers, suppliers and customers.
- Ability to reduce costs by developing lasting personal acquaintances and loyalties that reduce overhead.
- Better knowledge of local markets, development goals and needs.
- Better knowledge of local weather patterns and climate.
- Easier coordination across different parts of the firm.
- More rapid response to change.
- More ability to understand uncertainties and respond accordingly.
- In some cases, lower overhead costs.

7. The advantages held by larger firms include:

- Technology can create cost savings as production is increased, allowing each item to be sold for a lower cost.
- Size can create marketing leverage since the same publicity expenses are borne by sales in many regions.
- Larger firms tend to have greater access to political power or personal influence with decision makers, which can allow for more favorable treatment through public policies.
- Larger firms may enjoy cost savings because they can purchase in quantity.
- Larger firms may enjoy better access to capital..
- Larger firms may be better placed to absorb risks, simply because they have more resources to work with.

8. General Findings

- Over the long term, all costs are variable costs.
- This means that as Southeast Minnesota plans for long-term sustainability, it will not want to assume that prices of any given factors of production will stay the same. Economies of size that exist now may change—for instance, as oil prices rise.
- Those who "produce" economies of size do not always gain the benefit of producing them. Since these benefits are dispersed through society as a whole, it would be wrong to say they are owned by any single firm.
- It will be most important to plan for uncertainty, assuring that local entrepreneurs and communities have *flexibility* in the face of changing conditions.
- The region's *networks of relationships* are just as important as the economies of size gained by any specific firms.
- Even in sectors where large firms appear to be dominant, there are opportunities for small firms to build a niche.
- What is efficient for a firm may not be efficient for the region. Southeast Minnesota will need to decide what businesses are most needed, and create networks that support these firms.
- The extractive nature of some large firms means the region cannot afford them.

- In particular, the possibility of creating *clusters* of industries that depend upon each other, and that cycle money through the region, looks promising. Significant experience has been gained in creating industry clusters in Spain and Italy.

Historical review of research covering economies of size

Economies of size have been analyzed at some depth by prior academic researchers. The essential finding is that farms, rural businesses, food processors and retailers have all become larger than economies of size would dictate. Where economies of size exist, they have been shaped by social policies. Further, many firms have expanded beyond their most "efficient" size due to a wealth of other economic factors.

Our research focused on five main topics. Each is taken up in order below.

1. What economies of size have been identified in the farm economy?
2. What economies of size have been identified in the rural business economy?
3. What economies of size have been identified in the food processing industry?
4. What economies of size have been identified for specific food industries?
5. What economies of size have been identified in rural services?

What economies of size have been identified in the farm economy?

Generally regarded as the classic study of economies of size in the farm sector is Patrick Madden's theoretical work, *Economies of Size in Farming: Theory, Analytical Procedures and a Review of Selected Studies*, published by USDA in 1967. Madden begins by making the distinction between questions of size and scale, as noted above. He then analyzes the findings of detailed production studies covering a number of different cropping regimes for diverse crops in various U.S. regions. His findings have held up well for 37 years.

Madden shows that small farms are efficient

Madden's overall conclusion is that "[In most of the farming situations studied,] all the economies of size could be achieved by modern and fully-mechanized 1-man or 2-man farms."³ Madden's research included cling peach growers in California (which reached their minimum average cost at 90-110 acres), highly mechanized irrigated cotton farms in Texas (with peak efficiency at 440 acres), and summer wheat farms in Oregon (reaching minimum costs at 1,600 acres).⁴

He concluded that two-man farms in Iowa were more efficient than one-man farms. Yet this advantage could be tempered if neighbors cooperated with each other. "When ownership of all farm machinery was assumed, 2-man farms were found to be more efficient than 1-man farms. But when hiring of timely and reliable custom service was considered for certain field operations, the average cost per unit for the smaller farms was reduced considerably. Under this assumption, the 1-man farms were nearly as efficient as 2-man farms."⁵

For "vegetable farms in California's Imperial Valley, farms less than 640 acres are nearly as efficient as larger sizes," Madden continued. Once again, he found that "Among field-crop farms in this area, economies of scale were found to occur up to about 1,500 to 2,000 acres. Custom hiring was found to be very advantageous to smaller farms in this area."⁶

In Yolo County, California, "Cash-crop farms achieved lowest average unit cost at a farm size of 600 to 800 acres, producing sugarbeets, tomatoes, milo, barley, alfalfa, and safflower." Lowest average costs were found at 640 acres for Kerr County farms producing cotton, alfalfa, milo, and barley. Further, "Cotton farms in the light-soils area of Fresno County were found to be most efficient at about 1,400 acres, while farms in the heavy-soils area of the county achieved their greatest efficiency at 700 acres."⁷

Madden cautioned, however, that larger farms can be more profitable, even if smaller farms are more efficient. "Even though most of the studies show that all the economies of size may be attained by moderate-sized farms, they also show that total profit may frequently be increased by extending beyond the most efficient size. However, uncertainty and management problems often become troublesome as farms become very large."⁸

Considering specialized beef feeding, Madden found that "All economies of size are attainable in an intermediate size range of 1,500- to 5,000-head capacity. Beyond this size range, the average cost curve continues to decline slightly, but the savings per head are relatively unimportant—in the range of \$1 to \$2 per head fed. Slight reductions in the price of feeder cattle or feed have a much greater influence on the overall cost and profit of the feeding operation. Also, the rather small technical

economies of size attainable beyond the intermediate size range are easily erased if the facilities are not utilized at full capacity throughout the year."⁹

Noting also that "Management problems do not seem to become prohibitively difficult as feedlot size increases," Madden predicted that feedlots would increase in size.¹⁰

Madden's "studies of dairy farms in various parts of the country showed that 1-man and 2-man dairies can achieve highly efficient operation if they have control of sufficient capital and utilize the modern milking and housing technologies. Very little evidence is currently available regarding the efficiency of larger dairies—over 100 head. However, the results of one study suggest that management problems become troublesome at about 150 head. For instance, it is difficult to feed each cow according to her production as herd size and the number of hired men increase. Also, the operator of a large dairy does not have time to "shop around" and obtain the lowest possible feed prices."¹¹

Madden would have had difficulty predicting the impact of computer technologies and market powers that might make it more efficient to increase the size of feedlots even further, or that might allow a farmer to track feed rations for a larger herd, or shop by internet for feed. The critical point here is that farms expanded in size in succeeding years, despite this wealth of evidence that economies of size were not driving this expansion.

Explaining the persistence of smaller farms

Madden himself has a partial answer for this. He shows that profits can increase with size even though efficiencies do not, as noted above. Yet he noted, at the time he wrote his paper in the late 1960s, that even greater profitability was not sufficient to make farmers larger. "Most studies of economies of farm size have shown that as farm size increases, average cost either (a) decreases, or (b) remains about the same, or (c) on very large farms, increases slightly but is still below average revenue, even for the largest farms observed. This implies that profit increases steadily as farm size increases, and that the largest farms are the most profitable. It would be expected, then, that farms would tend toward the largest sizes, and that the size distribution of farms would be shifted accordingly. This does not seem to be so, however. In many and for many types of farming, the most rapid increase in number of farms is in the intermediate size classes, consisting chiefly of farms

that can be operated by one or at most only a few full-time men, using modern technology and adequate capital. The number of very large farms seems to be increasing only gradually, and in some cases, to be decreasing."¹²

Once again, the conditions present when Madden wrote no longer apply. In recent years, the number of very large farms has increased dramatically. Nevertheless, more recent studies uphold Madden's analysis. Some factor other than economies of size led farms to get larger.

Madden delves into great detail when considering these other factors. First he directs his attention to management and entrepreneurship. Management generally divided into two components: supervision and coordination, he argues. "The essential feature of coordination is that every decision must be made in the context of all other decisions already made or likely to be made. This gives rise to the unitary character of coordination—all interrelated information must pass through a single brain."¹³

Entrepreneurship is more complex on farms

This process is more complex for farming than for industry, he adds. "The crucial difference between factory production and farm production is the relationship between stages. In a typical factory operation, the object being produced flows through a series of stages, all of this can proceed simultaneously at spatially separated points. In farm production, the stages typically are separated by waiting periods, but occur in the same areas."¹⁴

"This difference has important effects on the labor and management requirements of the two types of firms. Coordination of factory production poses unique problems not faced by most farms, because a large number of different stages are continuously being performed by many different persons at different places in the plant. Interpersonal communication and supervision problems tend to be more serious as the number of employees increases. In farming, the stages are spread out over a long period of time, so that relatively few operations must be coordinated, and only a few people employed, at any given time.

"On the other hand, the farm manager's task is complicated by (1) the relatively large dispersion of workers in most types of farming, and (2) the necessity for regular farm laborers to shift repeatedly

from one kind of work to another throughout the production season. These features lead to a considerably greater supervisory input per man in farming than in factory operations, where most workers perform essentially the same tasks throughout the production cycle."¹⁵

Writing in Madden's time, it was easy to assume that natural cycles and seasonal unpredictability placed a limit on the economies of size. Thus, he concluded, "As the farming operation becomes larger and more complex, the number of unpredictable situations requiring unique decisions becomes burdensome, because, the coordinator must relate each decision to all the other decisions that have been made or are going to be made....In cases where coordination is a limiting resource, the marginal value product of additional resources becomes less than their marginal cost."¹⁶

Overall, Madden argued that "Three aspects of farming greatly increase the difficulty of management: lack of uniformity among resources, spatial dispersion of the operations, and unpredictable behavior of resources, environment, and the market."¹⁷

In retrospect, it is clear that agribusiness has been successful in reducing uncertainty in farming, and this has promoted the growth of larger farms and processors. As inputs have become more uniform, as production has become more divorced from natural cycles and unpredictability, as technology has become more intensive (and thus output more predictable as long as energy supplies last), vulnerability to external forces has been reduced. Yet this has also come at a cost of divorcing food production from seasonal and local contexts, thus separating producers from consumers, and creating the impression that food can be produced independently of nature. This separation may plague urban consumers and industrial processors alike.

Forces that favor enlargement of farms

If increasing farm size primarily led to additional risk and uncertainty, then some other factor must explain why farms became larger. Madden further noted the work of two other researchers, Whitin and Peston, who found that "the larger volume of resources available to bigger firms provides an advantage in meeting contingencies."¹⁸ [In other words, larger firms had more resources to bring to bear to in responding to uncertainty.] This larger pool of resources might trump managerial talent if a large firm had deep enough pockets to ride out uncertain times, surpass mistakes, or address changing conditions.

If a farmer looks for a greater pool of resources to draw from in order to ride out periods of economic uncertainty, as well as to compensate for the natural uncertainties inherent in farming, where have farmers found such pools of resources? Madden does not fully answer this question, yet he provides a stark implication. "It is widely recognized that Government price-support programs have facilitated enlargement of farms producing price-supported commodities and closely related products. When price uncertainty is eliminated, farmers feel more confident of their debt-repayment ability. They are more likely to apply for, and creditors are more likely to give, the credit necessary for farm expansion."¹⁹

Thus, Madden suggests an even more fundamental cause for the expansion of farms. The issue may not be economies of size, but rather access to capital and credit. Those farms have expanded who have had access to capital that allowed them to invest in technology, perhaps to gain greater profits by expanding. This may not have made their farms more efficient, but their expansion was made more secure by the presence of farm support programs. As Madden states, "Lack of access to resources or markets could be more important than size."²⁰

Viewing farm operations in a more complex manner

Madden sees hope for smaller, scattered farm operations primarily because most farms are more complex than academic theories typically allowed. "The farm operator is usually envisioned as being engaged only in the production of goods, not outside services, owning or otherwise controlling all the durable factors as fixed resources, and using these resources to provide services only for his own farm. A more realistic concept views the farm firm as (a) a producer not only of goods but also of various services, such as custom work and off-farm jobs, and as (b) having the possibility of hiring various resource services in the amounts needed, as well as owning and operating durable resources.

Farmers that can hire out services, or can be hired by neighbors, are more likely to survive, he added. "A farm viewed as a goods-and-services firm may have a lower average total cost than would the same farm viewed as a strictly goods-producing firm, since wages and income from custom work raise the gross income....Empirical studies have shown that relatively small farms can achieve the ultimate in economies of size when sufficient custom service is available for timely performance of farming operation."²¹

Clustered, cooperating firms have advantages that may not only offer efficiency, but also resiliency. Farms that specialize may be more at risk than those that mount complex operations. Yet here, too, the ultimate reality does not neatly fit Madden's picture. For in the intervening years, many larger farms have in fact grown larger by specializing. How to explain this?

For one thing, the prevailing model in Minnesota, where corporate ownership of farms has been restricted, has been for larger investors to set up a cluster of farms in the same locale. Typically these farmers are related by bloodlines, such as brothers- or sisters-in-law who live near each other. Two to five family farms collaborate in their use of specialized equipment, doing custom work for each other, seeing themselves as farms who serve a broader cluster of operations rather than as isolated sole owners. They may rely upon substantial professional assistance to help them make planting, pest control, and chemical application decisions. In these respects, they have taken Madden's advice.

Concurrently, agribusiness and government have created marketing infrastructure that favors larger size. Output is more uniform, and more suited to larger distribution systems. Externalities have been displaced onto others' shoulders. The element of uncertainty itself has been removed, since that posed an obstacle to farm consolidation. This creates a more artificial system that favors larger size. In a very real sense, the large players appear more "efficient" because they have been able to create economic infrastructures that reward largeness. So far, however, we have uncovered little evidence that expansion is due to economies of size.

Additional evidence for the importance of federal farm programs

Five years after Madden's study, a forceful critique of economies of size concepts for farms was put forward by Philip Raup at the University of Minnesota. Raup concluded that farms expanded because purchasing land was seen as valuable, and land sales were sheltered with tax breaks. "Apart from specialized firms in poultry, cattle feeding, and some fruit and vegetable crops, there is almost no evidence that very large firms are more efficient when all costs are taken into account. If they prevail, it will be the result of defective institutional structures, above all the tax system, of farm programs that favor large farms, and of an insistence on freedom of choice of land transfers that is both blind and self-defeating."²²

Raup continued: “A part of the reason why big firms are attracted to agriculture can be traced to the heavy capital requirements of modern agricultural technology....Much of the vertical integration that has occurred in American agriculture is a result of the supply of credit to farmers by firms supplying production requirements or processing farm products.

“But this is only part of the explanation. In many types of farming there are added attractions to big firms that grow out of our tax structure and our system of government price supports for agriculture. The price support program reflects conscious policy. The tax advantages for big firms are an accident, and were almost certainly unintended.

“Because we have a graduated and progressive income tax, and because we tax capital gains at a low rate which becomes a flat rate for incomes above about \$52,000 (married couple, filing a joint return), we have built in a strong incentive to convert ordinary income into capital gains. This option is of little or no value to the year-to-year operation of a family-sized farm. Is it of great value to a high-income taxpayer who can use non-farm income to invest in farm capital which can benefit from capital gains tax treatment. The most common examples involve beef breeding herds, tree and vine crops, large dairy enterprises, and horses.”...

“The economies of California, Texas, Florida, and the Mountain States, to cite only the best publicized examples, have been distorted by an inflow of capital that is basically seeking a tax shelter....The tax shelters that function best are ones in which the investors have secured their investment with a stake in the land as well as in the animals, orchards, or groves. The lesson is clear: If you want a safe tax shelter in agriculture, make sure your investment includes rights in real estate.”²³

"Farms get larger to gain larger incomes."

Another seven years elapsed, and an economist for the Farm Sector Economics Branch of ERS, Thomas A. Miller, combined insights drawn from Madden and Raup's research, and blended it with data provided by the Congressional Budget Office. “The search for larger incomes provides much of the incentive for farms to grow; that incentive is augmented by the total impact of those

Government programs. Economies of size, however, is largely a neutral factor in farm expansion," Miller argued.²⁴

He pointed out that inefficiencies do set in if a farm is too small, but emphasized that studies in California had shown that "beyond a minimum point, the size of farm, as measured in total sales, does not explain variation in costs of production." Results from farms varied *more within* a certain size more than *between* farms of different sizes.²⁵

He further cited research by W. E. Martin, who considered the following factors as more important than economies of size:²⁶

- differences in technology used
- rate of adoption of technology
- management ability
- resource productivity
- yield variations caused by annual weather factors
- productivity of fixed factors
- geographic distribution of prices
- price expectations that are imperfect.

"From the standpoint of food production efficiency," Miller continued, "there is little evidence that a farming sector composed primarily of medium-sized family farms could not be as efficient as any other structure." He noted certain exceptions: poultry, cattle feeding, and some specialty crops such as lettuce.²⁷

Ultimately, Miller argued that suppliers have responded to farmers' desire to gain greater profits by providing larger machines, but that these machines did not yield greater efficiency. "The information reviewed here suggests that farm expansion has created a demand for larger machinery, more than larger machinery has caused farms to grow. Farms continue growing far past the point required to use the most efficient machinery."²⁸

Special Seminar tackles economies of size issues

Four more years passed, and a group of scholars convened a special 1983 seminar covering the economies of size. Convenor David Harrington, chief of the Farm Sector Economics Branch for ERS, led off by pointing out that "since Patrick Madden's definitive review of methods in 1967, very little work on economies of size has been done in this profession."²⁹

Harrington further cautioned that the realities of farming are often more complex than research models took into account. "Many important relationships in the economics of a firm cannot be reduced to either size, scale or costs. For example, enterprise combinations, which more effectively utilize periodically slack resources, can increase output without increasing the size of the firm (if size is measured by total outputs as opposed to value added). Also effective nonmarket income from the income tax treatment of firms is dependent on the marginal tax bracket of the farmer, the type of income or expenditure involved, the type of product being produced, and a host of other factors that cannot be reduced to the size of the firm. There are no universally acceptable transformations which would allow these dimensions to be commensurate with size."

Citing research he had published three years before, Harrington added that actual measurements of economies of size remained an elusive goal. "Jensen, Hatch and Harrington (1981) showed that identical representative farms that differ only in the tenure and equity of the operator could have cash income of from plus \$60,000 to minus \$60,000 with no changes in physical efficiency, yields, or prices."³⁰ Once again it appeared that size considerations were not the critical factor.

He further cited Michael Boehlje's research that "demonstrated that tax treatment is of overriding important in determining who can ultimately outbid whom for the ownership of farm assets."³¹

Iowa State economist Earl Heady responded to Harrington's comments at the seminar by adding that in the long-run, costs of production will show constant returns to scale (assuming all production factors are increased in proportion with each other). Still, he pointed out, this was an ideal case that did not mesh well with actual production realities. "In the changing technology of agriculture," he began, economists will look at a collection of short-term cost curves to estimate long-term effects. "The general evidence from these studies has been that...size economies do not extend over any

great range of output. Under this condition there is no cost advantage to bigness, but neither is there any cost disadvantage."³²

Access to capital looms important

Ultimately, Heady added, capital access trumps economic efficiencies. "To predict farm size for the individual (or family) is highly synonymous with predicting his demand and use of capital. His employment of capital will depend on the supply of it to him. The supply will be a function of the forms and amounts of his own equity capital, the expectations and risk aversion of financial institutions, their appraisal of his integrity and interest rates. Under this set of variables, big farmers will usually get bigger and small ones will also prevail." Still he cautioned that due to uncertainty, larger farmers will face greater risk.³³

Research biases

The ERS' Thomas Miller then pointed out that most studies that showed economies of size made assumptions that essentially assured that larger farms would be found more efficient. Researchers found what they had expected to find. One key assumption, he argued, had biased research. Calculating economies of size for a given cluster of firms required the researcher to place a value on the opportunity costs of labor—the costs of giving up one opportunity for the sake of another. A farmer that thought he was giving up a chance to earn more income in another field would have a lower threshold for getting out of farming, than one who thought farming was his true calling or his only skill.

Most studies, Miller added, assume this opportunity cost is constant for all farmers. Yet this assumption is false. A farmer's own assessment of the income he gives up from other sources by pursuing farming clearly varies with the farmer's complement of other skills. It also depends on to what extent the farm is paid for, the family's tolerance of risk, its commitment to neighbors, and other less tangible concerns that shape how a farmer values his or her own time. Moreover, this might change from day to day—for instance, a sudden illness requiring unforeseen medical costs may alter the farmer's calculation considerably.³⁴

Should economies of size be measured for a single firm or for a group of firms?

Implicit in Miller's analysis is the caution that while studying the economies of size for a particular firm, where the individual's debt, capital structures and opportunity costs can be known and may have a great deal of validity, the tool may be less useful, and have less validity, when one begins to work across firms.³⁵ The complexity of the different assumptions made by different operators, and the fact they will change over time, renders such industry-wide calculations tenuous at best.

Miller's conclusions suggest that it would be most useful for Hiawatha Fund to consider appropriate economies of size for a given *firm* that may request investment, and less valid to think in terms of business *sectors*. There may be no "proper" size for any given type of firm.

For example the "proper" scale of operation for a firm could depend on any of the following factors, and many others: (a) existing equity owned in the business; (b) current market penetration; (c) market niches filled by competitors; (d) nearby clusters of compatible industries; (e) potential complementary uses of the firm's "waste" products; (f) level of concentration in the industry; (g) opportunity costs of capital and labor; (h) loyalty of consumers; (i) availability of raw materials. Many of these are highly specific to a given firm.

In conclusion, Miller argued, "even when cost efficiencies are apparently correlated with size, close inspection of the underlying...assumptions raises real doubts about the ability of economy of size studies to throw any light on current policy issues."³⁶

Responding to Miller, Madden agreed with much of what he said, adding that "in light of the declining farm population, it would be instructive to consider entrepreneurship the limiting resource," rather than land.³⁷

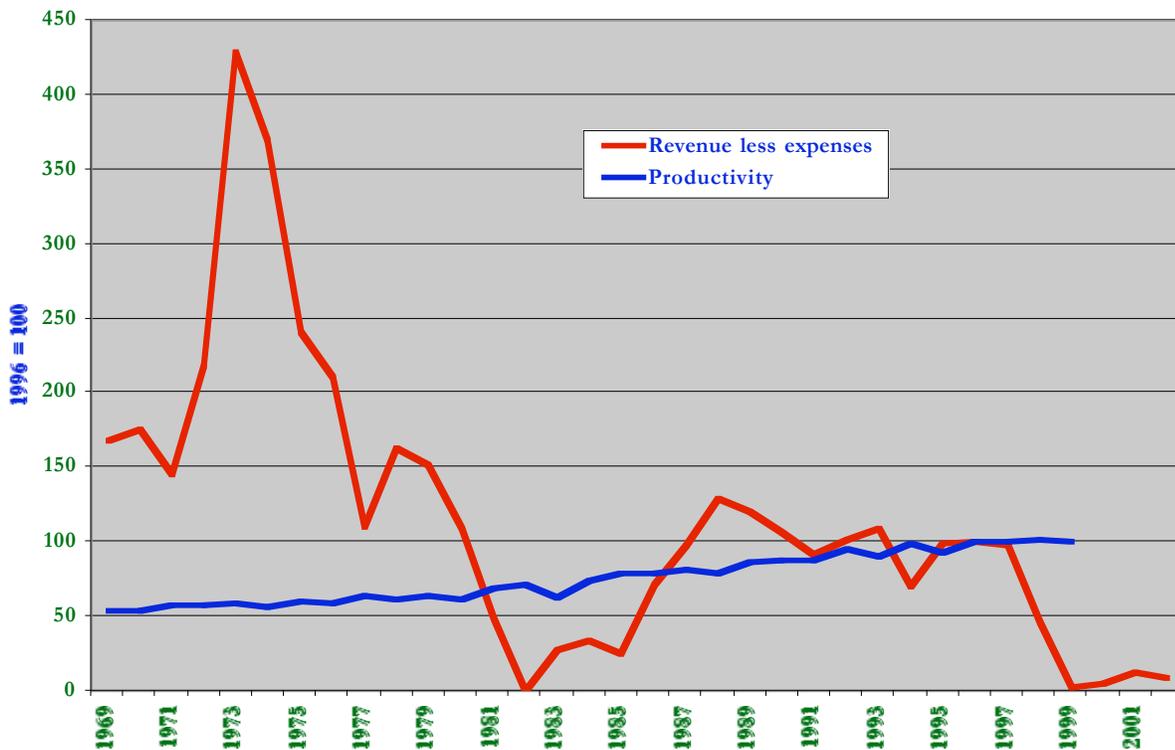
In the Southeast Minnesota context, entrepreneurs have often focused upon a vision of creating a more cohesive community, rather than upon building the largest or most profitable firm possible.

Dispersing the benefits

This strategy of dispersing the benefits emerges out of the awareness that those who "produce" economies of size do not necessarily gain economic benefit by doing so. The National Farmers Union of Canada issued this warning in an incisive economic analysis of the Canadian farm economy in 2003. NFU concluded, "Over the past fifty years, for every dollar that new technologies and inputs have contributed to farmers' revenues, farmers have been made to pay \$1.44." This is despite the fact that "since the early 1960s, farmers have increased their efficiency at a rate unmatched by other sectors and at a rate almost triple that of the Canadian business sector as a whole."³⁸

Similar dynamics are at work in the US farm economy. The chart below shows the relationship between the net costs of producing farm commodities (the balance of cash receipts and production expenses) for U.S. farms over the past 33 years. While farm productivity has steadily increased over that time, net income from producing commodities has been erratic, and steadily declining.³⁹

U.S. farm income and productivity, 1969-2002



If farmers subsidize the introduction of new technologies, who should get the economic benefit? Should this benefit accrue to the food processors who buy food from farms more cheaply? Should it accrue to those who designed the technology? Should it be given to the retailers, wholesalers and distributors who enabled the farmer to purchase new machinery? The answer, of course, is yes, all of the above, but no one of the above. These benefits should be dispersed—and markets alone will not disperse them adequately.

Strong local connections allow the benefits of economic efficiency to be dispersed through the region. From the perspective of the region, it would be most important to create economic networks and local loyalties that allow both small and large firms to take advantage of whatever economies of size exist at their level. Regions that build strong collaboration across firms of all sizes are likely to have greater resiliency as conditions change.

For example, to place this in a regional context, when the Gengler family of Caledonia built a cold-storage warehouse long ago, and allowed their neighbors to lease food-storage space in the facility, they were essentially spreading the benefits of a large-scale facility to others. By leasing space, consumers and neighboring firms were sharing investment costs, and certain risks, with the Gengler family. This allowed the entire region to take advantage of the economies of scale that came with building a single warehouse with a single power supply serving a single insulated shell, rather than for every home or firm to build its own storage. This shared investment became one important part of the foundation for what would later become Sno Pac Foods.

The size of a firm is set by its need for capital

Summing up the 1983 seminar, Michael Boehlje observed that the size of a farm is set largely by its need for capital. As long as debt is required to increase the size of a farm, he argued, there will be an optimal level of debt and equity that any given farm can sustain without assuming more risk than is warranted, which will argue for an optimal farm size.⁴⁰

Boehlje further pointed out that horizontal and vertical integration of farms that expand into nonproduction activities in the marketing and supply input arenas change what it means to be a

"farm firm," rendering economies of size studies less comparable across farms. This echoes Madden's 1967 suggestion that considering farms as a source of services as well as goods was important; like Madden, Boehlje argued that emphasis may be better placed on entrepreneurship—especially as a phenomenon that occurs in a context of particular legal and financial structures—than on economies of size.⁴¹

Ultimately, Boehlje said in his concluding remarks, economies of size were not good predictors of farm success, nor the most important way to test policy proposals. "A broader focus that views determinants of size from a technical, pecuniary [monetary], entrepreneurial, financial and institutional perspective seems more appropriate to understand micro behavior as well as policy responses," Boehlje determined.⁴² This agrees well with the structural suggestions implicit in Miller's work, noted above.

Research on social networks in rural communities

Other researchers devoted attention to the importance of social networks—which can also affect opportunity costs. To take only one example, in her book, *Preserving the Family Farm*, Mary Neth of the University of Missouri focused on the uncompensated activity of rural women in the Midwest in the early years of the 20th Century. Neth pointed out that "Women, in particular, increased their share of farm resources through community building, home production, and making do, and through their activities they emphasized the mutuality of kin and community. As they did so, they increased the communal resources available to men as well. In times of crisis, farm people relied upon these informal local relations for security."⁴³

Thus Neth's reminds us that the "opportunity costs" and "equity structures" noted above rely on the labor of family members, including women, men and children who are not actively farming, and whose work is not given economic reward. These factors have at times fallen outside of the view of economic analysis. She goes on to show that such voluntary activity is often rendered impossible under industrial models of agriculture, once market relationships dominate, forcing people to work only for money. This suggests that the presence of voluntary contributions of time and energy, as well as the persistence of voluntary social networks focused on addressing local needs, may themselves be prime indicators of rural sustainability, perhaps trumping economies of size.

Office of Technology Assessment checks in

Only two years following the Purdue seminar, the Office of Technology Assessment emerged with a study that found economies of size did exist. OTA also concluded that government programs played a major role in shaping farm survival, arguing that "Clearly, there are economies of size in many of the crop areas covered by farm policy. These economies motivate further concentration of resources."

Yet OTA also concluded that policy was a more important force—one that might keep larger farms more viable. "In addition, current farm policy, more than any other policy tool, makes major impacts on farm size and survival. Although very large farms can survive without these farm programs, moderate farms are very dependent on them for their survival."⁴⁴

Under this OTA analysis, written by Stephen Cooke, it appeared that medium-sized farmers needed subsidies in order to get big enough to wean themselves from farm subsidies. Certainly, however, the reality has been that very large farms have continued to collect public payments. Moreover, Cooke's evidence suggesting that large farms were more efficient was calculated data from theoretical models, not from actual farm budgets. Unfortunately, Cooke's study failed to answer any of the three main concerns that had been raised in recent work. Miller's concern about researchers tendency to inject bias into their modeling was overlooked, as was his concern about the opportunity costs of farm labor, and the wisdom of measuring efficiency for an entire sector.

Corn farms

In the face of compelling evidence of economies of scale, either of these concerns could have been overlooked. Yet OTA's analysis fell under the weight of its own internal errors. OTA boldly announced that "In corn production, very large enterprises of about 1,000 acres have an 11-percent cost advantage over 250-acre, medium-size enterprises. The structural elasticity measure is -15 . This indicates that each 15-percent increase (between the 250- and 1,000-acre range) results in a 1-percent decrease in corn production costs."⁴⁵

Although prior work had pointed to a multiplicity of factors that may affect farm efficiency, Cooke pointed out that his modeling used only three key variables. The main indicators used in his model

were (a) costs of production, (b) use of harvesting equipment, and (c) calculated indices of how concentrated production of each commodity was in a certain region. Cost of land was not factored in. Cooke himself cautioned that "There is an element of judgment required in using these indices."⁴⁶

His quantitative results, moreover, did not mesh well with other material that was presented. "Of the areas studied, Iowa has a comparative advantage in corn production," the study argued. Yet the very same paragraph continued by adding, "Iowa also has the smallest average corn enterprise size, the lowest level of resource concentration, and the lowest percentage change in resource concentration of the selected corn-producing areas studied." Thus, it would seem the researchers' own data indicated that medium-sized farms were among the most efficient. Further, a nearby table appeared to indicate that the largest Iowa farm studied had been 576 acres.⁴⁷

Soybean farms

For soybean farms, OTA found no economies of size after examining production records in Iowa, Mississippi and Ohio. Despite finding "evidence to argue for the existence of constant internal economies of size in soybean production across the selected producing areas," OTA concluded that "In soybean production, very large enterprises of about 800 acres have a 1-percent cost advantage over 300-acre, medium size enterprises."⁴⁸ This, of course, is a small margin, which makes it likely that other factors would also be important to analyze.

Iowa was once again found to have the comparative advantage for producing soybeans among the areas studied, but once again the report noted that "this area has the smallest average soybean enterprise size....The quality of the initial resource endowment in Iowa provides producers with the ability to remain highly competitive without having to exploit size economies fully."⁴⁹

Once again, it appeared that OTA's own data had shown that economies of size were less important effects than, say, the quality of the soil—yet the message that economies of size prevailed was still put forward.

Wheat, rice and cotton farms

Turning its attention to wheat, OTA found variable results. "Very large returns to size" were found in Kansas and Montana. No economies of size were reported on farms in North Dakota and Washington state. Yet the largest farm studied in Montana was 577 acres, hardly huge for a wheat farm. The largest farm studied in Kansas, at 3,909 acres, fell beyond the study's sampling range. Kansas was found to have "a comparative advantage in wheat production among the selected areas," and in fact that state had the largest farms of the study.⁵⁰

For rice, OTA found diseconomies of size. In their measurement of farms ranging in size from 600 acres to 2,400 acres, they found a 4 percent disadvantage as farms got larger.

Cotton also showed mixed results. Although "very large returns to size" were found in Alabama and Texas, none were found in California or Mississippi. However, the Texas farmers were found to be reluctant to expand their operations, despite the potential for economies of size. Apparently growers shunned the risks of getting larger.

"This seems to indicate that producers of dryland cotton in Texas are willing to forego the potential gain associated with expanding enterprise size," OTA concluded, "to avoid the additional exposure to risk and uncertainty. The capital investment in land and machinery required as cotton enterprises in this area expand from 1,000 acres to 6,000 acres substantially increases indebtedness, which threatens survivability of the firm. In particular, the uncertainty associated with cotton yields in this area of Texas make indebtedness unattractive."⁵¹

Scholars predict farms will get larger

With no strong proof that size economies exist for any of the crops studied, the paper nevertheless ended by stating, "This information strongly suggests that resource concentration for most American field crops will probably continue for some time. Powerful forces at work in the farm economy will lead to fewer and fewer farms." Significantly, the study had not identified economies of size as one of those powerful forces.

Three years after the OTA study, its source Stephen Cooke collaborated with the University of Minnesota's Burt Sundquist. Once again it was predicted that farm size would increase still further.

Once again, size did not appear to be the main cause. Examining production records for wheat, corn, cotton and soybean farms across the U.S., the authors found that although a "number of size economy questions [were still] unanswered" it was reasonable to expect that corn, soybean, and wheat farms would expand in size to make maximum use of available technology. They foresaw no such expansion in cotton, since "most of the economies of size derived from existing technologies for cotton may already have been achieved."⁵² **It is important to note that this analysis also did little to take into account the complexities in measuring economies of size that had been identified by previous researchers.**

Dairy farms

To return to the 1985 study, OTA also predicted that dairy farms would expand in size. This was primarily because "larger dairies are more profitable." Efficiency was another matter. OTA charts showed that costs declined sharply as smaller farms grew larger, but the rate of change leveled off for farms that had more than 200 cows. There was still slower growth for farms above 600 cows.⁵³

This data emerged from a quantitative model that selected prototype farm sizes based on discussions with key informants. OTA cautioned this represented "not the average of what now exists, but rather approximate modern sizes and types of operations."⁵⁴

These predictions of increasing farm size arose despite massive milk surpluses that, the OTA concluded, cost taxpayers about \$2.6 billion in 1983. Furthermore, OTA warned, "Emerging technologies promise to dramatically increase milk production per cow by year 2000, from a national average of 12,000 pounds in 1982 to over 24,000 pounds in 2000. As discussed in chapter 3 a reduction of approximately 30 percent in cow numbers will be needed by year 2000 to counteract the effect of the emerging technologies, and the static demand for milk products."⁵⁵ Certainly there was no consumer pressure to increase output at this point.

NASS statistics show that these predicted yields were overly optimistic, since the actual average production per cow in 2000 turned out to be only 18,200 pounds.⁵⁶ Still, the decline in demand was real, and the bizarre pressure that pressed for ever more production and larger farms continued in the face of surplus. Yet even this prediction of larger farms had not documented that this proposed growth was due to efficiencies of size.

Beef Feedlots

Beef feedlots in the corn belt gained efficiencies of size by adopting feed handling and waste handling technology, according to one 1988 study. Expansion of feedlots was further encouraged by favorable tax laws, Weimar found, although when depreciation rules were then changed, these advantages were somewhat offset.⁵⁷

Hog farming

The ascendance of large, confinement hog operations has spawned a spirited debate about economies of size in the hog industry. An Iowa State University brief for producers covering swine systems in Iowa concluded that smaller-scale, outdoor hog production methods were profitable. Pasture feeding meant so much lower fixed and production costs that this method compensated for reduce litter size and poorer feed efficiency—and involved fewer environmental externalities.⁵⁸

The 1998 book, *Pigs, Profits and Rural Communities* edited by Kendall Thu and E. Paul Durrenberger, added even stronger evidence. The authors pointed out that expansion in hog facilities was not driven by consumer demand, which remained steady for the decade prior to their book. Further, they added, pork's share of total domestic meat consumption has declined since 1950.⁵⁹

Their analysis was confirmed by Walter Goldschmidt, who used the following chart to show that expansion of the size of the hog industry has not resulted in the production of substantially more hogs—more importantly, a reduction in the number of farms producing hogs.⁶⁰

Year	Average			
	Number of farms	farm size (acres)	Number of hog farms	Number of hogs on farms
1945	209,000	165		
1954	192,993	177	151,508	13,284,000
1964	154,162	219	106,184	13,674,000

1974	126,104	262	59,582	11,477,000
1982	115,413	283	45,768	14,333,000
1992	96,543	325	31,790	14,153,000

Thu and Durrenberger continued, "Some argue that the rapid growth of large-scale swine operations is occurring because their scale allows them to achieve increases in production efficiency and economic profitability by virtue of their size. However, we are aware of no data on the production efficiencies and profitability of the largest swine operations in the country, particularly the largest fifty-seven which market more than fifty thousand hogs each. This data is closely guarded proprietary information of the firms themselves. Data do exist on the production efficiencies of most swine producers. Studies (Iowa Farm Business Association 1992; Mueller 1993) indicate economies of scale are achieved in very modest-sized farm operations, and that size has little to do with efficiency of production and profitability. In an analysis of 705 hog farms in Illinois, Mueller (1993:4) showed...that scale was the least important determinant of profitability. These findings substantiate earlier studies conducted on agricultural operations generally which show that modest-sized operations capture the bulk of economic efficiencies, and larger operations have little to no advantage in terms of economies of scale (see Madden 1967 for a summary)."⁶¹

The authors add, however, that "The fact that large-scale operations are not inherently more efficient than their smaller counterparts does not mean smaller operations are efficient. What it does mean is that smaller operations are not inefficient by virtue of their size."⁶²

What caused hog production facilities to get larger, they argue, is that large firms had the capacity to construct commercial relationships that suited their needs. "Large-scale corporate producers were not just responding to market pressures of supply and demand, they were creating [these pressures]. The issue was not who was the most efficient, rather who had the resources to shape the structure of the market." In fact, the authors concluded, agribusiness had actually transcended market relationships. "Further, as producers and processors collaborate, there simply is no market."⁶³

Thu and Durrenberger also examined the history of farm failure, and found no link to size. "As the economist Neil Harl demonstrated, efficiency was largely irrelevant to survival during the 1980s

crisis. What occurred in agriculture in the 1980s in terms of firms failing because equity was exhausted or operating credit was denied had little to do with efficiency and did not represent a continuation of the long-term trend toward greater efficiency in agriculture. In fact, the firms at risk were some of the most efficient in the industry and were operating at or near the point of greatest efficiency."⁶⁴

Their conclusion echoed the cautions made by Thomas Miller. "The idea that changes in the swine industry reflect a natural process of survival of the most efficient is also an assumption, not a fact. It may well be that, similar to the 1980s, survivors are those who have access to the most capital by establishing appropriate "relationships" with economic power centers."⁶⁵

The two authors suggested an alternative measure. "Our study in Iowa similarly showed a measurable relationship between large-scale swine production and measures of declining economic well-being in rural Iowa (Durrenberger and Thu 1996). Our analysis indicated that having more hog farms was better for rural health than producing more hogs."⁶⁶

A more graphic representation of the causes of concentration in hog production was offered in the same year by Laura DeLind, in an analysis of hog operations in Jackson County, Michigan. Her research showed that what shaped the growth of the containment hog industry was not economies of scale, but rather tax policy and availability of investment.

"Jackson County is located in south-central Michigan about fifty miles from the Michigan-Ohio border. In mid-1983, a feasibility study for the Jackson County Hog Production Project (JCHP) in Michigan was completed (Allen Consultants, Inc. 1983). The \$25,000 study, funded largely through the Michigan Department of Commerce, found that it would be feasible to build at least ten 500-sow hog production units in Jackson County, 'giving an excellent return to investors and achieving the economic gains sought by Jackson County and the state.' (*ibid.*) These units...would be state-of-the-art, total confinement facilities producing some ninety thousand market weight animals per year. It was projected they would increase Michigan hog production by 8 percent, help eliminate the state's vast corn surpluses, and help Michigan's few remaining packers reach capacity with a steady supply of uniform, in-state animals for slaughter. These objectives were entirely consistent with the state's plans to reindustrialize agriculture (DeLind and Spielberg-Benitez 1990).

"Equally feasible, from the study's point of view, was the way in which the \$16.5 million project would be financed. Each unit would be organized as a subchapter "S" corporation. As calculated in the feasibility study, there would be thirty-two investors per unit and each investor would be required to invest approximately \$51,600 per unit. As part of a subchapter "S" corporation, investors would be able to "deduct losses of the corporation from their personal income tax" (Allen Consultants, Inc. 1983; Willbanks 1985). A five-year depreciation allowance for single-use facilities would generate losses of over \$11.3 million in as many years (Willbanks 1985). In addition, investors would hold \$10 million worth of bonds issued by the Jackson County Economic Development Commission at 13 percent. The tax-free income from the bonds would contribute further to deductible corporate losses. Thus, investors would receive a double or compounded tax break. The bottom line, the study calculated, would be a net return of 24 to 27 percent to those with more than \$50,000 to invest in it."⁶⁷

In other words, these industrial hog operations addressed the needs of urban investors for a tax break, and addressed the needs of vertically integrated firms for market control, but in no way responded to consumer demand for pork. Rather, they addressed the needs of investors who had surplus wealth and were looking for a tax break, based not on efficiency, but on the new operations' capacity to *lose* money. In a very real sense, rural America was shaping itself to the needs of people who held surplus capital. The "demand" that was being met by the "market" in this case was the need for investors to dispose of their surpluses. Farm production, and even the hogs themselves, were shaped to this need.

John Ikerd added to the discussion by reporting on the impact that smaller farms have on the rural community as a whole. Ikerd found that "A key difference between contract and individually owned hog production is in management and labor requirements. The composite contract farrow-finish operation [analyzed] employs only 4.25 people to generate \$1.3 million in hog sales. In contrast, independently operated hog farms employ 12.6 people. Large-scale, specialized operations create far fewer jobs per hog produced but more hogs per employee." Since rural regions need employment, efficient use of local labor resources suggests that, from the standpoint of the community, the independent-operator strategy will be more suitable.

"When feed is produced on the farms where it is fed and returns to the management of local farmers, there is little doubt about the positive impact on the local community. A recent Minnesota study (Chism and Levins 1994) examined the financial records of large and small livestock producers and concluded that smaller producers bought a greater proportion of their inputs locally. For smaller livestock farmers (annual gross sales less than \$400,000) the weighted average of local spending (within twenty miles) was 79 percent, whereas for larger farmers the weighted average was only 47.5 percent. These data indicate that smaller to moderate-sized hog operations are more supportive of local input suppliers than either larger owner-operated or corporate operations."⁶⁸

More recent analysis of economies of size in the farm sector

Meanwhile farms continued to increase in size, and analysts continued to refine their modeling techniques. University of Minnesota's Willis Peterson argued in 1997 that although "Numerous empirical studies have reported scale economies"—he listed nine—few of these studies had paid attention to three important concerns. First, most studies combine the cost of the farm dwelling as one of the capital inputs of the farm. Second, many studies failed to realize that many environmental and management characteristics are correlated with size—for instance, that larger farms are often located where soils are the highest quality, and may appear more efficient simply because the soil is better. Third, few studies had taken into account off-farm employment on farm output and production costs. Peterson concluded, "Estimates of long-run average total cost curves for farms in the corn belt reveal that after the above factors are taken into account, estimated scale economies in agriculture disappear, while there is evidence of diseconomies as scale increases."⁶⁹

Peterson found it curious that, despite economic theories that show that scale economies must be temporary, "Conventional estimates of returns to scale in U.S. agriculture have not decreased over the past 40 years," which suggested to him that researchers who measured economies of scale may have been biased. Moreover, he added, "returns to scale estimates did not decline during the 10-year period mid-1970s to mid-1980s even though farm size remained relatively constant during this time. It is argued, therefore, that estimates of returns to scale have been biased upward."⁷⁰

Crucially, Peterson pointed out, scale economies are a temporary phenomenon, since they are associated with a period of market disequilibrium.⁷¹ This means gearing any policy to any particular

economy of scale is only a short-term solution, and suggests the Southeast region should devise approaches that allow flexibility in the face of changing factor costs and economies of scale.

Philip Raup also pointed out that larger scale can also involve costs. "Only in the past decade," Raup testified to a Senate subcommittee in 1972, "has serious attention been given to the fact that the large agricultural firm is also able to achieve benefits by externalizing certain costs. The disadvantages of large-scale operation fall largely outside the decision-making framework of the large farm firm. Problems of waste disposal, pollution control, added burdens on public services, deterioration of rural social structures, impairment of the tax base, and the political consequences of economic power have typically not been considered as costs of large scale, by the firm. They are unquestionably costs to the larger community.

"In theory, large-scale operation should enable the firm to bring a wide range of both benefits and costs within its internal decision-making framework. In practice, the economic and political power that accompanies large size provides a constant temptation to the large firm to take the benefits and pass on the costs."⁷²

Raup reminded the subcommittee of the classic study of rural economies, performed by Walter Goldschmidt in the mid-1940s. Goldschmidt studied two California towns that had similar demographic conditions, Arvin and Dinuba. Arvin was a community of large farms at the time Goldschmidt performed his research. Dinuba held mostly smaller farms. Goldschmidt had found that Dinuba had a healthier community and stronger local economy.

Subsequent research by a University of Minnesota scholar showed that twenty years later, Arvin "is short of skilled tradesmen of all kinds." Moreover, Raup added, "farm laborers and foremen were 36 percent of the labor force in Arvin, [but only] 13 percent in Dinuba. Professional and related skilled trade and service staffs were 6 per cent of the labor force in Arvin, 15 per cent in Dinuba. In Arvin in 1960, 19 per cent of the population over 25 years had completed high school. In Dinuba, the small-farm community, the figure was 38 per cent."⁷³

Still more recent research by a graduate student at the University of Missouri found that the number of small farms in Missouri counties—even "urban" counties—was the single indicator most related to child well-being.⁷⁴

After reviewing such evidence, Raup concluded that "It is a part of our mythology of large firms that they are efficient. But the key question is: efficient at what? For very large farms, the answer is clear: At the exercise of market power." The U.S. had yet to experience such market domination by large farms at the time Goldschmidt wrote, Raup argued. But he was aware of one key difference that separated the agricultural economy from the industrial one that provides the nation with its understanding of the economies of size. "There are few large-scale business firms, apart from mining and forest products, that can look to land value appreciation for any substantial part of their long-run prospects for firm growth. The situation in agriculture will be quite different," he continued. "There is well documented evidence that much of the non-farm capital that has entered agriculture in the past two decades has done so in anticipation of capital gains in land. A desire for food is not the only source of demand for land that has increased its price."⁷⁵ And land would become increasingly scarce.

Arguing from a slightly different perspective, historian Mary Neth came to similar conclusions. Neth argued that farm policies were established by a federal government that wished to assert power over farm production, which was difficult as long as control over farms was dispersed. "Implementing these [federal farm] policies was difficult because many farm families, not a few corporations, controlled the means of production. To gain control of agricultural production, the government promoted farm consolidation."⁷⁶

If this was conscious policy, it appears to have failed, since federal power over farm production has eroded as the U.S. has lost its global dominance. The government itself may carry less clout than global trading firms—and certainly relies upon those same traders for basic data showing global commodity trade flows. Yet for our purposes, it is noteworthy that two scholars, writing from quite different perspectives, both found federal subsidies to be a major cause for the expansion of farm size—not efficiencies of size.

One recent study covering economies of scale found that farms that rotated two or three crops gained economies of scale and scope because they could spread out fixed costs over the costs of producing more than one crop, and could often use equipment more efficiently. Researcher Edouard Mafoua argued in 2002 that these economies increase with size. However, his analysis did not take into account farm revenues, nor did it cover externalities. As a calculated data set that analyzes groups of firms, it also is vulnerable to Miller's criticism that economy of scale calculations are most meaningful when they cover only a single firm.⁷⁷

Ten years following the ISU meeting, still another major report addressed the size and structure of agricultural production. Produced by Arne Hallam, this 1993 study concluded that "The appropriate ways to analyze and measure [economies of size] remain a subject of much disagreement."⁷⁸

Hallam identified four distinct approaches to measuring economies of size, and assessed the strengths and weaknesses of each. He cited findings that the first adopters of any new technology may be the ones to benefit the most, regardless of size economies, because they control competition. He also found that small farms were often able to overcome competition from "large and possibly more efficient firms" simply because they could alter their own farm output more rapidly. He echoed prior researchers who suggested that size of a farm may be primarily due to the owner's willingness to accept risk.⁷⁹

Among other conclusions drawn in this thoughtful and detailed analysis, Hallam pointed out that time-series data that show farms changing size over time are inherently flawed, because over time the relative costs of various farm inputs change, and there is no meaningful way to account for these changes.

Ultimately, Hallam concluded that the primary agricultural production industry "may be independent of size or scale economies." He reminded that there is an entire body of research that had been neglected: "There is also a need for models that can explain why firms may decrease in size as economic conditions change."⁸⁰

For farms that sell more than one product, Hallam also argued, "There is no return to size." The firm's gross revenue results from shared technology and infrastructure, and these costs cannot fairly

be assigned to any given product. This is, of course, to say that for most farms, there is no credible way to assess economies of size at all. His argument furthermore implies that the essential idea of calculating economies of size for farms may simply be an outgrowth of an ideology that favors monocropping. Perhaps only if farms choose to resemble calculated models would such measurements ever make sense—they may never apply to farms that actually depend on changing weather, input costs and product mixes.

Perhaps Hallam's most incisive point was to argue that economies of size depend on the purpose of the research being undertaken. "It is extremely important to know the purpose for which results will be used before undertaking studies. For example, if the purpose is to explain the viability of a particular size structure, economies of size are only one of many important factors." In sum, echoing prior researchers, Hallam stated, "Efficiency, access to credit, producer preferences, and pecuniary economies may be more important than technical economies of scale."⁸¹

Hallam further cautioned that it is impossible to calculate economies of size separately from the economic infrastructure in which they operate. "The viability and profitability of firms are partially determined by elements associated with firm size, firm structure and the character of the industry in which they compete." One has to analyze these jointly, because the firm influences the context and the context influences the firm. "The relevance of firm size and structure cannot be determined independently of industry structure because the causal factors are not unidirectional."⁸²

He found some evidence that larger livestock farms may be more efficient, but ended by stating, "The general conclusion is that while some economies of size or scale may exist for livestock farms, that significant economies, at least as conventionally defined, do not exist for most crop production activities. While differences in efficiency [exist] and growth paths differ among firms, few of these seem directly related to economies of size and scale." Nevertheless, echoing Cooke, Hallam added, "The structure of agriculture is changing rapidly."⁸³

Ultimately, Hallam argued that "The differences in firm efficiency may be more a reflection of commitment to perceived goals than the result of any underlying differences in technology or economic environment."⁸⁴

What economies of size have been identified in the rural business economy?

Of course, the rural economy is made up of more than simply farms. Of great interest to the Hiawatha Fund is also the survival of small businesses that serve those farms and the rest of the rural community.

Little literature has been found that analyzes the economies of size for rural businesses. The very fact that 90% of all businesses in the Southeast Minnesota region hire less than 20 employees, and that this has been true for the past 20 years despite increasing concentration in urban economies, certainly suggests that small businesses may be quite efficient in the small town context.

One exploration of appropriate size was performed in North Dakota. Examining sales tax records for small businesses in that state, Coon and Leistritz found 16 types of businesses that serve communities of 2,600 or less. Although the widely scattered small settlements of North Dakota, far from urban centers, may exhibit a very different character than those in our region, these results make an interesting point of comparison. As the table below shows, this study found that towns with an average population of less than 1,000 can support at least one farm/garden machinery, farm supply, lumber, grocery, gasoline/service station, sporting goods, eating, and drinking place. Further, Coon and Leistritz discovered that towns with an average population of 600 could support four eating places, while towns with an average population of 4,000 could support as many as four lumber stores.⁸⁵

Other studies focused on small town business more generally. A 1990 study of metro and nonmetro businesses between 1980-1986 showed that "local, independent firms survived better and grew faster than corporate affiliates in nonmetro areas." More than half of these small firms survived the six-year study period, compared to only 39 percent of the corporate affiliates. Small firms expanded employment by 19 percent in that time, compared to only a 3 percent expansion in the corporate sector. Firms of less than 20 employees fared better than average, accounting for 33 percent growth in employment.⁸⁶

However, the firms that were most likely to survive in nonmetro areas tended to be resource-based firms, low-wage manufacturing, and residential services. These firms did not create as many jobs as urban firms did, offering only lower-wage work.

Required populations for Southeast Minnesota businesses are likely to be larger than in North Dakota, since the Southeast region is more compact, with more competing urban and town centers. The region may want to do its own analysis of local business conditions. Still, the persistence of multiple businesses in small towns suggests there are strong niches for small firms to occupy.

Table 4. Mean Population per Cities with One, Two, Three, or Four Firms, For Selected SIC Codes, 2000

SIC Code Number	Industry Description	Number of Permits			
		1	2	3	4
508	Farm and Garden Mach. & Equip. Stores	436	632	768	642
519	Farm Supply Stores	521	758	835	1,141
521	Lumber & Other Building Materials	986	1,324	1,797	4,036
525	Hardware Stores	1,131	2,077	a	a
531	Department Stores	2,606	a	a	a
533	Variety Stores	2,324	5,061	a	a
541	Grocery Stores	709	2,059	3,303	a
554	Gasoline Service Stations	650	746	1,092	a
565	Family Clothing Stores	1,351	a	a	a
571	Home Furniture & Furnishings Stores	1,628	2,781	a	a
573	Radio, TV, and Electronic Stores	1,602	4,712	a	a
591	Drug Stores	1,065	1,769	6,551	a
594	Sporting Goods Stores & Bicycle Shops	847	1,089	1,859	2,292
599	Florists	1,287	3,855	a	a
5812	Eating Places	408	439	454	597
5813	Drinking Places (Alcoholic Beverages)	305	428	670	779

^a The number of permit holders in the category were too few to provide reliable mean populations.

Source: Coon and Leistriz (2002). Note: "Number of permits" means number of sales tax permits issued by the state for firms located in each town.

The efficiencies of local banking

Similarly, a recent study of the U.S. banking industry—not particularly focused on rural areas—is also instructive, since it finds that the most efficient-sized bank holds about \$100 million in assets—about one-thousandth the size of the average bank in the U.S. At about \$200 million, scale diseconomies set in. "Small banks have consistently outperformed large banks in terms of profitability," argues Gary DymSKI of the University of California Riverside. "No studies have found that very large banks are systematically more profitable than smaller ones," he added.⁸⁷

Plainview, Minnesota, banker Dean Harrington adds some perspective to this subject. A handful of the larger small-town banks in Southeast Minnesota hold about \$100 million in assets each. These would apparently be well-poised to be among the most efficient banks in the nation. Dozens of other rural banks in the region operate at a smaller scale, ranging from about \$30-60 million in assets. There are several multi-bank holding companies with assets of about \$200 million each, and of course branch offices of major urban banks as well.⁸⁸

Harrington's own research, on behalf of the Independent Community Bankers of Minnesota (ICBM), shows that to support a bank with \$125 million in assets (the optimal size for efficiency) 3,000 customers are needed. To attract 3,000 customers, the local market must contain at least 7,000 in population. Finally, he has found that a very local bank can save \$20,000 to \$40,000 in annual overhead costs by making use of informal communications rather than having to contact each customer more formally, as a larger bank would. This amounts to 1 percent more profit.⁸⁹

Leo Stadnik, ICBM director of technology, argues further that technology can "tilt the playing field to a smaller bank's advantage because it is less costly to install and update technology advances and tailor them to their customers' needs. Community banks can implement technologies more affordably than big bank chains."⁹⁰

Harrington lists the following advantages for a locally owned bank. It can keep more of the bank's profits in the community. A local banker can "make bolder decisions for the development of the local economy and ones that are better grounded in local community values. It is better placed to take a long-term planning view, and can bring most financial services to rural citizens more efficiently and responsively.

Many key "best practices" and trends in the business world, he adds, "are either scale neutral or actually can be implemented more easily on a relatively small scale." Many of them "actually favor small-size organizations."

Technology used by small firms may be more user-friendly and more cost-effective. Bank managers can build better management teams, since top management is part of the team, and has more "hands-on" knowledge. As a smaller bank markets its local services, if it is attuned to the needs of its customers, it can more easily discover new points of differentiation, and tailor service features and benefits for local markets.⁹¹

Dymski concludes that if efficiency is not motivating bank mergers, something else must be at work. In his analysis, it is the availability of capital. "Wall Street has chronically provided the requisite capital for banks' stock buy-back and stock swaps during the long merger wave. Of course, these mergers have been a rich source of fees for brokers and investment bankers. But more broadly, Wall Street has generally provided backing for bank mergers due to its perception that mergers enhance banks' franchise value for shareholders."⁹²

Relationships of trust create economies for banks

Using a regression model that drew upon detailed loan data from six agricultural lenders in the Northeastern states, Gunderson *et. al.*, found that lenders that were able to make more than one loan to the same borrower received "substantial economies of size at the relationship level." That is, the trust that had been built between the lender and the borrower led to lower staff costs in reviewing subsequent loan applications—the primary cost concern for loan initiation. Significantly, however, this in-depth review of lending data did not identify economies based strictly on the size of the lender, nor of the size of the loans made.⁹³

Farm input businesses

Few studies have focused on farm input firms. One 2002 study by Kim, *et. al.*, showed that, although economies of size did exist for nitrogen fertilizer production, these were far outweighed by higher costs that were created by the concentration of marketing power by the largest producers.

“Empirical results, with data for the period 1996-2000, indicate that for the U.S. nitrogen fertilizer industry, market power effects outweigh the cost-efficiency effects by 55 percent,” they concluded.⁹⁴

Rural retail firms

The persistence of small stores on Main Streets across the region, in the face of heightening concentration of the retail industry, is a testament to the efficiency of the small and the commitment of loyal residents. This is underscored by recent analysis of the opposite end of the retail spectrum—the giant Wal-Mart. Wal-Mart and its sister firm Sam's Club have recently emerged as the top two food retailers in the U.S. Overlooked in this emergence has been the cost this firm has inflicted on U.S. taxpayers.

The Democratic staff of the U.S. House of Representatives, under the direction of Rep. George Miller (D—CA) published a review of Wal-Mart's impact on federal welfare programs in early 2004. Their research found that firm's sales clerks “made only \$8.23 per hour on average, or \$13,861 per year, in 2001....This fell below the 2001 federal poverty line of \$14,630 for a family of three.” Moreover, the study continued, “about one-third of Wal-Mart’s employees are part-time, restricting their access to benefits....Fewer than half of Wal-Mart’s employees are insured by the company’s health plan, compared to 66 percent” for similar stores nationally.” The report added that “The average supermarket employee makes \$10.35 per hour” in other firms.⁹⁵

This means taxpayers pick up the tab for health insurance, social services and other costs the employees cannot pay for themselves. All told, the report found, “One 200-person Wal-Mart store may result in a cost to federal taxpayers of \$420,750 per year – about \$2,103 per employee.⁹⁶ By contrast, 2002 company profits were \$6.6 billion. This is \$4,714 of profit per employee, a profit of two dollars for each dollar of federal subsidy.⁹⁷

Good Jobs First came up with additional subsidy calculations by examining local government records. In May, 2004, the group reported that Wal-Mart “has received more than \$1 billion in economic development subsidies from state and local governments across the country.” This does not simply involve retail outlets, they add “Taxpayers have helped finance not only Wal-Mart stores, but also the company’s huge network of distribution centers, more than 90% of which have gotten subsidies.”⁹⁸

There are further hidden costs. “In January, 2004, the *New York Times* reported on an internal Wal-Mart audit which found ‘extensive violations of child-labor laws and state regulations requiring time for breaks and meals.’”⁹⁹

The Economist magazine added that the recent class-action suit just filed by women who have worked for Wal-Mart is hardly a unique case. “The firm now faces about 8,000 lawsuits, the ‘vast majority’ of which are personal-injury liability claims from employees. It is currently under 34 class-action lawsuits alleging violations of the Fair Labor Standards Act. Staff turnover at Wal-Mart has fallen from 60% to 44% in recent years, meaning the firm has to hire 440,000 people every year simply to stay at its current size.”¹⁰⁰

Research has further shown that Wal-Mart's presence also carries a negative impact upon the local business climate. *The Economist* also cited research by Iowa State University economist Kenneth Stone in 1993 that found that, “The longer-term effects of Wal-Mart were disastrous for nearby independent businesses. Over the course of the next several years, retailers’ sales of mens’ and boys’ apparel dropped 44 percent on average, hardware sales fell by 31 percent, and lawn and garden sales fell by 26 percent.”¹⁰¹

Analysts for the city of Los Angeles, similarly, found that “Big box retailers and superstores may negatively impact the labor market in an area by the conversion of higher-paying retail jobs to a fewer number of lower-paying retail jobs. The difference in overall compensation (wages and benefits) may be as much as \$8.00.”¹⁰²

Perhaps the most hopeful news to come out of these analyses of Wal-Mart's impact came from Germany, where, *The Economist* reported, community-friendly legislation has created a climate under which the firm does not succeed very well. “Wal-Mart has lost money ever since” it paid \$1.6 billion to buy two German firms, Wertkauf and Interspar, in 1997-1998, the magazine pointed out. At the time of the purchase, Wertkauf was profitable. “[The firm's] problems have included price controls, which prevent below-cost selling, rigid labour laws and tough zoning restrictions, which make it extremely difficult to build big stores.”¹⁰³ This offers compelling evidence that economies of scale, and perhaps not even managerial talent, are not as important as the ability of a social and

economic infrastructure to support a given scale firm, and to advance community-minded goals. Rather than workings of the market, public policy appears to play a crucial role. Even the 1960s-era suburban shopping centers, now dwarfed by big box stores, would not have been economical to build without accelerated depreciation policies that favored investors.¹⁰⁴

This strongly suggests that the U.S. could reduce the negative impacts of big box stores, and strengthen local economies, if it pursued appropriate policies. Hiawatha Fund may be able to help point the way.

Surrounding farm and nonfarm businesses with networks

Echoing Madden, Miller, Boehlje and Hallam, Randy Ziegenhorn called for an emphasis on infrastructure, rather than economies of a single firm. Ziegenhorn argued for networks of local producers that can "hold the promise of a flexible, adaptive response on the part of family farmers that can allow them to compete with those who want to continue the transformation of American agriculture and rural life along the industrial model." He recommended bottom-up organizing appropriate to local communities.¹⁰⁵

This suggestion points toward the work of Paul Wilson, who wrote about elements of social capital and trust. Echoing Neth, Wilson argued that "trust alters the terms of trade, generates decision flexibility, reduces transaction costs, and creates additional time resources for management."¹⁰⁶ This is an important consideration in the size discussion, since small firms are better at generating trust, while larger firms are more dependent on coordination through control. Wilson cites three authorities, writing over a 50-year period, who illuminated the role of trust in business relationships. He begins by quoting Ronald Coase. "A firm, therefore, consists of the system of relationships which comes into existence when the direction of resources is dependent on an entrepreneur."¹⁰⁷ This view, it could be argued, is overly dependent on a private, single-owner model of business—trust could also be won by a board of directors, or by a well-organized group of leaders who adhere to a concerted vision. Still, its emphasis on relationships is of fundamental import to our discussion.

Wilson continued by considering a refinement from Kenneth Arrow. "Virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time."¹⁰⁸

Wilson then cited David Kreps' 1990 definition of the firm. "[The firm is] an intangible asset carrying a reputation that is beneficial for efficient transactions, conferring that reputation upon whoever currently owns the asset."¹⁰⁹

If doing efficient business is essentially to build relationships of trust, and if a good entrepreneur is someone who is adept at building such social connections, this has important implications for the Southeast Minnesota region. It would seem that the best way for trust to be established in the region's business community would be if local lenders and investors actually had the power to make economic decisions based upon who they trust. They could then facilitate the starting or expansion of local businesses that exhibit that trust. This further suggests that building social connections and personal capacities is more the goal of the region than is the pursuit of narrow economic efficiency.

It is imperative that the Southeast Minnesota region be able to create new relationships of trust on its own terms. As Wilson so concisely pointed out, "Like other economic assets, social capital requires investment." This has further implications. A region that sees itself primarily in terms of what it *consumes* cannot build social trust. Trust is produced, not consumed. A region that is the recipient (a consumer) of work process templates determined in distant offices, or that is forced to select its development strategy from among a list of options created by some party external to the region cannot effectively build social connection. It must seize the opportunity to *produce* life essentials.

A farm region, to be more specific, that farms according to formula worked out in Washington, DC, or in a professional suite in Chicago, is consuming the technology required to farm. A farm region that consumes most of its food from outside the region is losing its ability to invest in trust. Given the centrality of food to human spirit, gatherings and health, it is in fact arguable that unless a region produces a substantial share of its own food, it cannot build relationships of trust. People eat three times a day, and food is the second largest consumer expense after housing. Raising food is to take advantage of nature's own multiplier, in which one seed becomes thousands, and two mating

livestock may spawn hundreds. A region that cannot build new wealth for its citizens by harnessing this multiplier in meeting the food needs of its own region is likely to have difficulty building wealth in any other manner.

This vision suggests that Southeast Minnesota should consider creating infrastructure that is focused, not narrowly on economies of size, but more broadly on strengthening *social networks that produce trust* and the *flexibility* to respond to changing economic forces. Such an infrastructure would recognize the unique strengths of both large and small firms, and would create linkages among them. It might utilize the efficiencies—and avoid the inefficiencies—of both the very large and the very small. It might create new efficiencies among players at all levels by creating regional synergies, allowing large and small firms to work at the appropriate levels of scale for their own operations, and to share the benefits of each level of scale broadly among local residents.

Such an approach would recognize the economic truism that all fixed costs are, in the long run, variable costs. Codifying any single set of economies of scale will produce rigidity as factor costs change. Establishing flexible networks that can respond as oil prices and credit availability, for example, change will provide more lasting sustainability for the region.

As the esteemed financial journalist Bill Greider writes, communities need to build "cooperative network[s] that allows small firms to share the costs of functions that do have economies of scale."¹¹⁰

Two other experts that argue for strengthening clusters of compatible local businesses are urban planner Bennett Harrison and local business consultant Michael Shuman. As in Silicon Valley, Shuman argues, "The proximate siting of related and interrelating firms is believed to create certain economies of scale."¹¹¹

The advantages of clustering in Silicon Valley, in fact, have led researchers to conclude that rural communities in America should focus on what they already have, rather than trying to attract high-technology firms. "High-tech firms tend to cluster, raising doubt as to whether rural communities re wasting resources by efforts to attract such industry."¹¹²

Were Hiawatha Fund to adopt such a perspective, it would consider its region more as a *system* than as a collection of individual firms. A local investment pool would play a crucial role in framing a vision for such a system, and also by investing in specific opportunities that advance the local vision, rather than advancing primarily the interests of external parties.

What economies of size have been identified in the food processing industry?

In clear contrast to farms and small businesses, food processing and other industries served by farmers have not only grown immense, but have also at times gained economies of size. Yet research data shows no clear correlation between economies of size and their growth. Food processing, wholesaling and retailing firms clearly hold powerful positions in the current economy, and many are able to shape farm production and distribution to serve their interests. Moreover, intermediary firms in general, since they trade relatively inert commodities, do not face as directly the unpredictable risks of climate and weather as farmers do. This gives traders an inherent advantage in trade. Even a basic overview of the history of the growth of these intermediaries has uncovered some startling evidence.

This analysis begins with Russell Parker, a Federal Trade Commission official who took a leave from his position in Washington to teach at the University of Wisconsin in 1976, where he wrote an analysis of concentration in the food industry. He wrote at a time of rapid concentration, analyzing this era from many perspectives, and concluded that economies of size had little to do with driving the concentration of the food industry.

Parker wrote during a period when food prices had escalated rapidly, even while grain production had risen dramatically. In an effort to offset rising oil prices due to the OPEC oil embargo, USDA had urged farmers to plant "fence row to fence row." By exporting grain to the Soviet Union, it was argued, farmers would make good money and the U.S. trade deficit would be reduced.

Indeed, farmers had several prosperous years in this era. Yet, farmers faced other consequences, as well. Rising grain costs forced up the cost of meats, since livestock were fattened with those same grain products that were now in export demand. Farms became saddled with greater debt than many could handle, leading to the farm crisis of the mid-1980s. Moreover, as Parker pointed out, "In the four years beginning with 1972, the amount consumers spent on food increased by 50 percent, principally because of higher food prices. In this period, food prices became the major cause of inflation. In the single year between 1972 and 1973, higher food prices caused over half of the increase in the overall Consumer Price Index in the United States."

The chart below shows how net farm income from production spiked in this era, only to fall steadily ever since.¹¹³

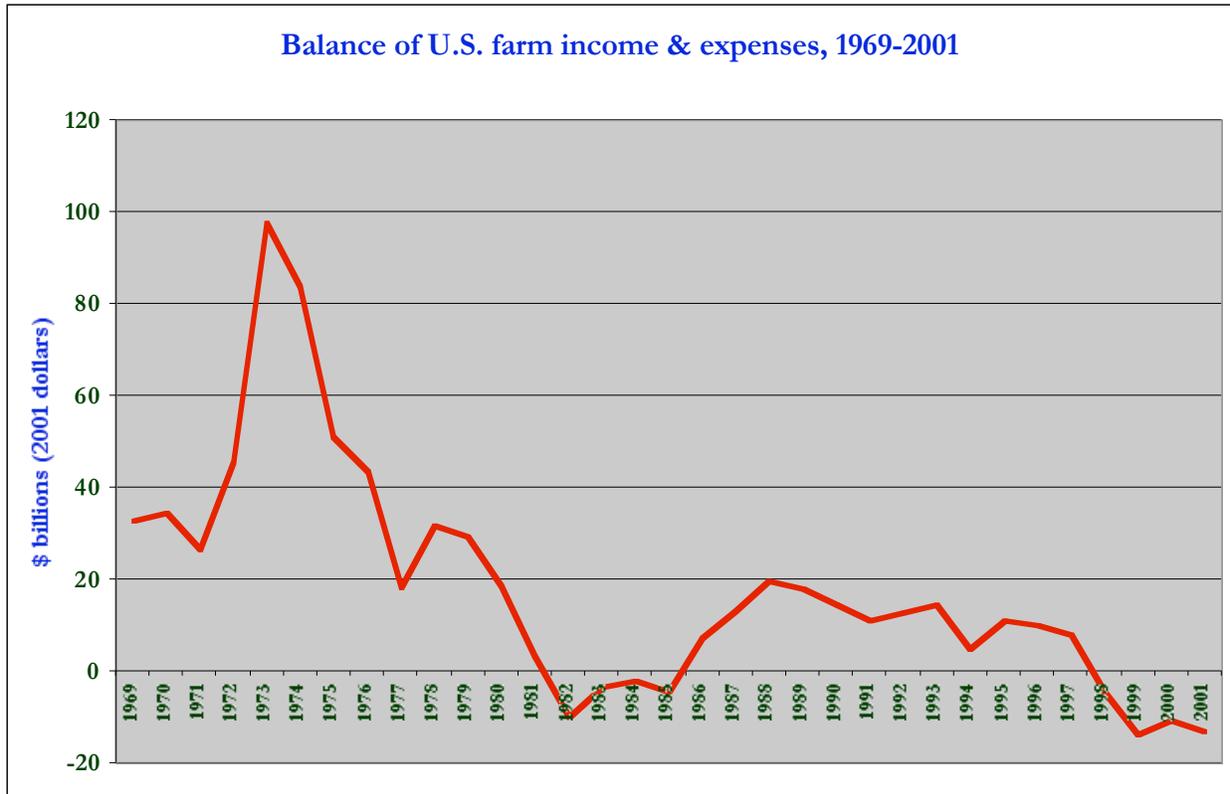


Chart by Ken Meter, 2004. *Source:* Bureau of Economic Analysis, Regional Economic Indicators Series, data for the U.S. from 1969 to 2001, adjusted for inflation. Note that the balance of farm income and production expenses has been negative *for the entire nation* since 1998, at levels that surpass the period of the farm debt crisis of the 1980s. Net deficit in production costs for all farms in the U.S. was \$42 billion from 1998-2001.

Not only was this a stark increase in the cost of food, it also represented a reversal from trends that had persisted since the end of World War II. In that 26-year span, food consumption as a percentage of total consumer expenditures had fallen from over one third to a little less than a fifth.

Yet Parker noted that this still represented a loss to farmers. "The U.S. Department of Agriculture index for the average farm price of raw food commodities in 1971 was identical to that of 1948. During the same period, however, the average price consumers paid for food products in grocery stores increased 35 percent. Higher marketing margins, which rose over 80 percent during the period, were solely responsible for the increase."¹¹⁴

As prices began to rise in the early 1970s, rising commodity prices and increasing energy costs created what Parker called a "pyramiding" effect, with price rises at each level of the food value chain affected those at succeeding levels. "This pyramiding," Parker continued, "caused the annual rate of increase in food prices between 1972 and 1974 to be over five times greater than the average annual increase over the previous 20 years."¹¹⁵

During this period of rising food costs, food marketing margins increased even more dramatically, providing Parker with the impetus for his study. "The USDA index for food marketing margins rose 31 percent over the 1972-1974 period; a rate of increase nearly three times greater than the overall rate of inflation in the economy as measured by the rate of increase in the Consumer Price Index for items other than food."¹¹⁶ Parker sought to explain why this increase would occur.

He began by sketching the history of food manufacturing in the U.S. "As the food manufacturing industries became mechanized and as food manufacturers began to seek national markets, the food industries developed large scale national organizations. This trend is particularly noticeable beginning in the 1920's and 1930's. Since World War II the trend toward bigness and few firms has taken on a strong conglomerate character and has been the major cause of major transformations in the structure of food manufacturing industries."¹¹⁷

It is important to note here that the 1920s were an era in which farm income declined while urban personal income rose dramatically, a situation that also typified the 1990s, although of course with a very different complement of economic institutions. Parker further notes that "World War II took a heavy toll on food manufacturers....The 25 percent reduction in the number of food processors and manufacturers that occurred between 1939 and 1944 'was due entirely to the elimination of very small food concerns,' [the 1946 Smaller Plants Corporation Report had found]." In the years immediately following the War, with consumer demand high and high profits making capital

available, new equipment was introduced into the food processing industries right after the War, further leading to consolidation. Parker concluded that this investment in machinery promoted some economies of size in the industry.¹¹⁸

Yet overall, Parker found that the declining number of food industries following this postwar investment was not due to economies of size. "The largest absolute declines in company numbers occurred, not unexpectedly, in the largest industries."¹¹⁹ The main cause, he found, was acquisitions. These food mergers outpaced the rest of the U.S. manufacturing sector. "The average size food manufacturing company in 1972, measured in terms of value of shipments, was \$5.2 million. This was twice the size of the average for companies in the rest of manufacturing."¹²⁰

By 1972, Parker determined, 77% of the value added in the food industry occurred in the 37 concentrated food industries, and not in the 10 competitive market industries. Considered from the standpoint of value of food shipped to consumers, two of every three dollars worth of food shipped was handled by noncompetitive firms.¹²¹

Key to increasing size in the food industries, Parker argued, was advertising. "Significantly, industries where advertising was less important experienced only moderate or no increases in concentration."¹²²

Importantly, Parker further found that this concentration occurred despite a drastic decline in the size of several meat processors, forced by federal anti-trust action, that had decreased the market share of the four largest meat processing firms from 41 percent in 1947 to 22 percent in 1972.¹²³

Those firms that grew in size, Parker concluded, accumulated considerable market power at levels that were disproportional to their size. "In 1964, when the 50 largest [food] companies controlled 49 percent of assets, they accounted for 61 percent of profits and nearly 90 percent of television advertising."¹²⁴

Mergers continued in the food industry at a pace far exceeding the rest of the U.S. manufacturing sector. "In fact, the 1966 FTC *Food Manufacturing* study shows that were it not for mergers, the

combined share of assets of the 50 largest food manufacturers would have declined between 1959 and 1965."¹²⁵

When food companies merged, advertising revenues doubled, but very little new productivity was gained. Parker notes the "very low research and development expenditures of the largest food manufacturers," adding that a previous study had found "that food manufacturing was the only one of the 20 major industrial groups in manufacturing where there was an inverse relationship between size of firm and the number of research and development personnel per 1,000 employees."¹²⁶

"The picture that emerges from these data and others," Parker concludes, "such as use of sales force field personnel and advertising, is that large food manufacturers move into new products only after they are first developed by smaller firms."¹²⁷

Similar trends were found in food retailing. "Food retailers perform almost no R & D," Parker stated. "Higher than competitive costs also result from advertising and promotional expenditures, packaging costs associated with product differentiation, and inefficiencies in delivery and service systems of some industries which are necessary to attract and hold certain classes of customers. The cost of maintaining excess capacity can be substantial. Excess capacity, particularly in the hands of larger companies in markets, is a barrier to entry."¹²⁸

In sum, Parker's data showed that firm profits as a percent of stockholder equity in the food industry increase steadily as the degree of concentration increases (from 40 percent to 70 percent), and as advertising-to-sales ratios increase (from one percent to five percent). Mergers and marketing power create barriers to entry for small firms—but this is not based on economies of size, which Parker concludes, "explain only a fraction of the actual concentration levels observed in the food industries."¹²⁹

This concentration continues. "Just 20 large grocery chains accounted for 37 percent of total grocery store sales in the United States in 1975," Parker concluded.¹³⁰

By 2003, only five grocery firms accounted for 49 percent of all grocery sales. Moreover, the top two grocers in the U.S. currently were Wal-Mart and Sam's Club, essentially one single firm. Neither had

sold any groceries until 1988.¹³¹ Immense growth of this nature is certainly impressive, and also offers further evidence that Parker's analysis still holds true. If economies of size in themselves were enough to explain concentration in the food industry, Wal-Mart and Sam's Club would have found no point of entry into the supermarket sector. They would have been choked off by prevailing large firms.

Parker also found that concentration affected specific cities more than others. The city of Washington, DC, he pointed out, had a level of concentration in the food marketing industries of 76 percent in 1972. This level was "higher than nearly all manufacturing industries, including many that are considered virtual monopolies."¹³²

Concurrently, food retail profits soared. "Long run profit to stockholders' equity for food retailers have averaged 50 percent higher than other retailers." From 1952 to 1971, IRS tax return data showed, "Food retailers earned an 8.9 percent average after-tax profit rate on stockholders' equity compared with 6.0 percent earned by other retailers. Food retailers' rate of return averaged about 20 percent higher than that of food manufacturers over the 20-year period."¹³³

These high rates of return existed despite efforts by food retailers to claim that margins were fiercely low. "Industry spokesmen have generated a great deal of confusion regarding the level of food chain profits by diverting attention from profits as a percentage of stockholder equity to profits as a percent of sales....The percentage referred to by these spokesmen as typical for food chains is 'a little more than 1 cent per dollar sales.' It is implied that an industry earning this low a profit rate must be highly competitive." Parker argues, however that these figures are misleading since they are pre-tax figures, and that in any case return to stockholder equity is a more meaningful measure.¹³⁴

In addition, Parker points out that national profit averages do not explain much, since "grocery retailing markets are local." Consolidated national firms could further benefit, Parker argues, since more profitable stores could shift profits to stores in less profitable areas. This created a further barrier to entry by competitors.¹³⁵

As long ago as 1976, Parker argued that the FTC should pursue policies of deconcentration in the food industry.¹³⁶ Clearly this has not occurred. More recent studies show that concentration has

only deepened. University of Missouri studies show that, among the firms buying commodities from or selling inputs to farms, markets are concentrated in amounts that range from 25 to 81 percent.¹³⁷ University of Connecticut scholars calculated that 85% of all food industries lack competitiveness.¹³⁸

Currently, the US suffers from massive imbalances of supply and demand due to the concentration of the food industry.¹³⁹ Food prices may be higher than they should be, as Parker argues, or they may have been reduced by concentration, as others argue. However, one thing is clear. Very little of the price consumers pay for food gets to farmers. The nation's farmers paid \$13 billion more in 2001 to produce food commodities than they earned from marketing their products.¹⁴⁰

A quantitative model of food market concentration was constructed by Lopez, Azzam, and Lirón-España in 2001. While this offers the opportunity to assess whether the historic trends noted in the literature above still hold, the cautions about modeling noted above still apply. Analyzing U.S. manufacturing industries over the period 1972 to 1992, this study found widespread oligopoly power in the food industry, with 84% of all food industries operating in less-than-competitive markets.¹⁴¹ This agrees closely with Heffernan's data.

In some cases, concentration of the food industry created cost efficiencies, the authors argue. However, they found, "in nearly every case the oligopoly-power effects dominate or reinforce cost inefficiencies, resulting in higher output prices." On average, food manufacturing industries exhibited no economies of size. "The few exceptions where concentration is beneficial to buyers are in the fat-and-oil sector," where economies of size were strong and product homogeneity made larger-scale production more viable.¹⁴²

Further work by Lirón-España and Lopez showed that where concentration of economic power brought down manufacturing costs (in food as well as non-food industries), the savings were garnered by corporations rather than consumers.¹⁴³

"If rising concentration leads to lower production costs and more market power, food prices rise if the market power effect dominates the cost-efficiency effect," they continued in a subsequent paper. "In this case, both farmers and consumers are worse off." Alternatively, both farmers and

consumers would benefit if concentration made processes more efficient, and if the impact of this efficiency were greater than the impact of concentrated market power. In a third scenario, both sectors suffer. "If, on the other hand, rising concentration leads to higher production costs and more market power, then food prices rise and both consumers and producers are worse off."¹⁴⁴ Tragically, it is this third scenario that is borne by the evidence.

ERS researcher J. Michael Harris compiled an overview of the food manufacturing sector in 2002 that showed that the food processing and beverage industries account for one-sixth of all U.S. manufacturing activity. About \$193 billion of economic value was added to foods by these firms in 1997. Aggregate performance of the food processing industries outpaced the rest of U.S. manufacturing in 2000. Meat packing now has the lowest average wage rate of any food industry, with beverage firms the highest.¹⁴⁵

The highest ratios of value-added to shipment value came in the bakery and beverage sectors. Lower ratios were found in the meat, dairy, and fats/oils sector.¹⁴⁶

Still, some small niches are being created. Despite massive concentration in the food processing sector, as noted above, this ERS study noted that "The number of food processing plants rose 5 percent" from 1992 to 1997, with marked growth by small firms. Over 500 salsa makers entered the market during that time, along with 800 processed food manufacturers and 232 bakery products firms, while dairy processing lost 190 plants.¹⁴⁷

The potential strength of such niche products relies more on the producer's relationships of trust. "Value-added products do not have the economies of scale as mass-produced goods and their success hinge heavily on the producer's retail strategy, especially advertising and promotion."¹⁴⁸

Hiawatha Future may find that some of these businesses with higher value-added ratios, as well as small firms addressing specific niches, will be attractive for the region.

Economies of size calculations for specific industries

Meatpacking

USDA's Economic Research Service performed an exhaustive review of the food industry in 2000, examining meat and produce processors. Although as noted above there is reason to doubt that economies of size can be calculated for an industrial sector as a whole, these findings may suggest situations that are experienced by individual firms.

In the beef and pork meatpacking industries, ERS researchers concluded that larger firms enjoyed economies of size. Yet these economies were small. "Industry's largest plants can deliver meat to buyers at costs 3-5 percent below those of plants only a quarter as big."¹⁴⁹

Plants had expanded primarily to compete with newer, low-cost entrants into the industry, the authors explained, in the context where beef consumption was declining, so competitive pressures were strong.

Most telling, the authors found that large packing plants had actually operated under *diseconomies* of scale in the 1970s. Although large firms used more advanced technology, their higher labor costs, under union contracts, offset the advantages of this machinery. Thus, at the time, the smaller plants enjoyed economies of scale. Only by reducing labor costs were the large plants to recover the economies of scale their equipment had promised.¹⁵⁰

Yet even the "economies of size" enjoyed by meatpacking firms would not satisfy the needs of a rural region that wants to build wealth among its population. This is a clear case where what is "efficient" for the firm is inefficient for the community. And, since economies of size are small anyway, there is reason to question whether concentration in the industry is at all effective for the community itself. Currently, mid-sized plants offer the highest pay for both meatpacking and poultry workers, ERS found.¹⁵¹

The authors also found that any economies of size enjoyed by the larger firms disappeared unless they were able to garner a constant supply of animals at a level that allowed them to work at full capacity. Without this reliable stream of animals, they lost their competitive edge.¹⁵² This has interesting implications for communities—which may wish to reject standardized products and

inputs, as a way to foster the growth of smaller firms that offer greater employment and a higher level of local ownership.

Significantly, the primary source of beef cattle for the largest processors were small operations. Eighty-nine percent of the 19,395 farms selling to the large plants were small farmer-feedlots with less than 1,000 head.¹⁵³ Of course, some of the larger firms in the remaining 11% are very large indeed, and ship impressive quantities to select processors.

Also of concern is the ERS finding that "as many as 25 percent of the workers at meatpacking plants in Iowa and Nebraska were illegal aliens."¹⁵⁴ Without denying the contributions illegal aliens make to the national economy, by filling jobs that have become less desirable to longer-term residents, this further raises questions about what is efficient for whom. Further, it suggests that food security efforts may need to address normalizing rights for meat workers.

It should also be remembered by a region pursuing sustainability that "meatpacking has had the highest rate of occupational illnesses and injuries of all U.S. industries. During the late 1980s [just as union contracts were being dismantled] on-the-job injury and illness in meatpacking rose to a peak in 1991 of 45.5 for every 100 workers." Although worker safety has improved since then, one of every three packers were injured or sickened on the job in 1996.¹⁵⁵

Of interest to Hiawatha Fund in considering investment opportunities, ERS found that the largest processing plants usually slaughter and pack steers and heifers, while cows and bulls are shipped to smaller firms. In the pork industry, ERS found that most hogs were purchased from within 150 miles of the farm where they were raised.¹⁵⁶

Poultry processing

A similar team of ERS researchers found dramatically different conditions in the poultry industry. Not only were there substantial economies of size, there was "no evidence" that these economic advantages diminished as processing firms get larger. Consumer prices have dropped steadily for 20 years, the authors reported, as these efficiencies took hold.¹⁵⁷

They found "no apparent limit" to the size of poultry processing plants. Or rather, the limit they envisioned would be the concentration of waste products that might be released from a larger processing plant. Such externalities, of course, are not adequately reflected in product prices.¹⁵⁸

This is especially true, ERS found, the more chicken and turkey processors offer a mix of products. By selling specialized trays of with a single part of the animal, and related value-added products, processors could enjoy great economies of scope.¹⁵⁹

Despite these large economies (or perhaps because they attract large-scale investors) a large number of new firms still enter the poultry industry. "The number of firm entrants was at least equal to the number of existing firm expansions in all Census years except 1997, suggesting a very fluid industry in which new firms continue to enter."¹⁶⁰

This, of course, also suggests to the Hiawatha Fund that new small-scale opportunities, especially those that make productive use of waste products, may be worth exploring.

Produce

Economic Research Service also surveyed the nation's produce industry, finding strong forces working to consolidate the industry at both the wholesaling and retailing level. More produce is sold through national brand names, and retail stores are carrying twice the number of fresh produce items they carried than a decade ago.¹⁶¹

Many of these changes are fueled by new technologies that allow atmosphere-controlled cargo, and remote monitoring systems that promote longer shelf life. Further, consumers more than doubled their purchases of fresh fruit and vegetables between 1987 and 1997, and produce sections are increasingly becoming important profit centers in supermarkets.¹⁶²

This ERS study did not analyze of economies of size, but did note one shift in the industry that has implications for Hiawatha Fund. The amount of produce sold directly under contract to the emerging big-box food retailers is increasing fast. In 1993, they found one-third of all produce was produced under contract.¹⁶³

Dairy processing

The dairy industry has undergone intense concentration, not entirely due to economies of size.

Nationally, there were 2,374 dairy cooperatives by 1940, supplying half of the national dairy market.

By 2000, there were only 213 dairy cooperatives, holding 89 percent of the market.¹⁶⁴

It is interesting to note that the dairy industry in Wisconsin was formed as a regional industry cluster by farmers in the early 20th Century after the state's early farm markets collapsed.¹⁶⁵ By 1917 there were 835 creameries in the state, nearly half of them farmer cooperatives. An additional 1,929 cheese factories also operated in Wisconsin at the time.¹⁶⁶

For many years the perishability of dairy products limited the range of transportation, and with local cooperatives dominating regional markets, no national markets for dairy products existed.

"Cooperatives competed well when the dairy sector was organized locally or even by region, and when the capital requirements were relatively small and could be met by farmers in a community."¹⁶⁷

ERS researchers found that traditional integrated dairy producers like these withered in the 1960s and 1970s, apparently not due to economies of size, but because "institutional investors favored conglomerates and companies that diversified into a variety of product lines." Of the top seven dairy firms in 1975, "five were or became conglomerates." Yet the ERS also found that "Conglomerates eventually fell out of favor. They were a profitable means of buying and selling businesses but were exceedingly difficult to run profitably."¹⁶⁸

Despite these investment trends, by 1976, researchers were finding considerable economies of size. One study found that the most efficient size for cheese and butter plants in the South required volumes of from 10-30 million pounds of raw milk per month. This size plant was among the largest of the plant sizes in the study, holding enough capacity to provide one to four million people with their annual demand for cheese and butter. Combining milk bottling with processing of other dairy products was desirable, the authors added, since demand for milk itself was somewhat variable. Yet the study also pointed out that at the time it was written, the southern states did not have adequate milk production to supply this level of processing, and that this research did not cover efficiencies of distribution and marketing. Of course, without a steady supply, larger plants would not realize their potential efficiencies.¹⁶⁹

Twenty years later the U.S. International Trade Commission found that the number of fluid milk plants in the U.S. had dropped from 774 to 478 between 1985 and 1995. Average production per plant had risen from 71 million to 122 million pounds per year.¹⁷⁰ The higher figure is, of course, right at the 10 million pounds per month level—the low range of what had been determined to be the most efficient size in 1976.

Recent years have resulted in even further concentration, but primarily due to concentration in the retail market, not due to new efficiencies. National retailers have begun to assemble so much clout they are able to dictate terms to producers. Increasingly, retailers are selling dairy products branded to their store name. This means "food manufacturers become more focused on serving the interests of food retailers rather than the interests of farmers."¹⁷¹

The food giant Wal-Mart wants to buy each of its products from one or two suppliers nationally, placing great pressure on manufacturers to get large.¹⁷² This pressure has been so intense that even European stores are consolidating to fend off competition from Wal-Mart.¹⁷³ In the meantime, European dairy manufacturers are carving out an increasingly larger share of the U.S. dairy products market—primarily driven by American consumer demand for ice cream.¹⁷⁴

Today, the ERS says, "Wall Street investors favor companies that produce or market high-margin branded products and those that specialize in "core competencies," a fairly narrow set of products per firm."¹⁷⁵ Dairy imports are more than twice the level of dairy exports.¹⁷⁶

Yet, as discouraging as this news is to the region, research also shows some glimmers of hope. University of Missouri researchers concluded an exhaustive survey of recent industry trends by stating "that in the long-term such trends as the horizontal and vertical integration in the global food system are probably not sustainable." Further, they found that food retailers' success in achieving mergers is not reflected in stockholder share prices.¹⁷⁷ ERS found that one-third of the national dairy market is still supplied by smaller firms, and that the market share of the largest private firms is barely increasing, even while cooperatives are buying out the small.¹⁷⁸

Respected dairy analyst Robert Cropp added that "not all dairy cooperatives are becoming larger." Between 1992 and 2000, he stated, 26 "smaller dairy cooperatives were formed." Many of these

address niche markets for "rBST free," "organic" or "high quality" milk. "Most commonly the product made is specialty cheese, but others have engaged in butter, soft manufactured products, and fluid milk products."¹⁷⁹

Grocery warehouses

In general, grocery warehouses that become more mechanized realize greater cost savings, argued Grinnell, Crawford and Feaster in 1977. However, their research also found that at certain levels of package volume, manual labor was more efficient. The main barrier to adopting more mechanized technologies, the authors argued, was lack of access to capital.¹⁸⁰

Electricity

Economies of size may favor small, dispersed plants more than is commonly believed. In 1977, Amory Lovins noted that the cost of transmitting electricity was more than twice the cost of producing it.¹⁸¹ Relative costs are likely to have changed since this time, but Lovins' conclusion still makes sense for the long term: reducing the distance between energy production and its use will reduce both inefficiencies and costs.

Lovins adds that there is no "most appropriate" size for energy production. The key, he argues, is to tailor the production to its final use. Thus, where a factory is large it makes sense to produce nearby the amount of electricity that factory will consume, and to ramp up production as the factory expands. In an area where there is no large-scale user, smaller dispersed electricity generators can be tailored to local demand.¹⁸² Similarly, there may be ways where small firms may be able to build complementary uses. On a dairy farm, he explains, waste heat from the bulk tank could be used to help heat the fermentation process for ethanol production, creating cost savings for both operations.¹⁸³

Further, he lists several additional diseconomies of size. Large plants require long lead times for planning and construction, making it hard to predict ultimate costs, delaying the response to specific increments of new demand. The complexity of the planning process makes it prone to slowdowns. Once a large plant is built, its potential downtime is longer since its systems are more complex. Costs of operating may be higher since higher technical skills are required, and the capital costs of

carrying replacement parts increases with size. Environmental costs may similarly be higher with a larger plant.¹⁸⁴

More recently, *The Economist* underscored Lovins' analysis, reporting that "even the gurus at Electric Power Research Institute (EPRI), which relies on funding from utilities that run big power plants, agree that moving to a distributed model, in conjunction with a smarter grid, will reduce blackouts." This smarter grid, the magazine continued, will become a "digital network capable of handling multi-directional flows of power."¹⁸⁵

What economies of size have been identified in rural services?

Rural schools

Of course, rural communities are more than simply businesses. Rural services also seem to find benefit in smaller scale. For example, there also appears to be a limit to the size of rural schools. One study tracked student achievement and school district spending in the state of Oklahoma for the 1994-1995 school year. Urban schools were included. Researchers Jacques, Brorsen and Richter concluded that school districts could achieve economies of scale up to an average daily membership (ADM) of 965 students. After that point, "as school districts become larger, test scores decline." Further, the authors argued that the reason larger schools became less effective was that costs were diverted from instruction to administration. "School districts which spend more on instruction and less on administration have students that perform better on achievement tests."¹⁸⁶

The main predictors of high test results were not the amount of money spent on instruction, but rather, a higher percentage of parents holding bachelors degrees, and a lower percentage of poor or minority students.

A national review of school success by the Rural School and Community Trust and the Knowledge Works Foundation concluded "that small schools [are] better places in which to educate children." Moreover, the authors continued, "Large schools themselves actually create significant diseconomies." These diseconomies of size became more clear when school costs were weighed against the number of students who actually graduate, rather than the number of students who attend the school. Large schools are more likely to generate dropouts, who are in turn more likely to suffer social ills or incarceration, all of which cost more than effective education on the front end. Administrative costs in larger schools are often actually higher than for small schools.¹⁸⁷

Similarly, a University of Minnesota study showed how rural, suburban and urban schools "have used small size or shared facilities (or both) to dramatically improve achievement, attendance and behavior, while developing stronger community support and involvement in the schools."¹⁸⁸

Other rural services

While data are sketchy, similar findings emerge in studies of other rural services. “Significant scale economies were not detected for any of the major operating costs” associated with nursing homes, Yu and Bradford found.¹⁸⁹

Larger institutions, often outside of the rural community itself, also impact farmers. Agricultural colleges, themselves, have been studied to consider their economies of size. Results are inconclusive. Depending on the model chosen, both economies of size and no economies of size could be found, concluded Nefstad and Gillard, in a study of agricultural teaching colleges.¹⁹⁰

This echoed the lessons of prior research cited by the authors. One “study of twenty-one large universities indicates the greatest cost efficiency is achieved by institutions that have 30,000 full year equivalent students and \$80-100 million in grants.” Yet, “other studies found no evidence of economies of scale at twenty-five major public research universities.”¹⁹¹

Conclusion

While many industries are yet to be analyzed, it is impressive how many studies have found that economies of size are either overstated, or not present. Small farms attain most of the economies of size that accrue to larger farms. Small towns can support multiple small businesses. Food manufacturing and distribution have become concentrated for reasons other than efficiency. Many small-scale services are economic. Even where large firms appear dominant, new firms are entering, and may have an advantage by clustering with other firms in the region.

More research would be advised, to explore economies of size for rural industries, to learn how industry clusters have been formed in other countries, and to learn how social networks in a region such as ours might work to strengthen small firms.

In the meantime, however, this evidence strongly suggests that Southeast Minnesota has every reason to explore the creation of economic and social networks that will keep food production and distribution in the hands of smaller local firms. Cornelia Flora calls these “flexible networks.”¹⁹² Built on social trust, regional networks should allow a local region to both create local efficiencies,

and to disperse the benefits of those efficiencies to a broad share of the local population, cycling more money through the region's communities.

Flora, *et al.*, cite social capital expert Robert Putnam's research in Northern Italy, which showed that building trust among stakeholders was the essential foundation for prosperity. "These communities did not become *civic* simply because they were rich. The historical record strongly suggests precisely the opposite: they have become rich because they were civic."¹⁹³

Flora, *et al.*, further argue that effective community networks are diverse, allowing several paths for connections to be made among diverse citizens. They identify four characteristics that distinguish effective local networks: they accept controversy and healthy discussion of alternative solutions. They depersonalize political choices. Focusing on process rather than only on outcomes, they consider their boundaries permeable rather than closed.¹⁹⁴

Effective regions, they continue, tend to feature an unbiased newspaper, a variety of types of investment into community projects by financial institutions, multiple linkages to other communities, and formal mechanisms for civic input into local government budget processes.¹⁹⁵

A long-term approach will not focus on individual firms, but upon the value created by supportive networks. This path will emphasize *retaining options* for local residents, and will ensure *flexibility* in the face of changing conditions. The backbone of this effort is likely to be the small firms of less than 20 employees that currently serve as the core of the region's economy.

Endnotes

- ¹ Meter, Ken (2004a). "Economics of Size Considerations for Hiawatha Fund." Crossroads Resource Center.
- ² Madden, J. Patrick (1967). *Economies of Size in Farming: Theory, Analytical Procedures and a Review of Selected Studies*. USDA: Economic Research Service, 1.
- ³ Madden (1967), ii.
- ⁴ Madden (1967), ii.
- ⁵ Madden (1967), ii.
- ⁶ Madden (1967), ii.
- ⁷ Madden (1967), ii.
- ⁸ Madden (1967), iii.
- ⁹ Madden (1967), iii.
- ¹⁰ Madden (1967), iii.
- ¹¹ Madden (1967), iii.
- ¹² Madden (1967), 7.
- ¹³ Madden (1967), 8.
- ¹⁴ Madden (1967), 9.
- ¹⁵ Madden (1967), 10.
- ¹⁶ Madden (1967), 10.
- ¹⁷ Madden (1967), 8, 10.
- ¹⁸ Madden (1967), 10. Citation is to Whitin, T. M; & M. H. Peston (1954). "Random Variations, Risk and Returns to Scale." *Quarterly Journal of Economics* 68(4):603-612.
- ¹⁹ Madden (1967), 13.
- ²⁰ Madden (1967), 25.
- ²¹ Madden (1967), 21, 23.
- ²² Raup, Philip M. (1972). "Needed Research into the Effects of Large Scale Farm and Business Firms on Rural America." University of Minnesota Department of Applied Economics Staff Paper 72-15, May, 10. This paper is the transcript of a statement made by Professor Raup before the Senate Subcommittee on Monopoly, of the Senate Small Business Committee, March 1.
- ²³ Raup (1972), 7-8.
- ²⁴ Miller, Thomas A. (1979). "Economies of Size and Other Growth Incentives." In USDA Economics, Statistics and Cooperatives Service (1979). *Structure Issues of American Agriculture*. Agricultural Economic Report 438, 114. Also cites Congressional Budget Office, U.S. Congress (1978). *Public Policy and the Changing Structure of American Agriculture*. September, 31.
- ²⁵ Miller, (1979), 110-111.

- ²⁶ Miller, (1979), 111. Citing Martin, W. E. (1978). "Economies of Size and the 160-acre Limitation: Fact and Fantasy." *American Journal of Agricultural Economics*, Vol. 60, No. 5, December, 921-928.
- ²⁷ Miller, (1979), 113. It should be noted that as the salad market has gone to mixed greens rather than iceberg or romaine lettuce, costs of various alternatives are likely to have changed. Many small growers quite successfully compete in mixed greens.
- ²⁸ Miller, (1979), 112.
- ²⁹ Harrington, David (1984). "Purposes and Uses of Economies of Size Studies," in Ames: Center for Agricultural and Rural Development, *Economies of Size Studies: A collection of papers presented August 3-4, 1983 at Purdue University, West Lafayette, Indiana*. February, 2.
- ³⁰ Harrington (1984), 15. Citation is to Jensen, Harald; T.C. Hatch; and D. H. Harrington (1981). *Economic Well-Being of Farms: Third Annual Report to the Congress on the Status of Family Farms*. AER-469. USDA, ERS, July.
- ³¹ Harrington (1984), 16. Citation is to Davenport, Charles; M. D. Boehlje; and D. B. H. Martin (1892). *The Effects of Tax Policy on American Agriculture*. AER-480. USDA, ERS, February.
- ³² Heady, Earl (1984). "Discussion of Purposes and Uses of Economies of Size Studies," in Ames: Center for Agricultural and Rural Development, *Economies of Size Studies: A collection of papers presented August 3-4, 1983 at Purdue University, West Lafayette, Indiana*. February, 24.
- ³³ Heady (1984), 26.
- ³⁴ Miller, Thomas A. (1984). "Conceptual Issues in Economies of Size Studies: How Assumptions Drive Away Research," in Ames: Center for Agricultural and Rural Development, *Economies of Size Studies: A collection of papers presented August 3-4, 1983 at Purdue University, West Lafayette, Indiana*. February, 32.
- ³⁵ Miller (1984), 34.
- ³⁶ Miller (1984), 50.
- ³⁷ Madden, J. Patrick (1984). "Discussion: What to Do With Those Empty Boxes," in Ames: Center for Agricultural and Rural Development, *Economies of Size Studies: A collection of papers presented August 3-4, 1983 at Purdue University, West Lafayette, Indiana*. February, 105.
- ³⁸ National Farmers Union—Canada (2003). "The Farm Crisis, Bigger Farms, and the Myths of 'Competition' and 'Efficiency.'" Saskatoon, November 20, 12, 22.
- ³⁹ Bureau of Economic Analysis, Regional Economy Income Studies, farm income data. Available at www.bea.gov.us/reis; viewed July 22, 2004; and Economic Research Service farm productivity data, viewed at www.ers.usda.gov.us, viewed July 16, 2004.
- ⁴⁰ Boehlje, Michael (1984). "Economies of Size—Some Brief Observations," in Ames: Center for Agricultural and Rural Development, *Economies of Size Studies: A collection of papers presented August 3-4, 1983 at Purdue University, West Lafayette, Indiana*. February, 217.
- ⁴¹ Boehlje (1984), 217.
- ⁴² Boehlje (1984), 220.
- ⁴³ Neth, Mary (1995). *Preserving the Family Farm*. Johns Hopkins Press, 3.
- ⁴⁴ Office of Technology Assessment (1985). *Technology, Public Policy and the Changing Structure of American Agriculture*. Chapter 8 summarizes material by Cooke, Stephen C. (1985). "Size Economies and Comparative Advantage in the Production of Corn, Soybeans, Wheat, Rice and Cotton in Various Areas of the United States." Office of Technology Assessment, 163.

- ⁴⁵ OTA (1985), 164.
- ⁴⁶ Cooke, Stephen (1985). “Analysis of Size Economies and Comparative Advantage in Crop Production in Various Areas of the United States.” Appendix D of Office of Technology Assessment (1985). *Technology, Public Policy and the Changing Structure of American Agriculture*, 316.
- ⁴⁷ OTA (1985), 164.
- ⁴⁸ OTA (1985), 164.
- ⁴⁹ OTA (1985), 166.
- ⁵⁰ OTA (1985), 166.
- ⁵¹ OTA (1985), 171
- ⁵² Cooke, Stephen C & W. Burt Sundquist (1988). "Economies of Size in U.S. Crop Production." University of Minnesota Department of Applied Economics Staff Paper P88-15, June, 13.
- ⁵³ Office of Technology Assessment (1985). *Technology, Public Policy and the Changing Structure of American Agriculture*. Chapter 9: “Emerging Technologies, Public Policy, and Various Size Dairy Farms.” Page 192.
- ⁵⁴ OTA (1985), 189-202
- ⁵⁵ OTA (1985), 189-202.
- ⁵⁶ National Agriculture Statistics Service, data at <http://www.usda.gov/nass/aggraphs/cowrates.htm>.
- ⁵⁷ Hallam, Arne (1993). “Empirical Studies of Size, Structure, and Efficiency in Agriculture.” in Arne Hallam (ed.), *Size, Structure, and the Changing Face of American Agriculture*. Westview Press, 206. Cites Weimar, M. R., A. Hallam, and L. D. Trede (1988). "Economies of Size, Tax Reform and Profitability of Alternative Midwestern Feedlot Systems." *Journal of the American Society of Farm Managers and Rural Appraisers*, 52: 11-18.
- ⁵⁸ Honeyman, Mark & Liz Weber (1996). "Swine System Options for Iowa." Iowa State University: Aldo Leopold Center for Sustainable Agriculture Animal Science II [B], May, 3-4.
- ⁵⁹ Thu, Kendall; and E. Paul Durrenberger (1998). “Introduction” in Thu, Kendall M, and E. Paul Durrenberger, eds. (1998). *Pigs, Profits and Rural Communities* State University of New York Press, 8. Citations to: *Feedstuffs* (Reference Issue). (1994). *A Complete reference and resource guide for the feed industry*, vol. 66, no. 30. Miller Publishing Company; and Van Arsdall, Roy N., and Henry C. Gilliam (1979). “Pork.” *In Another Revolution in U.S. Farming?* Ed. Lyle P. Schertz, *et al.*, 190-254. USDA.
- ⁶⁰ Goldschmidt, Walter (1998). “The Urbanization of Rural America,” in Thu, Kendall M, and E. Paul Durrenberger, eds. (1998). *Pigs, Profits and Rural Communities* State University of New York Press, 188. Chart compiled by Julia K. Venzke from the *1992 Census of Agriculture* and *1990 Agriculture Statistics*.
- ⁶¹ Thu and Durrenberger (1998), 10. Citations to: Iowa Farm Business Association (1992). “Economic Costs of Hog Production by Number of Hogs Marketed.” Iowa Farm Business Association; and Mueller, Allan (1993). “Economies of size in hog production: is size related to profitability?” *Farm Economics*. 93-95. Department of Agricultural Economics, University of Illinois at Urbana-Champaign; and Madden (1967).
- ⁶² Thu and Durrenberger (1998), 10.
- ⁶³ Thu and Durrenberger (1998), 11.
- ⁶⁴ Thu and Durrenberger (1998), 11. Citation to: Harl, Neil (1990). *The farm debt crisis of the 1980s*. Iowa State University Press, 20.
- ⁶⁵ Thu and Durrenberger (1998), 11.

- ⁶⁶ Thu and Durrenberger (1998), 14. Citation to Durrenberger, E. Paul, and Kendall M. Thu (1996). "The expansion of large-scale hog farming in Iowa: the applicability of Goldschmidt's findings fifty years later." *Human Organization* 55(4): 409-415.
- ⁶⁷ DeLind, Laura B. (1998). "Parma: A Story of Hog Hotels and Local Resistance," in Thu, Kendall M, and E. Paul Durrenberger, eds. (1998). *Pigs, Profits and Rural Communities* State University of New York Press, 24-25. Citations to: Allen Consultants, Inc. (1983). *Jackson County hog production project: Final report*. Lansing, Michigan; and Willbanks, Michael (1985). Presentation to the Michigan House Agricultural Committee, 3 April, Lansing.
- ⁶⁸ Ikerd, John E. (1998). "Sustainable Agriculture, Rural Economic Development, and Large-Scale Swine Production," in Thu, Kendall M, and E. Paul Durrenberger, eds. (1998). *Pigs, Profits and Rural Communities* State University of New York Press, 163. Citations to: Chism, John W. and Richard A. Levins (1994). "Farm spending and local selling: how do they match up?" *Minnesota Agricultural Economist* 676:1-4.
- ⁶⁹ Peterson, Willis L. (1997). "Are Large Farms More Efficient?" University of Minnesota Department of Applied Economics Staff Paper P97-2, January, 12.
- ⁷⁰ Peterson (1997) 1.
- ⁷¹ Peterson (1997) 3.
- ⁷² Raup, Philip M. (1972), 2.
- ⁷³ Raup, Philip M. (1972), 3-4. Raup cites research by Bruce L. La Rose (1970). "Arvin and Dinuba Revisited: A New Look at Community Structure and the Effects of Scale of Farm Operations," an unpublished manuscript from the University of Minnesota Department of Applied Economics, March. Raup also cited 1960 Federal Census data.
- ⁷⁴ Peters, David J. (2002). "Revisiting the Goldschmidt Hypothesis: Social Indicators and Economic Structure in Rural Areas." Submitted to *Rural Sociology*. Presented to the Organization for Competitive Markets annual meeting in Kansas City, July 25, 2004.
- ⁷⁵ Raup, Philip M. (1972), 5-6.
- ⁷⁶ Neth, Mary (1995). *Preserving the Family Farm: Women, Community, and the Foundations of Agribusiness in the Midwest, 1900-1940*. Johns Hopkins, 5.
- ⁷⁷ Mafous, Edouard K. (2002). "Economies of Scope and Scale of Multi-Product U.S. Cash Grain Farms: A Flexible Fixed-Cost Quadratic (FFCQ) Model Analysis." Presented at the American Agricultural Economics Association Meeting in Long Beach, California, July 28-31.
- ⁷⁸ Hallam, Arne (1993a). "Economies of Size: Theory, Measurement, and Related Issues." In Arne Hallam (ed.), *Size, Structure, and the Changing Face of American Agriculture*. Westview Press, 150.
- ⁷⁹ Hallam, (1993a), citing W. J. Baumol, J.C. Panzer, and R. D. Willig (1982), who "contend that it is the principal entrants who can rapidly enter a market who control competition." 170.
- ⁸⁰ Hallam, (1993a), 179.
- ⁸¹ Hallam, (1993a), 179.
- ⁸² Hallam, Arne (1993b). "Empirical Studies of Size, Structure, and Efficiency in Agriculture." in Arne Hallam (ed.), *Size, Structure, and the Changing Face of American Agriculture*. Westview Press, 204.
- ⁸³ Hallam, Arne (1993b), 224.
- ⁸⁴ Hallam, Arne (1993b), 225.

- ⁸⁵ Coon, Randal C., & F. Larry Leistritz (2002). "Threshold Population Levels for Rural Retail Businesses in North Dakota, 2000." Fargo: North Dakota State University Department of Agribusiness and Applied Economics, 6.
- ⁸⁶ Miller, James P. (1990). "Survival and Growth of Independent Firms and Corporate Affiliates in Metro and Nonmetro America." USDA, Economic Research Service Rural Development Research Report Number 74, February, 1-2, 4.
- ⁸⁷ Dymski, Gary (2000). "The Bank Merger Wave and the Future of U.S. Banking." Viewed March 24, 2004 at http://www.economics.ucr.edu/people/dymski/rioba_paper.pdf.
- ⁸⁸ Dean Harrington, president of First National Bank in Plainview, personal communication, March 31, 2004.
- ⁸⁹ Harrington, Dean (2004). Personal communication, May 14.
- ⁹⁰ Stadnik, Leo (2003). Independent Community Bankers of Minnesota (ICBM) Director of Technology, in *ICBM News*, October 28.
- ⁹¹ Harrington (2004).
- ⁹² Dymski (2000), 10.
- ⁹³ Gunderson, Michael; Brent A. Guy, & Eddy L. LaDue (2003). "Profitability of Agricultural Lending Relationships." Paper presented to American Agricultural Association Annual Meeting, July 27-30, 18.
- ⁹⁴ Kim, C. S., C. Hallahan, H. Taylor, & G. Schluter (2002). "Market Power and Cost-Efficiency Effects of the Market Concentration in the U.S. Nitrogen Fertilizer Industry." USDA, ERS, 11
- ⁹⁵ Democratic staff of the Committee on Education and the Workforce (2004). "Everyday Low Wages: The Hidden Price We All Pay for Wal-Mart." U.S. House of Representatives, February 16, 4,5,7. [Cites Williams, Charles (2003). "Supermarket Sweepstakes: Traditional Grocery Chains Mull Responses to Wal-Mart's Growing Dominance." *The Post and Courier*. Charleston, SC, November 10, 16E; and Bianco, Anthony and Wendy Zellner (2003). "Is Wal-Mart Too Powerful?" *Business Week* 100, October 6; and PBS (2004). "Store Wars: When Wal-Mart Comes to Town," <http://www.pbs.org/itvs/storewars/stores3.html>, February 2.]
- ⁹⁶ Democratic staff (2004), 6.
- ⁹⁷ Olsson, Karen (2003). "Up Against Wal-Mart." *Mother Jones* 54, March-April. Cites AFL-CIO (2003). "An Example of Why Workers Remain Uninsured and Underinsured." October, 1.
- ⁹⁸ Mattered, Philip, & Anna Purinton (2004). "Shopping for Subsidies: How Wal-Mart Uses Taxpayer Money to Finance its Never-Ending Growth." *Good Jobs First*, May 24. Available at www.goodjobsfirst.org, viewed August 9, 2004.
- ⁹⁹ Democratic staff (2004), 6. Cites Greenhouse, Steven (2004). "In-House Audit Says Wal-Mart Violated Labor Laws," *New York Times*, January 13, 16A.
- ¹⁰⁰ *The Economist* (2004a). "How Big Can it Grow?" April 17-23, 69.
- ¹⁰¹ *The Economist* (2004b), "Learning to Love Wal-Mart." April 17-23, 10.
- ¹⁰² *The Economist* (2004b), 9. Citing Rodino and Associates (2003). "Final Report on Research for Big Box Retail/Superstore Ordinance." Prepared for Industrial and Commercial Development Division, Los Angeles Community Development Department. October 28, 18-20.
- ¹⁰³ *The Economist* (2004a), 68.
- ¹⁰⁴ Gladwell, Malcom (2004). "The Terrazzo Jungle." *The New Yorker*, March 15, 125-126.

- ¹⁰⁵ Ziegenhorn, Randy (1998). "An Alternative Model: Swine Producer Networks in Iowa," in Thu, Kendall M, and E. Paul Durrenberger, eds. (1998). *Pigs, Profits and Rural Communities* State University of New York Press, 182.
- ¹⁰⁶ Wilson, Paul N. (2000). "Social Capital, Trust and the Agribusiness of Economics." *Journal of Western Resource Economics* 25:1, 1.
- ¹⁰⁷ Wilson, Paul N. (2000), 2. Wilson cites Coase, Ronald H (1937). "The Nature of the Firm." *Economica* 4, 41-42.
- ¹⁰⁸ Wilson, Paul N. (2000), 2. Wilson cites Arrow, Kenneth (1972). "Gifts and Exchanges." *Philosophy and Public Affairs I*, 357.
- ¹⁰⁹ Wilson, Paul N. (2000), 2. Wilson cites Kreps, David (1990). "Corporate Culture and Economic Theory." In *Perspectives on Positive Political Economy*, Alt, J. E. & K. A. Shepsle, eds. London:Cambridge University Press, 94-95.
- ¹¹⁰ Greider, Bill (2003). *The Soul of Capitalism: Opening Paths to a Moral Economy*. Simon & Schuster, 91.
- ¹¹¹ Shuman, Michael (2000). *Going Local: Creating Self-Reliant Communities in a Global Age*. Routledge, 81. Cites Harrison, Bennett (1994). *Lean and Mean*. Basic Books, 220.
- ¹¹² Huron Business Development Corporation (2004). "Best Practices in Rural and Small Town Economic Development." Municipal Economic Development Readiness Initiative—Huron County, Ontario, January, 15. [Cites: Goetz, S. J. & A. Rupasingha (2002). "High Tech Firm Clustering: Implications for Rural Areas." *American Journal of Agricultural Economics* 84:5.]
- ¹¹³ Bureau of Economic Analysis, Regional Economic Indicators Series, data for the U.S. from 1969 to 2001, adjusted for inflation. Available at <http://www.bea.doc.gov/bea/regional/reis>, viewed on March 1, 2004. Analysis by Ken Meter, Crossroads Resource Center.
- ¹¹⁴ Parker (1976), 2. [FIRST CITATION???
- ¹¹⁵ Parker (1976), 2.
- ¹¹⁶ Parker (1976), 3.
- ¹¹⁷ Parker (1976), 4.
- ¹¹⁸ Parker (1976), 5 fn.
- ¹¹⁹ Parker (1976), 7.
- ¹²⁰ Parker (1976), 8.
- ¹²¹ Parker (1976), 10.
- ¹²² Parker (1976), 13.
- ¹²³ Parker (1976), 14.
- ¹²⁴ Parker (1976), 16, citing National Commission on Food Marketing (1966). *The Structure of Food Manufacturing*. Federal Trade Commission staff report published by NCFM as Technical Study Number 8, 25, 66, and 221.
- ¹²⁵ Parker (1976), 17, citing National Commission on Food Marketing (1966). *The Structure of Food Manufacturing*. Federal Trade Commission staff report published by NCFM as Technical Study Number 8, 120.
- ¹²⁶ Parker (1976), 20, citing Worley, James S. (1961). "Industrial Research and the New Competition." *The Journal of Political Economy*, April, no page number given.

- ¹²⁷ Parker (1976), 20.
- ¹²⁸ Parker (1976), 21.
- ¹²⁹ Parker (1976), 29, 14.
- ¹³⁰ Parker (1976), 30.
- ¹³¹ Smith, Rod (2004). "Five retailers strengthen control over upstream processors, producers." *Feedstuffs*, July 5, 5.
- ¹³² Parker (1976), 35.
- ¹³³ Parker (1976), 44.
- ¹³⁴ Parker (1976), 44-46.
- ¹³⁵ Parker (1976), 40, 46-47.
- ¹³⁶ Parker (1976), 50.
- ¹³⁷ Heffernan, William & Mary Hendrickson (2002). "Concentration in Agricultural Markets." National Farmers Union. Available from the Agribusiness Accountability Initiative at http://www.agribusinessaccountability.org/pdfs/48_Concentration%20in%20Agricultural%20Markets.pdf, viewed April 26, 2004.
- ¹³⁸ Lopez, Rigoberto A.; Azzedine M Azzam; and Carmen Lirón-España (2002). "Market Power and Efficiency: A Structural Approach." *Review of Industrial Organization* 20:115-126.
- ¹³⁹ Meter, Ken (2003). "Food with the Farmers Face on It." Media Guide published by W. K. Kellogg Foundation. Available at <http://www.wkkfweb.org/FSRDFullGuide.pdf>.
- ¹⁴⁰ Bureau of Economic Analysis, Regional Economic Indicators Series, data for the U.S. from 1969 to 2001, adjusted for inflation. Available at <http://www.bea.doc.gov/bea/regional/reis>, viewed on March 1, 2004. Analysis by Ken Meter, Crossroads Resource Center.
- ¹⁴¹ Lopez, Rigoberto A.; Azzedine M Azzam; and Carmen Lirón-España (2001). "Market Power and/or Efficiency: An Application to U.S. Food Processing." University of Connecticut Department of Agricultural and Resource Economics Food Marketing Policy Center, Research Report Number 60, July, 4.
- ¹⁴² Lopez, Azzam & Lirón-España (2001), 1.
- ¹⁴³ Lirón-España, Carmen & Rigoberto A. Lopez (2001). "When is Concentration Beneficial?" University of Connecticut Department of Agricultural and Resource Economics Food Marketing Policy Center, Research Report Number 62, July, 4.
- ¹⁴⁴ Lopez, Rigoberto, Azzedine M Azzam & Carmen Lirón-España (2002). "Market Power and/or Efficiency: A Structural Approach." *Review of Industrial Organization* 20(2): 115-126.
- ¹⁴⁵ Harris, J. Michael (2002). "Food Manufacturing." U.S. Food Marketing System, 2002. Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 811, 3, 5.
- ¹⁴⁶ Harris (2002), 3.
- ¹⁴⁷ Harris (2002), 4.
- ¹⁴⁸ Huron Business Development Corporation (2004). "Best Practices in Rural and Small Town Economic Development." Municipal Economic Development Readiness Initiative—Huron County, Ontario, January, 27.

- ¹⁴⁹ MacDonald, James M; Michael Ollinger, Kenneth E. Nelson and Charles R. Handy (2000). "Consolidation in Meat Packing." Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 785, p. iii.
- ¹⁵⁰ MacDonald, et al (2000), i.
- ¹⁵¹ MacDonald, et al (2000), 16.
- ¹⁵² MacDonald, et al (2000), 6.
- ¹⁵³ MacDonald, et al (2000), 5.
- ¹⁵⁴ MacDonald, et al (2000), 15. Citing U. S. General Accounting Office (1998). *Changes in Nebraska's and Iowa' Counties with Large Meatpacking Workforces*. GAO/RCED-98-62. February.
- ¹⁵⁵ MacDonald, et al (2000), 15. Citing Bureau of Labor Studies data.
- ¹⁵⁶ MacDonald, et al (2000), 5.
- ¹⁵⁷ Ollinger , Michael; James M. MacDonald, and Milton Madison (2000). "Structural Changes in U. S. Chicken and Turkey Slaughter." Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 787, p. i., iii.
- ¹⁵⁸ Ollinger , et al (2000), 32, 1.
- ¹⁵⁹ Ollinger , et al (2000), p. iii..
- ¹⁶⁰ Ollinger , et al (2000), 8.
- ¹⁶¹ Kaufman, Phil R; Charles R. Handy, Edward W. McLaughlin, Kristen Park and Geoffrey M. Green (2000). "Understanding the Dynamics of Produce Markets: Consumption and Consolidation Grow." Food and Rural Economics Division, Economics Research Service, U.S. Department of Agriculture. Agriculture Information Bulletin No. 758, p. iv.
- ¹⁶² Kaufman, et al (2000), p. iv, 15. Health professionals also note that only 12 percent of the U.S. public is currently eating the recommended five servings of fresh fruit and vegetables per day, so there would appear to be rising opportunity in this market.
- ¹⁶³ Kaufman, et al (2000), 1.
- ¹⁶⁴ Cropp, Robert A. (2002). "Dairy Cooperatives: Structural Change and Operations." University of Wisconsin Center for Cooperatives: University of Wisconsin—Extension Bulletin No. 4, October, 1.
- ¹⁶⁵ Neth, Mary (1995). *Preserving the Family Farm: Women, Community, and the Foundations of Agribusiness in the Midwest, 1900-1940*. Johns Hopkins.
- ¹⁶⁶ Lawless, Greg (2002). "The History of Cooperatives in Wisconsin." University of Wisconsin Center for Cooperatives: University of Wisconsin—Extension Bulletin No. 2, August, 2.
- ¹⁶⁷ Hendrickson, Mary, William Heffernan, Philip H. Howard & Judith B. Heffernan (2001). "Consolidation in Food Retailing and Dairy: Implications for Farmers in a Global Food System. Columbia: University of Missouri Department of Rural Sociology, January 8, i, 14.
- ¹⁶⁸ Blayney, Don P. & Alden C. Manchester (2000). "Large Companies Active in Changing Dairy Industry." *FoodReview* 23:2, May-August, 8.
- ¹⁶⁹ Conner, M. C; W. T. Boehm, & T. A. Pardue (1976). "Economies of Size in Processing Manufactured Dairy Products and Implications for the Southern Dairy Industry." *Southern Journal of Agricultural Economics*, December, 103.

- ¹⁷⁰ U.S. International Trade Commission (1998). *Industry and Trade Summary: Dairy Products*. USITC Publication 3080, January, B-3.
- ¹⁷¹ Hendrickson, *et al.*, 5, 12.
- ¹⁷² Cropp, 3.
- ¹⁷³ Hendrickson, *et al.*, 5.
- ¹⁷⁴ Blayney & Manchester, 12.
- ¹⁷⁵ Blayney & Manchester, 8.
- ¹⁷⁶ Hendrickson, *et al.*, 16.
- ¹⁷⁷ Hendrickson, *et al.*, 15, 16.
- ¹⁷⁸ Blayney & Manchester, 9.
- ¹⁷⁹ Cropp, 3.
- ¹⁸⁰ Grinnell, Gerald E; Terry L. Crawford, and Gerald Feaster (1977). "Economies of Size by Level of Mechanization in Dry Grocery Warehouses with Implications for Market Performance." *Journal of Food Distribution Research*, February, 106-107
- ¹⁸¹ Lovins, Amory B. (1977). *Soft Energy Paths: Toward a Durable Peace*. Cambridge, Massachusetts: Ballinger Press, 89.
- ¹⁸² Lovins, 100.
- ¹⁸³ Lovins, 90.
- ¹⁸⁴ Lovins, 94.
- ¹⁸⁵ *The Economist* (2004). "Building the Energy Internet." *The Economist Technology Quarterly*, March 13, 26.
- ¹⁸⁶ Jacques, Charles, B. Wade Brorsen, & Francisca G. C. Richter (2002). "Consolidating Rural School Districts: Potential Savings and Effects on Student Achievement." *Journal of Agricultural and Applied Economics*, 32:3 (December), 579.
- ¹⁸⁷ Kent Lawrence, Barbara (2002). *Dollars and Sense: The Cost Effectiveness of Small Schools*. Knowledge Works Foundation, 11-12. Viewed at <http://www.ecs.org/> on July 21, 2004.
- ¹⁸⁸ Nathan, Joseph and Karen Febey (2001). *Smaller, Safer, Saner Successful Schools*. University of Minnesota Hubert H. Humphrey Institute for Public Affairs, Center for School Change. Viewed at <http://www.hhh.umn.edu/centers/school-change/reform.htm> on July 21, 2004.
- ¹⁸⁹ Yu, Wei & Garnett Bradford (1995). "Rural-Urban Differences in Nursing Home Access, Quality and Cost." *Journal Agriculture and Applied Economics* 27:2, December, 446.
- ¹⁹⁰ Nefstad, Ward E. & Steve A. Gillard (2002). "Cost Relationships at Colleges of Agriculture." Paper presented for the American Applied Economics Association meeting, July 27-31, 13-14.
- ¹⁹¹ Nefstad, Ward E. & Steve A. Gillard (2002). "Cost Relationships at Colleges of Agriculture." Paper presented for the American Applied Economics Association meeting, July 27-31, 10.
- ¹⁹² Bregendahl, Corry & Cornelia Flora (2003?). "Rural Development Policy Lessons from Europe: Using Devolution to Move Beyond Agriculture." Posted at www.ruralpolicyforum.org/ruralmatters/Forum_draft_4_1.pdf, viewed August 31, 2004.
- ¹⁹³ Flora, Jan L. Jeff Sharp, Cornelia Flora & Bonnie Newlon (1997). "Entrepreneurial Social Infrastructure and Locally Initiated Economic Development in The Nonmetropolitan United States." *Sociological Quarterly*.

38:4, 625. [Cites: Putnam, Robert D. (1993). *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton University Press, 37.]

¹⁹⁴ Flora, *et al.*, 628-630.

¹⁹⁵ Flora, *et al.*, 635.