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The Challenge to Think Big as American Agriculture Shrinks

Steven C. Blank

A multi-part test is proposed for the hypothesis that American production agriculture is shrinking. The results of the three tests presented here are consistent with a shrinking American agricultural sector that is on the verge of, but not yet in, the final decline stage of its “life cycle.” The sector is clearly shrinking in relative size and importance, and in absolute size, and its economic performance has been weak for decades. These changes in agriculture and their implications for the agricultural economics profession are discussed. Finally, (at least) two challenges to American agriculture and the agricultural economics profession are raised.

Key words: comparative advantage, hypothesis test, product life cycle, production agriculture sector, profitability

Introduction

A quick scan of the topics covered in Presidential Addresses of the Western Agricultural Economics Association and the American Agricultural Economics Association during the past five years turns up two recurring issues: changes in agriculture and changes in the agricultural economics profession. For example, Antle begins, “Agriculture in the twentieth century was characterized ... by technological innovation that ... made it possible for agricultural production to grow faster than the demand for food despite a rapidly growing world population. The result was a decline in real agricultural commodity prices throughout this era...” Gardner begins, “During most of the 20th century the U.S. farm economy generated low-average incomes and a higher incidence of poverty than in the non-farm population.” Shumway states, “The AAEA lost a fourth of its membership between 1990 and 1997...,” and Armbruster outlines implications of the changes in agriculture for agricultural economists and for the AAEA. A common theme in these papers is the apparent, although reluctant, acceptance of a decline in American agriculture’s size and/or importance.

Changes discussed in the papers cited above are due to economic development and the resulting adjustments that trickle down to our profession. The scale of the changes to agriculture was significant over the past century and the rate of change is not likely to slow in this new century. The catalyst of this change has been, and will continue to be, technological innovation spurred on by economic opportunities created by changes in consumer demand (e.g., changing tastes, global demographics). In particular, the scale of economic development influences mentioned by Gardner and by Antle make it clear

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that during this new century the world will face the possibility America and some other developed nations will intentionally allow their production agriculture sectors to shrink. A shrinking agricultural sector, whether the result of intentional or accidental developments, has significant implications for the American agricultural economics profession.

Also, it is important to note that nearly all of the recent literature indicates a very different future for the American agribusiness sector. Most authors expect a prosperous future for this sector. The primary reason for the dichotomous expectations for the production versus post-farmgate sectors of American agriculture is that farmers and ranchers sell undifferentiated commodities in competitive global markets, while agribusinesses sell differentiated products and services in less perfectly competitive markets. Thus, U.S. agribusinesses are in a position to influence their profit margins and have been doing so successfully on a global scale for decades. Therefore, the story in this article does not apply to the agribusiness sector.

In this paper, I propose a test of the hypothesis that American production agriculture is shrinking. Next, I present some empirical data for a brief list of factors to illustrate how the hypothesis test can be constructed and used. After doing so, I discuss both changes in agriculture and implications for the agricultural economics profession. Finally, I raise (at least) two challenges to American agriculture and our profession.

Is American Agriculture Shrinking?

To answer the question above, it is important to first define the measurement scales to be used. The idea that a country's agricultural sector will become relatively less important over time has received much attention (Johnston and Mellor; Johnson 1973; Anderson), but it is only part of the question. In recent years, studies of the economic deterioration of local and regional agricultural sectors have discussed the possibility of failure and absolute shrinkage on those scales (Egan), but the notion that a country's *entire* production agriculture sector might shrink in absolute terms has received little attention. The methodologies used to address each of the two pieces of the question have been very different; thus it is not surprising the relative and absolute questions have never been considered together.

Anderson, for example, asks the question: Why does a country's agricultural sector decline over time in relative terms, even if the country retains a strong comparative advantage in agriculture? His approach to the problem is typical of those following Johnson (1973) in using a two-sector general equilibrium framework to show that over time agriculture's terms of trade relative to manufacturing will decline with economic growth. This model applies both to an individual country's economy, as well as to the entire world economy; therefore, agriculture's international and domestic terms of trade will decline over time. In this type of model it is easy to show Engel's Law will be sufficient to ensure agricultural prices will decline relative to manufacturing prices. Thus agriculture's share of gross domestic product (GDP) declines over time and resources begin to leave the sector. Even if factor productivity growth is biased to agriculture, income inelastic demand for agricultural output ensures agriculture's terms of trade will still decline along with its share of GDP (Anderson).

Using portfolio theory, Blank (1998a) argued it was possible, and likely, that the investment decisions of individual farmers and ranchers could, in the aggregate, lead to

absolute reductions in the size of a country's production agriculture sector. He pointed out there was evidence of this occurring in several highly developed countries.

Blank (2001a) developed a theory to show how micro-level decisions of individual producers can eventually lead them to consider diversifying out of agriculture. In particular, cropping choices are viewed as investment decisions constrained by both agronomic and personal economic factors, and these choices have significant impacts on the producer's wealth. When the decision involves only a single asset or some group of investments from which the resulting profits or losses are relatively small compared to the person's total wealth, the expected utility model suits most investors. However, when the scale of possible losses from an investment is significant, risk-averse investors have been shown to adopt "safety-first" decision rules. Safety-first criteria are compatible with the standard utility theory (Robison and Barry, p. 201; Mahul) and several forms of safety-first models have been proposed as alternatives to expected utility maximization (Roy; Telser; Hatch, Atwood, and Segar; Bigman). Therefore, risk-averse farmers and ranchers may quit producing some less-profitable commodities voluntarily. In sum, individual agricultural producers are making investment decisions to protect their personal wealth and, in the aggregate, these decisions are causing resources to leave America's agricultural sector.

From the above, it appears both relative and absolute measures of agriculture should be considered. In the following two sections, a multi-part test is developed which includes both relative and absolute measures of a country's production agriculture sector and is used to test the hypothesis that American agriculture is shrinking.

Tests of a Shrinking Production Agriculture Sector

The proposed methodology for testing the hypothesis is to ask the question in terms of various measures based in economic development and portfolio investment theory. As summarized in exhibit 1, the approach groups different measures together in three test forms. Each group of measures provides a successively stronger assessment of the question.

A weak-form test is provided by measuring a country's production agriculture sector's size in relative terms. If the sector is shrinking as a percentage of the country's economy or the world's agricultural output, it is shrinking in importance. This is only a weak test because an agricultural sector may be shrinking in importance, yet still growing in absolute scale. As will be discussed later, most developing countries are expected to have an agricultural sector that is shrinking in importance relative to the entire economy, but only highly developed countries are likely to have a shrinking percentage of world agricultural output. This is based on the different rates of growth expected for sectors of a nation's economy (Gemmell, Lloyd, and Mathew). A mature sector of a highly developed country is not expected to grow at the rate of newer sectors which still have significant potential for expansion.

An intermediate-form test shifts focus from the importance of an agricultural sector to indicators of agriculture's attractiveness as an investment. The number of farms is a weak indicator of the number of people choosing to invest their labor and/or wealth in agriculture. Thus, it indicates the attractiveness of agriculture as an investment, but it also can be viewed as a weak proxy for the degree of political power based in the farm population. However, shrinking farm numbers may be a sign of economies of scale in agricultural production, so a second measure of investment attractiveness is used. The

EXHIBIT 1.
**Methodology to Test the Hypothesis
 that American Agriculture Is Shrinking**

Weak-Form Test (agriculture is shrinking in importance, but not necessarily in size)

Relative Measures:

- ▶ As a percentage of U.S. economy?
- ▶ As a percentage of world agricultural output?

Intermediate-Form Test (investment attractiveness)

Absolute Measures of Inputs:

- ▶ In number of farms?
- ▶ In number of acres?

Relative Measure of Outputs:

- ▶ In relative profit margins?

Strong-Form Test (economic outputs)

Absolute Measures of Outputs:

- ▶ In total profits?
- ▶ In total sales revenues?

number of acres of land in agriculture is a stronger measure of attractiveness as an investment. Land is the least flexible of resources, so its allocation serves as a slow-moving, long-run indicator of agriculture's attractiveness versus alternative uses. Finally, profit margins from agriculture relative to other investments will indicate whether there is incentive for agriculture to expand or shrink. When agricultural profit margins are low relative to alternate investments, farmers begin to shift out of agriculture. Consequently, relative profit margins influence total profit amounts, which is part of a strong-form test.

A strong-form test focuses on the absolute size of the sector's economic outputs: total profits and total sales revenues.¹ The "product life-cycle" model (Lilien and Kotler, pp. 608–13) demonstrates that profits lead revenues late in the life of a product. The model, developed to explain the pattern of development and eventual decline of an individual product over time, can be modified to explain the expected cycles in the life of an entire industry or economic sector. The underlying cause of the cycles is comparative advantage.

The product life-cycle model shows that sales and profit totals increase during the "introduction" and "growth" stages of the life cycle. This is due to the firm or industry developing, and then exploiting, its comparative advantage in the production of the product. Early in the "maturity" stage, profits level off and sales continue to increase. This is due to the costs of increased competition in the product market either as new firms develop their comparative advantage in the product or as the existing firms experience

¹ Economic outputs, rather than tangible outputs, are relevant to managers and investors. The fact that the USDA's index of aggregate output has risen most years does not help decision makers in their tasks. Aggregate agricultural output is a productivity factor, not an economic factor. Productivity factors affect costs per unit of output, but economic outputs such as profits and sales revenues are decision factors. Sales revenues measure how the market values aggregate output, and profits measure how well the firm or industry is performing in increasing owners' wealth. In commodity markets where demand can be inelastic, increasing aggregate output is not always a positive result, and thus is not a strong indicator of economic performance.

changes in their comparative advantages. Then, profit totals for a particular firm or industry gradually decrease with sales peaking and then beginning to decrease. In the “decline” stage, profit totals continue to shrink but remain positive, causing firms to withdraw from the market and resulting in a rapid decrease in total sales. At some point in the “decline” stage, all firms exit the market in favor of more profitable alternatives created by changes in comparative advantage. Thus, relative profit margins influence total profit amounts and when the latter starts its final decline, it will signal that total revenues are going to follow.

For American agriculture, total sales revenue is an important indicator of the race between falling prices and rising yields. The final indicator of agriculture’s demise will be signaled when profit and revenues turn down for good.

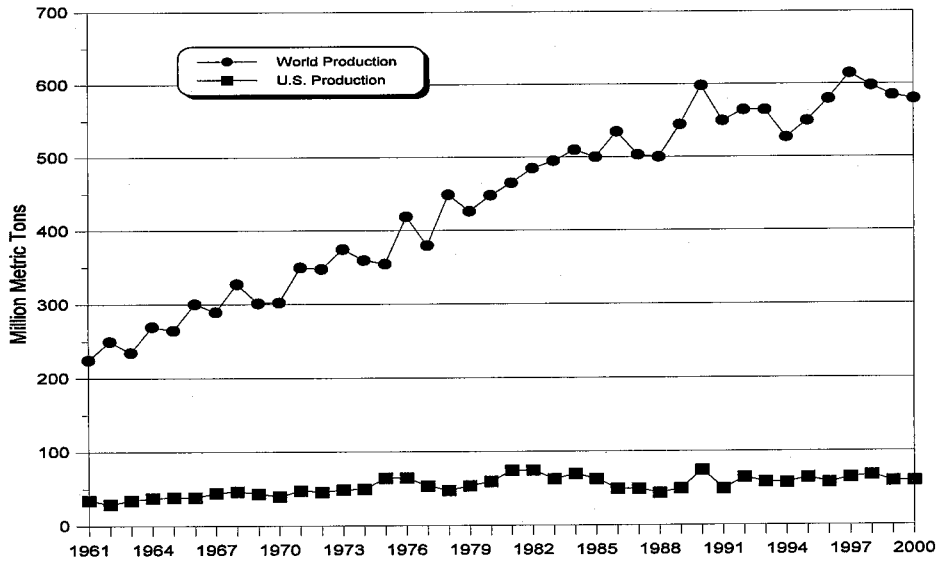
The tests described by exhibit 1 can be modified for use at the state or local level to evaluate the size and importance of agriculture. In the cases of many commodities or countries, the answers to the questions will be evident first at local and regional levels before national trends become apparent. Also, the tests can be expanded through the inclusion of additional factors for measuring the importance and absolute size of the national or local agricultural sector. Below, the tests are applied to some sample data from the American agricultural sector to initiate the debate.

Weak-Form Test

Is American agriculture shrinking as measured by its percentage share of the U.S. economy? Yes, the U.S. economy is developing, resulting in other sectors becoming bigger, causing agriculture to represent a smaller percentage of the growing total. U.S. data indicate about 8% of GDP came from farms in 1947 versus only 1.1% coming from farms in 1997 (Lum and Yuskavage), even though total agricultural sales revenues continued to increase in nominal terms during that period. As Bardhan and Udry note, this result is expected because “... historically, the share of agriculture in national income usually declines with economic growth” (p. 205).

Is American agriculture shrinking as a percentage of the world’s agricultural output? In general, the answer is “yes,” but the response varies when assessing each commodity separately. For example, as seen from figure 1, over the past 40 years the United States has nearly doubled its wheat output, but its share of world production has fallen dramatically. Obviously, other countries are expanding their agricultural output—making the United States a less important player. The situation is similar in other commodity markets. Over the past 40 years U.S. production of soybeans has increased about 400%, but our share of world production has decreased from about 75% to just under 50%. America has done better in some markets, such as corn. In total, however, the growth of commodity production in other countries continues to give us a smaller market share.

Thus, the data support a weak-form test result that American agriculture is shrinking, at least in terms of importance. This result should not be surprising to anyone familiar with the process of economic development. To continue the test, next we turn to an intermediate form which combines factors from economic development and investment theory. We begin with two absolute measures of inputs: number of farms and number of acres in production (exhibit 1).



Source: Food and Agriculture Organization of the United Nations.

Figure 1. U.S. and world wheat production

Intermediate-Form Test

Yes, American agriculture is shrinking in terms of its number of farms. America reached its peak of 6.3 million farms in 1935, and has had fewer commercial farms each year since. Translating farm numbers into farm population reveals America is following a typical downward trend.²

According to estimates by the United Nations, 65% of the world's population was engaged in food production in 1950, and less than 30% of the population will be in agriculture in the year 2025. This dramatic shift in human resource allocation is made possible by technological advances in agricultural production (Antle; Johnson 2000). Further, such a shift is known to be an indicator of positive economic development. Shifting labor and other resources into nonagricultural investments is good for America as a whole. Bardhan and Udry (pp. 22–23) assert, "... as economic growth occurs, the return to skilled labor increases relative to the return to unskilled labor," and, even in America, agriculture is characterized as using primarily unskilled labor.

Economies of the United States, Japan, and several countries in western Europe have developed to such an extent that agriculture has become a very small portion of the nations' "portfolio" of investments. In the United States, only 1.3% of the population is in agricultural production, the percentage is smaller in Japan, and in the European Union, with a population of about 300 million, the number of people working on farms plummeted to 7.3 million in 1995 from 12.3 million in 1979. For example, French farmers

² Some people are quick to point out that, after about 60 years of decline, the trend in farm numbers leveled off in the 1990s. USDA data document a decline in total farm numbers until 1992, but show these numbers have been fairly stable since 1993. Unfortunately, "total" farm numbers are distorted by the fact that "farms" with annual sales of less than \$10,000 have been increasing in numbers since 1992. This size category represented about 48% of total farms in 1990 and about 54% in 1998. These very small operations have negative profits, on average (USDA 1998), and thus cannot be called "commercial" farms. If these "hobby" farms are excluded, total farm numbers have continued to decrease throughout the 1990s.

comprise about 2% of the country's population and are declining in number by 4.2% per year (Reuters News Services 1996). Therefore, these countries are the first to face the questions related to a shrinking agriculture.

A dramatic example of agriculture's role as a holding area for labor is provided by China. A Chinese farm official was quoted as stating that much of China's 450 million rural workers are redundant. He said only 200 million are actually needed for farming (Reuters News Services 1997). Also, in 1997, Reuters reported the number of workers in China's agricultural sector would decrease by 2.6% each year over the next five years, while the number in manufacturing and the service sector would rise. In the year 2000, employees in China's agricultural sector accounted for only 43% of the total labor force, compared to 52% in 1990 and 69% in 1980.

In American agriculture, labor is not the only major resource leaving the industry. Land is also being reinvested elsewhere. Land is the least mobile of all resources, yet it is leaving agriculture in a steady flow. Total farmland in the United States peaked at 1.2 billion acres in 1954, but has declined every year since. After nearly a half-century of reallocation, there were only 931 million acres of farmland reported in the USDA's 1997 *Census of Agriculture* (USDA 1998).

Globally, cropland has been expanding by an average of 0.3% per year in recent decades as forest land is cleared and pasture is brought under cultivation (Wiebe). By 1995, cropland represented 11% of the world's total land area. Pasture represented 26% of total land area, and forest land accounted for 30%. Therefore, in absolute and relative terms, America's investment of land in agriculture is shrinking.

The third measure in the intermediate-form test is relative profit margins. When agricultural profit margins are low relative to alternate investments, farmers begin to shift out of agriculture. This factor helps explain the past decline in absolute inputs in agriculture, such as labor and land, and it offers a signal about the potential direction of future investments of inputs. To begin, figure 2 shows the absolute levels of two measures of profitability in American agriculture reported by the USDA over the period 1960–2000: the nominal return on assets and the nominal return on equity.

As observed in figure 2, the national returns have fluctuated around the 2–3% range over the past 40 years. Return on equity (ROE) was above 3% only during seven years and was below zero twice during that period. The trend in ROE is shown in figure 2 to be negatively sloped over the 40-year period. The trend line was estimated using ordinary least squares and has a statistically significant slope of -0.025% per year. When evaluating these results, it is important to remember that throughout the period the least profitable producers (and land?) were leaving agriculture. Despite this attrition, the trend in agriculture's profit margins was decreasing, as illustrated in the figure.

In relative terms, these profit margins are low compared to returns from investments available outside of agriculture (Bjornson and Innes). The stock market, for example, averaged about 14% nominal returns over the past 40 years. Even risk-free investments, like certificates of deposit, have offered profit margins higher than those available from agriculture, on average. Also, returns to agriculture have been low relative to rates needed for farmers to increase their wealth. Some farmers have debt levels of 60–80% of the value of their assets, with 16% being the current average. This means gross profit margins must be adjusted for borrowing costs to find the real returns to farmers. The USDA (1999) did so and found the average real net return to assets financed by debt has been negative for a decade and was -3.8% in 1999. Clearly, some farmers' real net worth

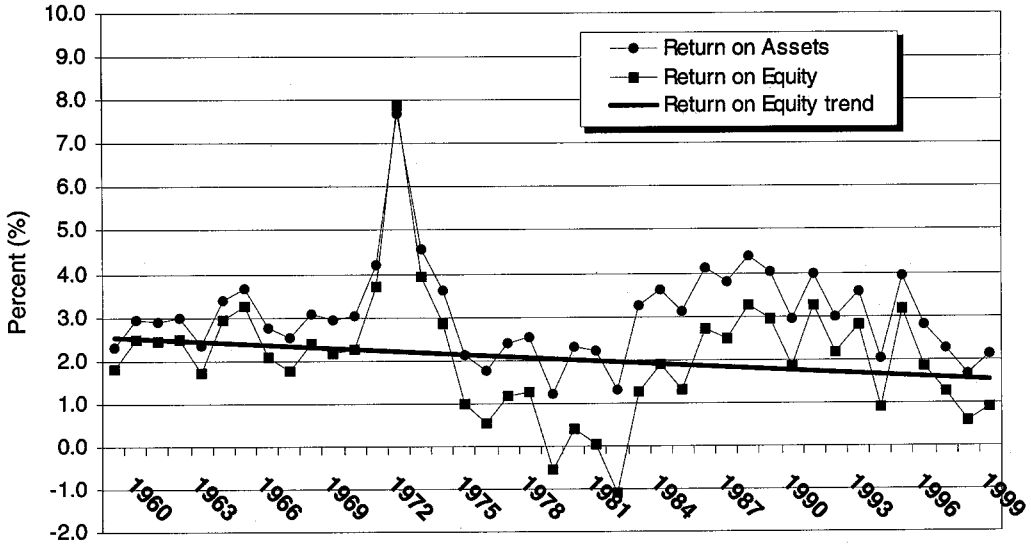


Figure 2. U.S. agriculture's profitability, 1960–2000

has been supported by farmland value improvements, not operating profits over the past decade (USDA 2000a).³

Thus, the data support an intermediate-form test result that American agriculture is shrinking in terms of both size and its attractiveness as an investment. Finally, we turn to a strong-form test to determine whether agriculture has begun the last phase of its life cycle. This test looks at two absolute measures of outputs.

Strong-Form Test

Total profits in American agriculture are declining. Recent levels of total annual income earned from American agricultural production are presented in nominal terms in table 1. The net farm income totals reported by the USDA represent one of the most commonly reported measures of absolute profitability. However, they are overstated. Among other things, those totals include direct government payments to agriculture, which have been at record levels over the last couple of years.

In table 1, direct government payments are subtracted from the net farm income totals to obtain adjusted production income for the last five years (1996–2000). As observed from these adjusted figures, the recent decline in profits is much more significant than indicated in reported figures. Without government subsidies, it is clear the profits earned from agricultural markets have dropped—from \$47.6 billion in 1996 to \$22.3 billion in 2000.

While the short period of decline shown in table 1 in nominal dollars is not long enough to provide convincing proof that total profits are falling for good, the five-year trend is consistent with the hypothesis of a shrinking agriculture. A longer data period is needed to confirm the past five years are not just a cyclical dip in agricultural profits.

³ Farm real estate represents about 78% of equity in agriculture. Farmland values are influenced by more than just income-producing potential (USDA 2000a). Thus, a farmer's net worth can increase despite weak operating income over time. The role of non-income factors in determining farmland values will be discussed in more detail later.

Table 1. U.S. Agricultural Nominal Sales and Income, 1996–2000 (\$ billion)

Description	1996	1997	1998	1999	2000
Final crop output	115.6	112.4	102.1	93.1	95.5
Final animal output	92.0	96.5	94.2	95.1	99.8
Total sales	207.6	208.9	196.3	188.2	195.3
Net farm income	54.9	48.6	44.6	43.4	45.6
Direct government payments	7.3	7.5	12.2	20.6	23.3
Adjusted production income	47.6	41.1	32.4	22.8	22.3

Source: USDA (2000b).

Also, to make a relevant long-term analysis, the data must be converted from nominal to real dollars. This was done for the 1949–2000 period, as depicted in figure 3. Clearly, the peak in 1973 and the bottom in 1983 bracket an unusual decade of change in American agriculture. Nevertheless, the fact that net farm income and adjusted production income are both slowly trending downward in the long term is a clear signal American agriculture is past the “growth” phase of its life cycle. Whether it is in its “mature” phase or its “decline” phase is still debatable.

The product life-cycle model says a product late in its maturity phase and approaching its decline phase will have falling total profits and flat or slightly declining sales totals (Lilien and Kotler, pp. 608–13). Thus, profits lead revenues, so the second absolute measure of outputs must be considered.

As shown in table 1, total sales [final crop output plus final animal output, as reported by the USDA (2000b)] of American agricultural producers have been mixed in recent years. In nominal terms, total sales peaked at \$208.9 billion in 1997, and were \$20 billion lower two years later. No strong trend, up or down, can be detected in the recent data. This fact is obscured by the reporting of gross cash income and other aggregate “sales” figures including items such as government payments, “other farm income,” and “imputed rental value of farm dwellings,” which distort true sales results and give the impression sales are trending upward. Also adding to the confusion is the reporting of sales totals in nominal terms. For these reasons, total sales were converted into real dollars for the 1949–2000 period covered by figure 3.

The results reported in figure 3 give rise to two possible conclusions. First, one could conclude that over the entire data period, real sales totals have a relatively flat trendline, with the 1972–1982 period being an anomaly. Second, one could interpret 1973 (or the 1973–1983 period) as a turning point when a slight uptrend reversed to create a downtrend. Regression analysis shows a positive trend in the real sales data prior to 1973 and a negative slope in the trend thereafter, whether the data used begin at 1973 or 1983.

In summary, the strong-form test results are inconclusive due to the debate over whether nominal or real data should be used. In nominal terms, it appears total profits are falling, but total sales revenues have not followed a clear trend in recent years after a sustained increase in revenues over previous decades. In terms of real dollars, total profits to American agriculture have clearly trended downward for decades, while total sales may have a flat or declining trend over recent decades. Additional data may be needed to make conclusive inferences using this test.

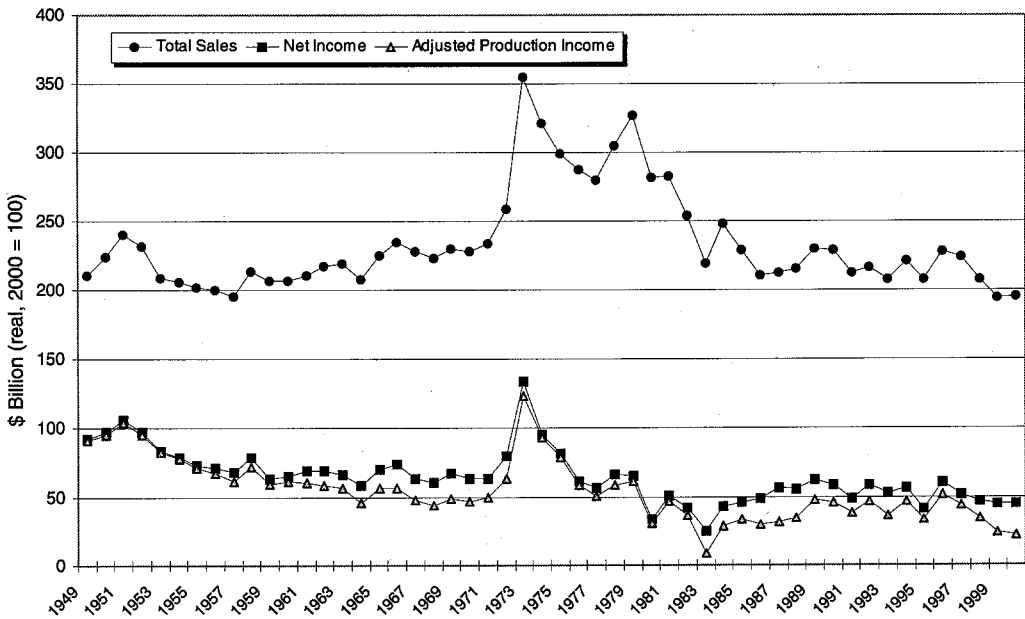


Figure 3. Real U.S. agricultural sales and income, 1949–2000

It appears the results of the three tests presented here are consistent with a shrinking American agricultural sector on the verge of, but not yet in, its final decline stage. The sector is clearly shrinking in relative size and importance, and in absolute size. However, the mixed results of the strong-form test lead to two different conclusions. If real total sales are interpreted as having a flat trend over the past half-century, it can be argued that the sector is still in the “mature” phase of its life cycle. Interpreting 1973 as a turning point in the real sales trend leads to the argument suggesting the sector is near the beginning of its “decline” phase. Nevertheless, only if additional nominal data reveal that the recent sales decline is the new trend will we have enough “degrees of freedom” to confirm American production agriculture is approaching the end of its economic life.

Why Is American Agriculture Shrinking?

The answer to this question is: There is a profit squeeze in American agriculture. Ironically, America’s higher level of development, compared to our new, less-developed competitors in global commodity markets, is responsible for causing much of the profit squeeze in our agriculture. Our production inputs—land, labor, etc.—are higher priced than resources in less-developed countries (Antle). The resulting absolute cost advantage of less-developed countries, many of which adopted our technologies (Griffen, pp. 100–131), enables them to underprice our agricultural commodities. Consequently, the world’s consumers buy agricultural products from other nations’ producers rather than from our farmers and ranchers when they have a choice. And when prices offered by the global market to American farmers are the same as those offered to farmers in less-developed nations, the larger profit margin earned by our competitors makes them economically stronger over time.

Prices for undifferentiated agricultural commodities are determined by global supply and demand factors, and prices are going down as global output expands. The USDA's Index of Prices Received for agricultural output shows the decline facing American producers. From 1990 to 2000, the index decreased 7% in nominal terms. Such a price decrease should not be surprising given the continued increase in world output, like that shown in figure 1.

Total costs of production are determined by local supply and demand factors for inputs, and in America those costs are going up as competition for resources expands with alternate uses. For example, the USDA's Index of Prices Paid by farmers for inputs increased 19% from 1990 to 2000. Production costs per unit of output are also influenced by productivity. The situation faced by Montana wheat farmers (Egan) is a good example of how U.S. production costs have risen faster than yields, resulting in higher costs per unit of output.

In less-developed countries, agricultural productivity gains have been relatively higher than those in America over the last 40 years. Duffy (pp. 344–45) points out, "... while the U.S. has out-paced the average of the other industrialized countries in increasing its production, the greatest gains have occurred in the developing nations." She reports Laspeyers indices for the 1961–2000 period of 2.0 for the U.S., 1.6 for developed countries, and 3.5 for developing countries—meaning costs per unit have dropped faster in newly competitive nations, and this trend is expected to continue.

Profits in U.S. agriculture, as measured by ROA or ROE, have been flat or declining for decades, as shown in figure 2. As a result, profits from production agriculture alone cannot support most farmers. In response to this profit squeeze, American agricultural producers have been diversifying into value-added activities and out of agriculture (Blank 2001a). The economic outcome of the shift of resources out of agriculture has been significant: during 1999, 90% of household income for farm owner-operators came from off-farm sources (USDA 2000c).

New alternative investments available in the U.S. economy are raising the opportunity costs to farmers of staying in agriculture. For example, farmland values are indicators of agricultural profitability and/or nonagricultural opportunities:

Although average agricultural land values nationally are determined primarily by the income earning potential of the land, nonagricultural factors appear to be playing an important role in many local areas. To some extent, the buoying effect of these non-agricultural factors on agricultural land values could be partially offsetting the effect of lower returns from agricultural production (USDA 2000a, p. 30).

What the USDA report cited above called "urban influence" affects only about 17% of U.S. farm acreage, but has a significant impact on farmland values. According to USDA estimates, during 1994–96 the value of farmland which was not urban-influenced was \$640 per acre, compared to \$1,880 for urban-influenced farmland. Thus, the USDA report concluded 66% of urban-influenced farmland market value was due to nonagricultural factors, stating:

The market value for undeveloped farmland in these areas often begins to rise above its value based on agricultural returns alone, reflecting anticipation of eventual non-agricultural uses (USDA 2000a, p. 30).

This explains why New Jersey had the nation's highest average value of farm real estate during 1998 at \$7,000 per acre.

None of the trends mentioned above are likely to diminish in the future. Profits will remain relatively low in agriculture. Thus, policies aimed at preventing land and other resources from shifting out of agriculture and into other industries will prove unsustainable in the long run because they create deadweight losses to the U.S. economy.

The discussion above hints at why a country would *want* to leave agriculture. The answer? It is an investment decision. American agriculture is still profitable in general; however, the fact that an enterprise or economic sector is making *some* profit does not make it a good investment. Over the last 40 years, producers' reluctance to exit, despite agriculture's low gross profit margin, may have already created a deadweight loss to the economy. Much of the labor, capital, and management resources remaining in American agriculture are there by choice, but might be better invested elsewhere.⁴ And these low profit margins in agriculture should not be a surprise. Agriculture is often described as a close approximation to the theoretical market construct called a "perfectly competitive" industry. Microeconomic theory says that in the long run, the average profit margin for such an industry will be zero.

What Are the Implications of a Shrinking Agriculture for the Agricultural Economics Profession?

The shrinking size of American production agriculture implies related sectors of the economy will necessarily shrink as well. Therefore, it is expected the American agricultural economics profession will shrink in size, but not necessarily in importance.

There will be fewer agricultural economists needed by American industry. The current trend of consolidation in agribusiness is expected to continue, meaning there will be fewer firms. The U.S. agribusiness sector will not become less important, however. Economic prospects are very good for firms which add value to agricultural commodities, so those firms will likely grow larger and have ever more power in controlling the world's agricultural resources.

American agribusiness firms will continue to expand their global perspective by using foreign direct investment, strategic alliances, contracting, and other management methods of guaranteeing American consumers will always have plentiful food supplies available. For example, some American agribusiness firms already have offices in over 100 countries, making them important participants in global commodity markets. In general, this geographic diversification of large American agribusiness firms suggests the shrinking number of agricultural economists who will work in the decreasing number of those firms will wield power across the globe.

While America becomes a giant processing center for food commodities produced in other countries and destined for consumption in the U.S., agricultural economists in American agribusiness firms will, in effect, be directing a global supply system. As global agribusinesses evolve, the words of Winston Churchill can take on new meaning: "Never has so much been owed by so many [American consumers] to so few [American agribusiness economists]."

There will be fewer agricultural economists needed by American government. With shrinking numbers of farmers and ranchers, there will be shrinking federal and state

⁴ Governmental intervention causing profits to be higher than otherwise may be a source of deadweight loss, but it can be viewed as an investment decision being made by our government.

agencies dealing with production issues. Food safety and nutrition regulation could burgeon, but relatively few economists will be needed in that effort. The resulting smaller group of agricultural economists in government will necessarily shift its focus from production to international trade and resource management issues.

There will be fewer agricultural economists needed in American academia. With shrinking numbers of farmers and ranchers, there will be fewer domestic students and colleges of agriculture. This will reduce the total demand for teachers of agricultural topics. However, American research (Land Grant) universities will be called upon to focus increasingly on the needs of foreign and less-developed producing nations and on agribusiness and trade topics. Agricultural economists will still be teaching and conducting research, just on different topics such as consumer issues. Extension clientele groups will also reflect the shift in focus from producers to consumers. As Blank (1998b) reports, the number of foreign graduate students in American agricultural economics graduate programs has been steadily increasing over the past three decades as other countries increasingly look to us as a source of research information. Blank (1998b) also documents the continual shift in curriculum away from production economics and toward agribusiness and resource economics topics.

Is a Shrinking American Agriculture a "Bad" Thing?

For individuals, being squeezed out is painful. Therefore, whether we are talking about farmers or agricultural economists being squeezed out of the profession they prefer, it is an unpleasant prospect. For farmers, being squeezed out often means the end of a family business and tradition that has lasted for generations. The personal pain of such an exit is real and significant. Maybe for those (and other) reasons, there are many people calling for the preservation of the "family farm" in America.

In the "big picture," however, letting American production agriculture shrink is allowing comparative advantage to work. The concept of comparative advantage asserts that countries should specialize in the production of whatever products its resources are best suited for, even if it does not have an absolute advantage in the production of any product (Helpman and Krugman; Layard and Walters, pp. 113–19). Trade patterns are believed to be determined by comparative advantage which, in turn, is explained by national differences in technology, factor endowments, and preferences (Peterson and Valluru; Findlay; Treffler; Harrigan). It is now understood that "countries may lose industries in which comparative advantage might have been maintained. . . . due to changes in comparative advantage and international competition" (Krugman, pp. 98, 101). This is especially likely in markets for undifferentiated commodities.

Changes in comparative advantage occur as technological advances create new industries or substantially change existing industries within a country. When those advances result in changes in the relative profitability between industries, they can reduce the attractiveness of investments in existing industries, such as agriculture.

International competition is now relevant to some industries in which comparative advantage once existed, like American agriculture, because there is an *absolute* limit to how much the world needs of a commodity. Unlike the situation for branded products, undifferentiated agricultural commodities can now be produced in greater quantities than the global market can absorb. This excess supply is due to technological advances and

productivity growth. Food commodities, in particular, have an absolute limit to the volume that can be consumed over time because there is a physical limit to how much a person can eat, even if an infinite supply were available free. And because commodities are undifferentiated (i.e., there is no difference between the output from two producers of a standardized commodity), buyers make purchases from the lowest-cost supplier. Thus, the "technological treadmill" helps push commodity prices lower (Johnson and Quance).

According to the Heckscher-Ohlin theory of international trade, when a country does not have an absolute advantage in the global market for a product in which it has a comparative advantage, it is forced to compete on the basis of lower input costs (e.g., wages, land prices, etc.) or by adjusting its currency exchange rates. A country can make the price of its product in which it has a comparative advantage competitive in absolute terms by forcing down input costs or lowering the value of its currency. However, this is easier to do in a less-developed country trying to export a limited variety of products, compared to a more-developed country like America that exports many different products. For the less-developed country, the relatively large impact of export sales for a single (or few) important product(s) will be felt in factor markets to a much greater extent than will the effects of export sales of any product from a more diversified, developed country.

For example, when Cuba's economy centered around the production of sugar, export prices of sugar greatly influenced wages and other input costs in that less-developed country. In contrast, sugar produced in Hawaii (although important to the local economy) had insignificant effects on the U.S. wage rate through currency changes because sugar was such a minuscule part of America's total economy. Also, factor prices in Hawaii did not fall sufficiently to lower the production costs of sugar because many alternative uses were available for labor and other resources. As a result, the Hawaiian sugar industry suffered a profit squeeze, forcing it out of business. This example is typical of cases where a regional comparative advantage in the production of some commodity is insufficient to overcome the industry's absolute disadvantage in a global market.

Krugman (p. 95) concludes, "... if foreigners are willing to sell us high-quality goods cheaply, that is a good thing for most of us, but a bad thing for the domestic industry that competes with the imports." There are many more American consumers benefitting from the growth of global commodity markets than there are agricultural producers being squeezed by the increased competition, so America will continue to shift its resources and policies in the direction of increasing agricultural imports.

All of this is bad news for American farmers and ranchers. Global competition in commodity markets will continue to increase as technology changes the comparative advantages of nations, making agriculture more profitable for less-developed countries and less profitable for more-developed countries. Gradually, the highest-cost suppliers will be forced to leave the markets as falling prices reduce profit margins. As noted by Duffy, it is America's less-developed competitors who are increasing their productivity most rapidly, and thus their production costs per unit are falling faster than are ours. As a result, the squeeze on U.S. producers will continue (Blank 2001b).

Once again, in the "big picture," this reduction in America's production agriculture sector is an improved, more efficient allocation of our nation's and the world's resources, making it a "good thing" from an economic perspective. Thus, as agricultural economists, our profession is stuck between wanting to help American agricultural producers and economic theory that tells us many producers will be squeezed out of business. This will

seem like a “bad thing” to some of us as we deal with the difficult challenges the conflict creates. However, it is “bad” only if we somehow weight producers’ interests more than consumers’ interests.

Thinking Big

The first of (at least) two challenges facing the American agricultural economics profession is to think big. Agricultural economists need to take the long-run, global view that a more profitable resource allocation is a Pareto improvement, even when it hurts those close to us. We can continue to do our best for America’s agricultural producers by making their future as long and as profitable as possible, but we cannot forget the big picture. In the end, comparative advantage does have an absolute limit, and in the big picture the lowest-cost commodity producers will be in less-developed countries. In other words, to gain access to the global markets for the manufactured goods produced in America, we will be forced to argue for free trade which, in the long run, means we will lose our production agriculture sector to foreign competitors. This shift in resources is a Pareto improvement to the country, even though it means most American agricultural producers and agricultural economists will be forced out of their professions; consumers, one of our new primary audiences, will benefit.

The second challenge facing the American agricultural economics profession is to prepare U.S. agriculture for the exit while making it as painless as possible. We need to help guide producers toward the most profitable resource allocations in what will continue to be dynamic global markets. Traditional cropping choices will have to change in many areas, and marketing issues will increasingly dictate production decisions. Vertical integration through strategic alliances will become a necessity, and financial diversification will become the norm. The smaller number of agricultural economists employed in the future will still play very important roles, although their roles will focus more on consumer, agribusiness, and resource issues.

These two challenges are going to be very difficult for some academic agricultural economists to pursue because many of us believe, or are under pressure to believe, that our role is to support farmers and ranchers. This is the view most often expressed by producer groups, such as that outlined by Tevis. Those groups continue to interpret the objective of Land Grant universities as being to benefit small farmers, rather than the country as a whole. “Many farmers also have criticized a land grant focus on large-scale, capital-intensive agriculture” (Tevis, p. 9).

Such a view is misinformed and out of date. Economists understand Pareto improvements can involve actions harming some while benefitting the many. We must remember this and tell agricultural producers what they *need* to hear, not just what they *want* to hear. Agricultural economists have been shifting away from production agriculture for decades (Blank 1998b), so we understand the difficulties the adjustment processes present to producers.

“Thinking Big” requires an unselfish perspective as we address two policy questions. In these questions there are (at least) two challenges to both agricultural economists and the American production agriculture sector. The first question is: *Does America have an “obligation” to our agricultural producers?* The second question is: *Does America have an “obligation” to the world to manage and preserve our agricultural resources and capacity for long-run global needs?*

American farmers and ranchers deserve our profession's help in dealing with the complicated issues embodied in the two policy questions. They also deserve the truth, so we will have to work hard to perform as analysts of, not advocates for, agriculture. We must maintain our objectivity to best serve agriculture, America, and the world.

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