A Comparative Marketing Analysis of Major Agricultural Products in the United States and Argentina

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Midwest Agribusiness Trade Research and Information Center
Iowa State University
Ames, IA 50011-1070
www.card.iastate.edu/matric/home.html

Sergio H. Lence is an associate professor in the Department of Economics at Iowa State University.

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For questions or comments about the contents of this paper, please contact: Sergio H. Lence, 166C Heady Hall, Ph: 515-294-8960, Fax: 515-294-0221, email: shlence@iastate.edu.

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Abstract

Interest is high in Argentina as an emerging economic power in the Americas. This paper analyzes issues pertinent to the relative advantages and disadvantages between the United States and Argentina for producing, transporting, processing, and marketing major agricultural commodities in the context of distribution to significant global markets. Designed as a tool for agribusiness students and prospective investment and trade partners, it provides a side-by-side analysis of major U.S. and Argentine agricultural commodities. All facts and figures are in U.S. currency and common U.S. (avoirdupois) weights and measures. Also from a comparative perspective, it defines the differences in technologies between the countries and examines in detail the marketing channels for grains (corn, soybeans, wheat, and sunflower) and livestock (beef and pork).

Key words: agricultural commodities, agricultural markets, Argentina versus United States, commercialization, comparative economic analysis, grains, livestock, marketing channels, production technology

A COMPARATIVE MARKETING ANALYSIS OF MAJOR AGRICULTURAL PRODUCTS IN THE UNITED STATES AND ARGENTINA

Introduction

Interest is high in Argentina as an emerging economic power. The five dominant countries in the Americas are the United States, Canada, Mexico, Brazil, and Argentina. This paper analyzes issues pertinent to the relative advantages and disadvantages between the United States and Argentina for producing, transporting, processing, and marketing major agricultural commodities in the context of distribution to significant global markets. It is a companion piece to two other Midwest Agribusiness Trade Research and Information Center (MATRIC) studies*: The Economic, Financial, and Political Environment in Argentina (Argentina Report 1)* by Sanjeev Agarwal and *A Comparative Analysis of Agricultural Transportation and Logistics Systems in the United States and Argentina (Argentina Report 3)* by Thomas J. Goldsby.

This study provides a side-by-side analysis of major U.S. and Argentine agricultural commodities. All facts and figures are in U.S. currency and common U.S. (avoirdupois) weights and measures. Also from a comparative perspective, it defines the differences in technologies between the countries and examines in detail the marketing channels for grains (corn, soybeans, wheat, and sunflower) and livestock (beef and pork).

There are significant differences in the technologies used by grain and livestock producers in the two countries. Farms in Argentina are more diversified than their counterparts in the United States. Argentine farmers are much less reliant on fertilizers, and they rely heavily on crop/pasture rotations. A typical farm will produce a mix of at least three crops and at least one type of pasture-raised beef. Beef production in Argentina is based on direct grazing of pastures, as opposed to fattening in feedlots. Also, Argentina has virtually no hog production.

Four grain crops are compared in this study: corn, soybeans, wheat, and sunflower. A much larger amount of corn is planted in the United States, and yields are greater, mainly due to greater use of fertilizer. Total corn production has exhibited an upward trend in both countries. As is the case with corn, the soybean acreage in the United States is considerably larger, with the United States averaging about four times the soybean acres of Argentina. Yields tend to be slightly higher in the United States, but the yield differential for soybeans in very small. The number of U.S. acres planted with wheat is about five times the number of wheat acres in Argentina, and the United States also exhibits consistently higher yields. Although there has been an upward trend in the total wheat production of both countries in relative terms, Argentina is the clear leader in increasing wheat production. Of the four crops analyzed, sunflower is the only one for which Argentina has both greater acreage and yields, and, therefore, greater output.

Beef and pork are the livestock commodities compared in this study. Cattle numbers in the United States are about twice as large as in Argentina. On average, since 1990, the total number of hogs in the United States has been more than 20 times the total number of hogs in Argentina.

Comparing marketing channels for grains, Argentina’s transportation system is very expensive relative to the United States, and the price of storage in Argentina is much higher than in the United States. A natural advantage of Argentina for exporting crops is that its ports are much closer to the major producing regions.

Comparing marketing channels for livestock, most of the beef produced by the United States and Argentina is consumed domestically. Beef consumption actually exceeds production in the United States, which implies that the United States is a net importer of beef. Both the United States and Argentina are major beef exporters. The United States is the world’s second largest exporter of beef, following Australia, whereas Argentina ranks sixth in the beef export market.

Pork production is substantially (about 50 times) larger in the United States than in Argentina. The United States is the world’s third largest producer of pork, following Mainland China and the European Union. An important difference in pork consumption between the United States and Argentina is that most pork is consumed as fresh meat in the United States, whereas most pork is consumed as processed products in Argentina. Pork exports from both countries are highly concentrated. The main customer of the United States is Japan, which purchased more than 40 percent of U.S. pork exports between 1997 and 1998. During that same time period, Bolivia imported 86 percent of Argentina's pork exports. The sources of pork imported by the United States and Argentina are highly concentrated, as well. For example, Canada accounted for almost 70 percent of the U.S. imports, and Denmark for an additional 20 percent during 1998–99. Argentina's major pork suppliers were neighboring countries, Brazil and Chile, with 62 percent and 17 percent, respectively, of the total pork imported by Argentina.

In this study, Section A highlights the differences in technologies between the two countries and compares their grain (corn, soybeans, wheat, and sunflower) and livestock (beef and pork) production. Section B compares marketing channels for corn, soybeans, wheat, and sunflower, while Section C compares marketing channels for beef and pork. Both Sections B and C cover U.S. and Argentine institutions facilitating commerce, price discovery and commercialization costs, competition, and government intervention.

We trust that this marketing analysis will be a useful tool for agribusiness students and prospective investment and trade partners.

Section A. Agricultural Production

It is clear that there are significant differences between the absolute magnitudes of key farm indicators for the United States and Argentina. Some summary figures corresponding to the farm sectors of the two countries are reported in Table A.1. The number of farmers in the United States (2 million) is slightly greater than five times the number of farmers in Argentina (0.38 million). Similarly, the total area farmed in the United States is noticeably greater than in Argentina. However, the difference in total area farmed—942 million acres for the United States versus 441 million acres for Argentina—is not nearly as large as the difference in the number of farmers. The obvious implication is that the average farm size in Argentina (1,160 acres/farm) is considerably greater than the average farm size in the United States (471 acres/farm).

Technology Differences

There are also fundamental differences in the technologies used to produce grains and livestock in Argentina and the United States. They are as follows.

- Farms in Argentina are more diversified than their counterparts in the United States (or, alternatively, U.S. farms are more specialized than in Argentina). Argentine farmers rely heavily on crop/pasture rotations; a typical farm will produce a mix of at least three crops (e.g., corn, soybeans, wheat, sunflower) and at least one type of pasture-raised beef (e.g., cow-calf production, fat cattle production).

- Argentine farmers are much less reliant on fertilizers than U.S. farmers.

- Beef production in Argentina is based on direct grazing of pastures, as opposed to fattening animals in feedlots.

- Argentina has virtually no hog production. Further, the hog production systems employed in Argentina are quite extensive and do not involve modern hog production technologies.

The above differences are discussed in more detail in the following discussion.

Diversification

The reasons that Argentine farmers are more prone to diversification are technological as well as economical. Technology is a major driver of the differences in farm diversification, because the conditions for growing crops are much more homogeneous throughout Argentina's crop-producing region. Relative to the United States, Argentina has a smaller area suitable for crop production, and it is highly concentrated geographically. This fact is illustrated by the maps at the bottom of Figures A.1 through A.4, which reveal a significant overlap among the areas devoted to the production of corn, soybeans, wheat, and sunflower in Argentina. Such overlap contrasts sharply with crop production in the United States, as shown in the top maps of Figures A.1 through A.4.

Farm diversification in Argentina is driven by *economic* forces, as well. In this regard, there are at least three reasons for diversification. First, Argentine farmers have historically relied on pastures to restore soil fertility, making pastures a crucial component of the crop rotation scheme. To a certain extent, the popularity of soybeans among Argentine farmers can be traced back to its capabilities to fix nitrogen in the soil, thereby reducing the need for fertilization. The reason for resorting to crop/pasture rotations to reduce fertilizer usage has been the historically high price of fertilizer relative to grain prices in Argentina. For example, in 1990, the cost of one pound of diammonium phosphate was 0.087 bushels of corn and 0.065 bushels of wheat in Argentina, compared to only 0.046 bushels of corn and 0.028 bushels of wheat in the United States.

Another economic force behind farm diversification in Argentina is the lack of safety-net government programs for farmers, coupled with the fact that net income from any crop or animal production in isolation is much riskier in Argentina than in the United States. For example, Figures A.5 and A.6 depict the coefficients of variation of yields and prices for the United States and Argentina. For all four crops, the yields, as well as the prices received by farmers, have been more volatile in Argentina than in the United States. Further, the actual differential in price volatility is greater than that shown in Figure A.6, because the U.S. figures include neither deficiency payments for corn and wheat, nor government emergency assistance payments. Given the high risks involved in any single agricultural activity in isolation, Argentine farmers have pursued diversification as an effective way to manage both production and price risks.

The third economic reason for diversification is that it allows for a more efficient use of machinery. As a result of diversification, the machinery costs imputable to any single crop budget in Argentina are smaller than in the United States. This is true because farm equipment is employed more uniformly throughout the year in Argentina, thereby greatly enhancing its usage efficiency. Spreading overhead machinery costs over several agricultural activities gives Argentine farmers a distinct competitive edge vis-à-vis U.S. farmers.

Fertilizer Usage

Argentina's lower reliance on fertilizers for crop production is evidenced by Table A.2. According to this table, the area of corn fertilized in the United States is more than double that of Argentina. Similarly, a much larger share of the wheat area is fertilized in the United States compared to Argentina. For soybeans and sunflower the difference would be even greater, as the area of such crops receiving fertilizer is virtually nil in Argentina. In addition to fertilizing a much smaller share of the planted area, Argentine farmers apply smaller amounts of fertilizer per acre. As discussed above, the low use of fertilizer in Argentina has historically been explained by the high price of fertilizer relative to the prices received by farmers for their produce.

From a productivity standpoint, the most obvious consequence of the low fertilizer usage by Argentine farmers is significantly lower yields in Argentina relative to U.S. yields for crops with high nutrient requirements, as reported in Table A.3. For example, relative to U.S. yields, yields in Argentina have averaged 40 percent less for corn and 14 percent less for wheat over the last nine crop years.

Although fertilizer usage in Argentina lags far behind that of the United States, it is important to note that there has been a very strong trend toward greater fertilizer usage in Argentina in recent years. Annual fertilizer sales in Argentina jumped from 300 thousand tons in 1991 to 1.65 million tons in 1996 (Figure A.7). However, despite this increase, fertilizer usage in Argentina is much smaller than in the United States. Evidence in this regard is that the gap has not diminished between U.S. and Argentine yields for the crops receiving most of this additional fertilizer. From 1991/92–1993/94 to 1997/98–1999/00, Argentine yields increased by 19.4 bu/acre for corn and by 3.6 bu/acre for wheat (Table A.4). Over the same period, U.S. yields increased by 18.3 bu/acre for corn and by 4.5 bu/acre for wheat.

Direct Beef Grazing

Unlike U.S. beef production, virtually all of Argentina's beef production is based on direct grazing. Beef cattle are fed supplementary rations based on grains in the last few months of their fattening stage, but even during that period animals are allowed to graze at large on pastures. This system of beef production is popular among Argentine producers for various reasons. First, as pointed out earlier, pastures are an integral part of crop rotations, used to substitute for fertilization. Hence, there are plenty of pastures available for grazing in most Argentine farms. Second, direct grazing greatly reduces the need for expensive investment in infrastructure compared to production based on feedlots. The smaller investment requirements provide a very important economic incentive for direct grazing, as financial markets for agriculture are much less developed in Argentina, and farmers often face severe financial constraints. Third, weather is considerably milder in the livestock producing regions of Argentina compared to many of their U.S. counterparts. Consequently, in Argentina cattle can graze at large without need for shelter.

Small Demand for Pork

Argentina produces almost no hogs. This might be considered somewhat surprising, given the ample availability of feedgrains. However, this favorable factor to hog production is outweighed by the significantly small domestic demand for pork. Annual per capita consumption of pork amounts to only 13 pounds in Argentina, compared to about 130 pounds of beef and about 45 pounds of poultry (Table A.5). The comparison with the United States is striking, as annual U.S. per capita consumption of pork, beef, and poultry is about 49 pounds, 64 pounds, and 63 pounds, respectively. Another reason for Argentina's small hog output is that, unlike beef, hogs are relatively difficult to direct graze on pastures. Hence, hog production does not fit as well as beef within the production scheme of most Argentine farmers. Furthermore, hog production requires large investments in dedicated facilities that cash-strapped Argentine farmers would find difficult to finance.

From the previous discussion, it is clear that crop and beef production in Argentina consists of a joint system of production. Therefore, output characteristics and costs of production for Argentina are best interpreted in the context of such a system. For example, consider the percentage changes in the number of acres harvested of corn, soybeans, wheat, and sunflower—Argentina's four major crops—in the United States and Argentina, which are depicted in Figure A.8. A cursory look at this graph reveals that, on an individual basis as well as in total, crop acreage fluctuates much more in Argentina than in the United States. One reason for this is that, as pointed out earlier, the crop producing-region in Argentina is much more concentrated geographically and, therefore, more homogeneous than its U.S. counterpart. As a result, it is much easier for Argentine farmers to switch from one crop to another, and between crops and beef production, depending on the outlook for their respective markets. Another reason for Argentina's greater acreage volatility is that, in contrast to the United States, there are no government programs that support agriculture and discourage crop substitution.[1]

Unfortunately, the data requirements are too great to be able to perform a system-level analysis of production costs for Argentina. With this caveat in mind, the following subsections provide a comparative analysis of production and costs for individual crops and beef production in Argentina vis-à-vis the United States. To interpret the figures reported for the costs of production of different crops, it must be noted that they assume representative production technologies used in the representative producing regions of each country, corresponding to each particular crop. It must also be noted that the production cost figures omit the cost of land. The reason for this omission is twofold. First, it is assumed that land receives a residual return that depends on the

[1]As an example, consider the U.S. corn program before passage of the FAIR Act, by which government payments to an individual farmer were calculated using the farmer's corn "base" acreage.

relative profitability of the crops. Second, as mentioned earlier, farmland in Argentina is typically used in crop-cattle rotations. Hence, a fair accounting of the cost of land involved in the production of a particular crop in Argentina should factor in the proportion of the time that such a crop enters into the crop-cattle rotation. For completeness, however, comparative figures pertaining to the cost of land are also reported separately for each crop.

Corn Production

A striking contrast between corn production in the two countries is that acreage is about ten times greater in the United States than in Argentina (Table A.6). Corn yields are also considerably greater in the United States, mainly due to the higher use of fertilizer. Corn yields in the United States have averaged 127.2 bu/acre in the most recent five crop years, compared to an average of only 79.9 bu/acre in Argentina. As a result of both larger acreage and greater yields, U.S. corn production is more than 15 times that of Argentina. The sizeable magnitude of the total corn production differential between the two countries is illustrated in Figure A.9.

Total corn production has exhibited an upward trend in both countries. This positive trend is the result of an upward trend in yields as well as in the total acreage devoted to corn (Table A.6). For example, the area harvested in the United States increased from an average of 67.9 million acres in 1991/92–1993/94 to 72.1 million acres in 1997/98–1999/00. Over the same period, corn acreage in Argentina increased from 6.0 million acres to 7.3 million acres.

Corn costs of production are summarized in Table A.7, both on a per acre basis and on a per bushel basis. For Argentina, two budget costs are presented. The average technology budget is representative of the traditional low-yield technology that uses no fertilizer. The high technology budget corresponds to corn produced with fertilizer and somewhat higher input levels, conducive to higher yields. In both cases, corn production is assumed to occur in the typical corn-growing region of Argentina.

On a per acre basis, the total cost of producing corn in the United States ($197/acre) is higher than the total Argentine cost, regardless of whether the technology used is average ($95/acre) or high ($161/acre). Most of the large difference in production costs between the United States and the Argentine average technology can be traced to the use of fertilizer in the United States, which adds $45/acre to the U.S. cost of production. Other items that are also important determinants of the higher U.S. production costs relative to Argentina's average technology are herbicides and harvest machinery, which account for $22/acre and $19/acre of additional costs, respectively. Interestingly, Argentina's average technology per-acre costs are smaller for each of the inputs listed in Table A.7.

On a per bushel basis, the cost of corn production in the United States ($1.51/bu) is also higher than in Argentina. The high technology package enables Argentine farmers to produce at $1.15/bu, which is $0.36/bu lower than U.S. costs. Production costs are slightly higher using average as opposed to high technology ($1.19/bu versus $1.15/bu), but still significantly lower than U.S. costs. It is apparent from the data reported in Table A.7 that the items accounting for Argentina's edge in the cost of producing corn are fertilizer, herbicides, and insecticides.

Comparative figures pertaining to the cost of land are reported in the bottom two rows of Table A.7. The value of an acre of representative farmland used for corn production in the United States is about 40 percent higher than in Argentina ($2,280 versus $1,620, respectively). However, the rental rate in the United States ($127/acre) is between two and three times the rental rate in Argentina ($41/acre for average technology and $64/acre for high technology). The rental rate for average technology is smaller than that for high technology because rental rates are negotiated on a crop share basis in Argentina. Even though the crop share paid as rent is smaller for the high technology package, it is still the case that it leads to a higher rental rate. On a per bushel basis, the cost of renting land to produce corn in the United States ($0.98/bu) is about twice Argentina's cost ($0.51/bu for average technology and $0.45/bu for high technology). Interestingly, the value of land per bushel produced in the United States ($17.54/bu) is roughly halfway between the average and high technology values for Argentina ($20.25/bu and $11.27/bu, respectively).

Soybean Production

Data on soybean production in the United States and Argentina are reported in Table A.8. As it is the case for corn, the area planted with soybeans in the United States is considerably larger than in Argentina. More specifically, in recent years the number of acres planted with soybeans in the United States has averaged about four times the soybean acreage in Argentina. Soybean yields also tend to be slightly higher in the United States, but the yield differential for soybeans is very small. Due to both larger acreage and higher yields, total production of soybeans in the United States is much larger than that in Argentina.

The relative magnitudes of the amounts of soybeans produced by the two countries can be better appreciated by means of Figure A.10. This graph shows that there has been an upward trend in the production of soybeans in both countries. The United States produced an average of 2,016 million bushels per year between 1991/92 and 1993/94, versus 2,701 million bushels per year between 1997/98 and 1999/00. For Argentina, the corresponding figures are 428 million bushels and 709 million bushels, respectively. For both countries, the increase in total soybean output through the 1990s is the result of more acres devoted to soybeans, as well as higher yields. More specifically, the annual number of acres harvested in the United States (Argentina) increased from an average of 57.8 (11.9) million in 1991/92–1993/94, to an average of 70.8 (17.0) million in 1997/98–1999/00. Similarly, soybean yields in the United States (Argentina) improved from an average of 34.8 (35.9) bu/acre in 1991/92–1993/94, to an average of 38.2 (42.0) bu/acre in 1997/98–1999/00.

Tables A.9 and A.10 provide a summary of the costs of producing soybeans in both countries. For the United States, two different costs of production figures are reported, depending on whether soybeans are planted using conventional tillage or no-till practices. Conventional tillage has much higher costs of production due to pre-harvest machinery. In contrast, no-till soybeans have substantially greater costs arising from seeds and herbicides. These cost differentials tend to offset each other, yielding similar costs of production for both practices. Costs of producing soybeans in the United States are about $131/acre or $2.91/bu.

Three alternative costs of soybean production in Argentina are reported in Table A.10. The average technology involves a traditional production practice, with no fertilization and relatively low yields (33 bu/acre). The high technology package consists of no-till practices along with fertilization and more intensive usage of herbicides, leading to higher yields (50 bu/acre). The second crop budget refers to soybeans planted following wheat in the same year. The second crop budget is presented because soybeans as a second crop immediately following the wheat harvest are a very popular crop combination in Argentina. Approximately 25 percent of the total area devoted to soybeans in Argentina consists of soybeans as a second crop.

On a per acre basis, the costs of producing soybeans in Argentina range between $69.95/acre (second crop) and $96/acre (high technology). The costs of producing soybeans in Argentina are substantially lower, regardless of the production practice considered for each country in making the comparison. The items that confer the competitive edge to Argentina are fertilizer costs (between $0/acre and $5.83/acre in Argentina, versus $25.25/acre in the United States) and herbicide costs (between $7.94/acre and $16.67/acre in Argentina, versus $30/acre to $35/acre in the United States). In contrast, insecticide costs are higher in Argentina (between $2.83/acre and $6.23/acre, versus $0/acre in the United States).

Due to the higher U.S. soybean yields, the cost differentials with Argentina's average technology and second crop are attenuated when considered on a per bushel basis. However, it is still the case that even for these low-yield technologies Argentina has a cost advantage. In Argentina, soybeans as the only crop can be produced at costs of $1.92/bu to $2.39/bu using low technology and high technology, respectively. As a second crop, Argentine soybeans can be produced at a cost of $2.50/bu. By comparison, soybean production in the United States requires about $2.91/bu of inputs.

The value of land used for soybean production is higher in the United States than in Argentina ($2,200/acre versus $1,620/acre, respectively). But the per acre cost of renting land for soybean production is much higher in the United States, in particular when compared against renting land for soybeans as a second crop in Argentina. The rental cost of land for soybean production is $125/acre in the United States, versus either $42/acre to

$53/acre (soybeans as a single crop) or $26/acre (soybeans as a second crop) in Argentina. The rental cost differential on a per bushel basis is also clearly favorable to soybean production in Argentina.

An important innovation in both the United States and Argentina is the introduction of Roundup Ready® soybeans. Roundup Ready® soybeans are resistant to glyphosate, a relatively inexpensive biocide. To use this technology farmers must pay for the seed, agree not to save seed, and purchase patent-protected Roundup® herbicide. Farmers may also receive a lower price for their crops, if genetically modified soybeans sell at a discount. In return, however, farmers gain simple and effective weed control at lower cost. Crop quality may be enhanced if foreign matter and weed seeds are reduced. In addition, the time and equipment required for weed control may be reduced, thereby permitting an operator to farm more land. Argentine farmers are likely to benefit more from the use of Roundup Ready® soybeans than U.S. farmers—at least in the near future—because the price of glyphosate is much lower in Argentina ($16/gallon) than in the United States ($56/gallon). The most likely explanation for the significant price differential for glyphosate is that Monsanto's patent expired a few years ago in Argentina. In the United States, Monsanto's patent will expire in the year 2000, which may allow prices to fall soon there.

Wheat Production

The number of acres planted with wheat in the United States is about five times the number of acres planted in Argentina. Table A.11 contains wheat production data pertaining to the United States and Argentina. The United States also exhibits consistently higher wheat yields than Argentina; over the last nine years, yields have averaged 38.5 bu/acre in the United States and 33.3 bu/acre in Argentina. Due to the larger area planted and the greater yields, total U.S. wheat production is over five times greater than Argentina's. Figure A.11 provides a clear illustration of the size of the wheat production differential between the two countries.

Although there has been an upward trend in total wheat production of both countries, in relative terms such a trend is much stronger in Argentina. Wheat output in Argentina increased from an annual average of 359.8 million bushels in 1991/92–1993/94, to 493.6 million bushels in 1997/98–1999/00, whereas the analogous figures for the United States are 2,281.1 million bushels and 2,445.6 million bushels, respectively. The upward trend observed in Argentine output stems from upward trends in both acreage and yields. In Argentina, the annual wheat area harvested (yield) increased from an average of 11.2 million acres (32.5 bu/acre) in 1991/92–1993/94, to an average of 13.7 million acres (35.9 bu/acre) in 1997/98–1999/00. The corresponding U.S. figures indicate that average yields improved from 37.3 bu/acre to 41.8 bu/acre between 1991/92–1993/94 and 1997/98–1999/00, but that the average wheat area harvested actually decreased from 61.8 million acres per year to 58.6 million acres per year over the same period.

Costs of production for wheat are itemized in Table A.12. Budgets for two alternative systems of production are reported for Argentina: average technology and high technology. The average technology budget represents traditional production with low levels of fertilizer and no insecticides or fungicides. The high technology budget involves much higher levels of fertilization and the use of insecticides and fungicides. As pointed out earlier, average wheat yields are higher for the United States than for Argentina (38.5 bu/acre versus 33.3 bu/acre, respectively, over the last nine years). However, such country-level differential is not reflected in the per bushel costs reported in Table A.12. The reason for this discrepancy is that the latter are estimates for representative producing regions in the two countries (as opposed to country averages).

On a per acre basis, U.S. costs of production ($96.51/acre) are about 40 percent higher than for Argentina's average technology ($68.24/acre), but about 9 percent lower than for Argentina's high technology ($111.19/acre). The per-acre cost advantage of Argentina's average technology stems mostly from machinery costs ($43.67/acre in Argentina versus $67.49/acre in the United States). Given that the yields assumed for the United States and for Argentina's average technology are virtually the same (37 bu/acre and 38 bu/acre, respectively), the relative magnitudes of the per-bushel costs are almost the same as the relative magnitudes of the per-acre costs.

Interestingly, Argentina's cost of production per bushel of wheat is quite similar irrespective of whether the technology employed is average ($1.80/bu) or high

($1.85/bu). In either case, Argentina is able to produce a bushel of wheat at about a 30 percent lower cost than the United States. The most significant difference in costs is due to machinery, which accounts for $1.82/bu in the United States and is only $1.04/bu to $1.15/bu for Argentina's average technology and high technology, respectively.

Farmland rental rates to produce wheat in the representative regions are somewhat higher in the United States. Rental rates in the United States amount to $36.00/acre, compared to $34.80/acre and $27.11/acre for Argentina's high technology and average technology, respectively. The value of land used to produce wheat in Argentina ($526.10/acre) is almost 20 percent less than in the United States ($650/acre). If added to the budget, rental rates add a significantly larger extra cost—between $0.26/bu and $0.39/bu—to the production of a bushel of wheat in the United States ($0.97/bu) relative to Argentina ($0.71/bu for average technology and $0.58/bu for high technology). Similarly, the value of land per bushel of wheat produced in the United States ($17.57/bu) is much higher than in Argentina ($13.84/bu for average technology and $8.77/bu for high technology).

Sunflower Production

Of the four major crops being analyzed, sunflower is the only one for which Argentina has both greater acreage and yields, and, therefore, greater output than the United States. The area devoted to sunflower in Argentina has been about three times larger than in the United States throughout the last decade (Table A.13). It is worth noting that, in relative terms, sunflower is the crop for which the area has fluctuated the most in both countries (see Figure A.8). Albeit volatile, on average, the yields in Argentina (15.5 cwt/acre) have been about 17 percent higher than in the United States (13.2 cwt/acre). Due to the larger area planted and the higher yields, Argentina's sunflower production has been almost four times greater than that of the United States. Figure A.12 provides a pictorial representation of the relative production of sunflower in both countries.

Total sunflower output displayed a strong positive trend over the last decade. In the United States (Argentina), annual average output increased from 2.3 (7.9) billion pounds in 1991/92–1993/94 to 3.4 (13.7) billion pounds in 1997/98–1999/00. The upward trend in output followed from increased acreage as well as higher yields in both countries. In the United States, annual average acreage increased from 1.9 million acres in 1991/92–1993/94 to 2.4 million acres in 1997/98–1999/00, whereas in Argentina the corresponding figures are 5.9 million acres and 8.7 million acres, respectively. Similarly, average U.S. (Argentine) sunflower yields increased from 12.7 (13.6) cwt/acre to 14.6 (15.8) cwt/acre between 1991/92–1993/94 and 1997/98–1999/00.

Costs of production for sunflower are reported in Table A.14. Again, two alternative crop budgets are displayed for Argentina; namely, one representing the traditional technology without fertilization (average technology) and another one with fertilization (high technology). The per-acre cost of producing sunflower in the United States ($90.90/acre) is almost the same as with Argentina's high technology ($90.46/acre), but substantially higher than with Argentina's average technology ($65.85/acre). The most noticeable differences between the two countries are Argentina's higher costs for herbicides ($10.32/acre in Argentina versus $6.54/acre in the United States), but lower costs for seed (between $6.39/acre and $7.98/acre in Argentina, compared to $14.72/acre in the United States) and for harvest machinery (from $18.63/acre to $25.87/acre in Argentina versus $28.35/acre in the United States).

Despite the differences in the respective production systems for the two Argentine technologies analyzed, the respective costs per hundredweight of sunflower produced are remarkably similar ($4.09/cwt for average technology and $4.06/cwt for high technology). As a result of Argentina's higher yields, its production cost per hundredweight of sunflower is more than a third smaller than the U.S. production cost ($6.36/cwt). Overall, Argentina's major advantage stems from lower harvest machinery cost ($0.82/cwt of cost differential). Other clear sources of cost advantage for Argentina are seed (between $0.74/cwt and $0.53/cwt of cost differential), and pre-harvest machinery (between $0.29/cwt and $0.39/cwt of cost differential).

The per-acre rental rate for planting sunflower in the United States ($46.20/acre) is almost the same as for Argentina's high technology ($44.55/acre), but about 25 percent higher than for Argentina's average technology ($36.45/acre). However, the value per acre of land used to produce sunflower in the United States ($565/acre) is about ten percent lower than in Argentina ($627.75).

Given the higher yields in Argentina, the cost of land rental per hundredweight of sunflower in the United States ($3.23/cwt) is between 43 percent ($2.26/cwt for average technology) and 62 percent ($2.00/cwt for high technology) more expensive than in Argentina. Similarly, Argentina's higher yields cause its land values per hundredweight of sunflower produced ($38.99/cwt for average technology and $28.15/cwt for high technology) to be less expensive than in the United States ($39.51/cwt).

Cattle Production

Some of the key statistics regarding cattle production in the United States and Argentina are displayed in Table A.15. Cattle numbers in the United Sates are about twice as large as in Argentina. Further, the extraction rate in the United States (approximately one-third of inventory) is significantly higher than in Argentina (about one-fourth of inventory). As a consequence, cattle production in the U.S.—as measured by cattle slaughtered—is almost three times as high as in Argentina.

The noticeable contrast between the United States and Argentine extraction rates reported in Table A.15 is largely due to the differences in the systems of beef production employed in the two countries. As mentioned earlier, most (over 97 percent) of Argentina's beef is produced from cattle that are grazed on pastures, in a joint system of production that involves crop rotations. Since fattening via grazing takes considerably longer than fattening via feedlots, the extraction rates in grazing systems are characteristically smaller relative to production based on feedlots.

Five regions can be clearly identified for the purpose of analyzing the location of cattle production in Argentina (*La Integración de la Ganadería Argentina*). Such regions are outlined in Figure A.13. A comparison of Figure A.13 with Figures A.1 through A.4 reveals that cattle Region I overlaps almost entirely with the major crop-producing regions. Coincidentally, Region I is also the major cattle-producing area. Region I accounts for approximately 62 percent of Argentina's total cattle numbers and 80 percent of Argentina's total cattle slaughter. Argentina's second major cattle-producing area is

Region II, with about 23 percent of the total inventory. However, less than 10 percent of the total cattle slaughter in Argentina occurs in Region II. The main reason for the discrepancies between inventory and slaughter across regions is that Region I specializes in fattening and Region II in cow-calf operations. As a result, there are major movements of feeder cattle from Region I to Region II. Cattle production systems differ across Regions III through V, but their relevance is limited because together they only account for 15 percent of the cattle inventory and 12 percent of the slaughter.

In the United States, cattle production also tends to be concentrated geographically (see Figure A.13). The states with the largest cattle numbers are, in decreasing order, Texas, Nebraska, Kansas, and Oklahoma (*Agricultural Statistics*). These four states account for one-third of the U.S. cattle numbers, and for one-half of the U.S. number of steers. In terms of production, the most important states in decreasing order are Texas, Nebraska, Kansas, Colorado, and Oklahoma. These five states also receive the largest inflows of feeder cattle, and altogether produce about 45 percent of the U.S. beef output.

Compared to Argentina, the location of cattle production in the United States overlaps much less with the crop-producing regions (compare Figure A.13 with Figures A.1 through A.4). Again, this is not surprising, given the substantial differences in the production systems employed in the two countries. Such differences make it very difficult to compare the costs of cattle production between the two countries.

With this caveat in mind, a comparative summary of the costs of cattle feeding, along with some key technology parameters, is provided in Table A.16. Not surprisingly, the most significant difference in feeding costs is due to feed. In the United Sates, it costs $28.35 to achieve a gain of 100 lbs, whereas in Argentina it only costs $16.66 with average technology. This cost difference is due to the direct grazing of pastures in Argentina. The downside of grazing is the low rate of weight gain, as a typical steer only gains one pound per day in Argentina, compared to 3.33 pounds per day in the United States. Also worth noting are the significant differences in the initial and final weights of the cattle fed in Argentina and in the United States. The cattle fed in the United States are heavier, again due to the feed being used. Because of the differences in initial and final weights, and in gain rates, the fattening cycle in Argentina (18.4 months) is more than four times longer than in the United States (4 months).

Hog Production

Hog production in Argentina is also mostly concentrated in the agricultural region depicted in Figure A.14. Approximately three-fourths of Argentina's hogs are produced in this region. In the United States, most of the hog production takes place in the corn-belt and in North Carolina (see Figure A.14). In decreasing order of importance, the major hog-producing states are Iowa, North Carolina, Minnesota, Illinois, and Indiana. In 1998, 64 percent of all of the U.S. hogs were located in these five states.

The technology used to produce hogs in Argentina is quite rudimentary when compared to the United States. For example, although fattening of barrows usually takes place in some kind of confinement, hogs in Argentina are fed in pastures at other stages of their lives. Unlike cattle, hog production cannot be considered a complementary activity to crop production in Argentina. This, along with the fact that Argentineans exhibit a strong preference for beef over pork, is a major reason that the hog industry does not play an important role in Argentina's agricultural sector.

The comparison between key output statistics for the United States and Argentina, reported in Table A.17, is quite revealing of the sizeable differences between the hog sectors in the two countries. On average, since 1990 the total number of hogs in the United States has been more than 20 times the total number of hogs in Argentina. Further, the average number of hogs slaughtered in the United States has been almost 50 times as large as the number of hogs slaughtered in Argentina. The significant gap between the extraction rates is a direct consequence of the low level of technology used to raise hogs in Argentina.

Table A.1. Summary figures of the farm sectors of the U.S. and Argentina

	U.S.	Argentina
Farms (thousands)	2,000	380
Total farm area (millions of acres)	942	441
Average farm size (acres/farm)	471	1,160

Source: *Agricultural Statistics* and *Encuesta Nacional Agropecuaria* 1995.

Table A.2. Percentage of areas planted with corn and wheat receiving fertilizer applications in the U.S. and Argentina

Crop Years	Corn (percent)		Wheat (percent)	
	U.S.	Argentina	U.S.	Argentina
1994/95	99	31	89	51
1995/96	99	36	89	51
1996/97	99	46	89	65

Source: *Agricultural Statistics* and *Argentina Agricultural, Agroindustrial and Fishing*.

Table A.3. Average crop yields in the U.S. and Argentina, 1991/92–1999/00

	U.S.	Argentina
Corn (bu/acre)	124.0	74.8
Soybeans (bu/acre)	37.0	36.5
Wheat (bu/acre)	38.5	33.3
Sunflower (cwt/acre)	13.2	15.5

Source: Prepared from data published by the USDA.

Table A.4. Average corn and wheat yields in the U.S. and Argentina

Crop Years	Average Corn Yield (bu/acre)		Average Wheat Yield (bu/acre)	
	U.S.	Argentina	U.S.	Argentina
1991/92–1993/94	113.6	67.7	37.3	32.3
1994/95–1996/97	126.4	69.7	36.5	31.6
1997/98–1999/00	131.9	87.1	41.8	35.9

Source: Prepared from data published by the USDA.

Table A.5. Annual meat consumption in the U.S. and Argentina (pounds per capita)

Year	Beef		Pork		Poultry	
	U.S.	Argentina	U.S.	Argentina	U.S.	Argentina
1991	63	150	47	10	58	26
1992	63	146	50	13	61	39
1993	62	148	49	14	62	46
1994	64	139	50	13	63	47
1995	64	124	49	14	63	48
1996	65	123	47	15	64	47

Source: *Agricultural Statistics* and *Argentina Agricultural, Agroindustrial and Fishing*.

Table A.6. Area harvested, production, and yield of corn in the U.S. and Argentina

Crop Years	Area Harvested (million acres)		Yield (bu/acre)		Production (million bushels)	
	U.S.	Argentina	U.S.	Argentina	U.S.	Argentina
1991/92	68.8	5.9	108.6	70.4	7,475	417
1992/93	72.1	6.1	131.5	66.3	9,477	402
1993/94	62.9	5.9	100.7	66.4	6,338	394
1994/95	72.5	6.3	138.6	71.0	10,050	447
1995/96	65.2	6.7	113.5	65.5	7,400	437
1996/97	72.6	8.4	127.1	72.6	9,233	610
1997/98	72.7	7.8	126.7	97.1	9,207	762
1998/99	72.6	6.3	134.4	84.3	9,761	531
1999/00	70.9	7.7	134.5	79.7	9,537	610

Source: *Grains: World Markets and Trade*.

Table A.7. Corn costs of production in the U.S. and Argentina

Input	Cost of Production ($/acre)			Cost of Production ($/bu)		
	U.S. (130 bu/acre)	Argentina Average Technology (80 bu/acre)	Argentina High Technology (140 bu/acre)	U.S. (130 bu/acre)	Argentina Average Technology (80 bu/acre)	Argentina High Technology (140 bu/acre)
Pre-harvest machinery	31	24	33	0.24	0.30	0.23
Seed	26	25	28	0.20	0.31	0.20
Fertilizer	45	0	22	0.35	0.00	0.16
Herbicide	30	8	11	0.23	0.10	0.08
Insecticide	7	0	1	0.05	0.00	0.01
Harvest machinery	57	38	66	0.44	0.47	0.47
TOTAL	**197**	**95**	**161**	**1.51**	**1.19**	**1.15**
Land rent	127	41	64	0.98	0.51	0.45
Land value	2,280	1,620	1,620	17.54	20.25	11.57

Note: The locations considered are Iowa for the U.S. and Northern Province of Buenos Aires/Southern Province of Santa Fe for Argentina. All budgets assume non-irrigated crops. Crop budgets were prepared with information available as of January, 2000, and October, 1999, for the U.S. and Argentina, respectively.
Source: Prepared from data reported in Duffy and Vontalge, and *Márgenes Agropecuarios*.

Table A.8. Area harvested, production, and yield of soybeans in the U.S. and Argentina

Crop Years	Area Harvested (million acres)		Yield (bu/acre)		Production (million bushels)	
	U.S.	Argentina	U.S.	Argentina	U.S.	Argentina
1991/92	58.0	11.7	34.2	34.9	1,987	410
1992/93	58.2	11.9	37.6	35.2	2,190	417
1993/94	57.3	12.1	32.7	37.6	1,870	456
1994/95	60.8	13.3	41.4	34.4	2,515	459
1995/96	61.5	14.1	35.4	32.4	2,174	457
1996/97	63.3	14.8	37.6	27.9	2,380	412
1997/98	69.1	15.3	38.9	46.8	2,689	717
1998/99	70.4	17.2	38.9	42.6	2,741	731
1999/00	72.8	18.5	36.7	36.7	2,673	680

Source: *Oilseeds: World Markets and Trade*.

Table A.9. Soybean costs of production in the U.S.

Input	Cost of Production ($/acre)		Cost of Production ($/bushel)	
	Conventional Tillage (45 bu/acre)	**No-Till (45 bu/acre)**	**Conventional Tillage (45 bu/acre)**	**No-Till (45 bu/acre)**
Pre-harvest machinery	31.95	18.52	0.71	0.41
Seed	18.00	21.00	0.40	0.47
Fertilizer	25.25	25.25	0.56	0.56
Herbicide	30.00	35.00	0.67	0.78
Insecticide	0.00	0.00	0.00	0.00
Harvest machinery	29.40	28.52	0.65	0.63
TOTAL	**134.60**	**128.29**	**2.99**	**2.85**
Land rent	125.00	125.00	2.78	2.78
Land value	2,200.00	2,200.00	48.89	48.89

Note: The location assumed is Iowa for both technologies. All budgets assume non-irrigated crops. Crop budgets were prepared with information available as of January, 2000.
Source: Prepared from data reported in Duffy and Vontalge.

Table A.10. Soybean costs of production in Argentina

Input	Cost of Production ($/acre)			Cost of Production ($/bu)		
	Average Technology (33 bu/acre)	**High Technology (50 bu/acre)**	**Second Crop (28 bu/acre)**	**Average Technology (33 bu/acre)**	**High Technology (50 bu/acre)**	**Second Crop (28 bu/acre)**
Pre-harvest machinery	28.34	15.66	13.11	0.86	0.31	0.47
Seed	12.11	14.08	24.22	0.37	0.28	0.86
Fertilizer	0.00	5.83	0.00	0.00	0.12	0.00
Herbicide	10.75	16.67	7.94	0.33	0.33	0.28
Insecticide	2.83	6.23	3.54	0.09	0.12	0.13
Harvest machinery	24.91	37.75	21.14	0.75	0.75	0.75
TOTAL	**78.94**	**96.23**	**69.95**	**2.39**	**1.92**	**2.50**
Land rent	42.09	52.61	25.90	1.28	1.05	0.93
Land value	1,620.00	1,620.00	1,620.00	49.09	32.40	57.86

Note: The location assumed is Northern Province of Buenos Aires for the three technologies. All budgets assume non-irrigated crops. Crop budgets were prepared with information available as of October, 1999. Second crop denotes soybeans planted after harvesting wheat in the same crop year.
Source: Prepared from data reported in *Márgenes Agropecuarios*.

Table A.11. Area harvested, production, and yield of wheat in the U.S. and Argentina

Crop Years	Area Harvested (million acres)		Yield (bu/acre)		Production (million bushels)	
	U.S.	**Argentina**	**U.S.**	**Argentina**	**U.S.**	**Argentina**
1991/92	57.8	11.2	34.3	32.3	1,980	363
1992/93	62.8	10.4	39.3	34.7	2,467	360
1993/94	62.7	11.9	38.2	30.0	2,396	356
1994/95	61.8	12.6	37.6	32.9	2,321	415
1995/96	61.0	11.1	35.8	28.4	2,183	316
1996/97	62.8	17.5	36.3	33.3	2,277	584
1997/98	62.8	14.1	39.5	38.6	2,481	544
1998/99	59.0	12.7	43.2	33.3	2,547	423
1999/00	54.1	14.3	42.7	35.9	2,308	514

Source: *Grains: World Markets and Trade*.

Table A.12. Wheat costs of production in the U.S. and Argentina

Input	Cost of Production ($/acre)			Cost of Production ($/bu)		
	U.S. (37 bu/acre)	Argentina Average Technology (38 bu/acre)	Argentina High Technology (60 bu/acre)	U.S. (37 bu/acre)	Argentina Average Technology (38 bu/acre)	Argentina High Technology (60 bu/acre)
Machinery	67.49	43.67	62.14	1.82	1.15	1.04
Seed	4.86	9.35	9.47	0.13	0.25	0.16
Fertilizer	15.80	13.60	24.97	0.43	0.36	0.42
Herbicide	8.36	1.62	1.62	0.23	0.04	0.03
Insecticide	0.00	0.00	0.45	0.00	0.00	0.01
Fungicide	0.00	0.00	12.55	0.00	0.00	0.21
TOTAL	**96.51**	**68.24**	**111.19**	**2.61**	**1.80**	**1.85**
Land rent	36.00	27.11	34.80	0.97	0.71	0.58
Land value	650.00	526.10	526.10	17.57	13.84	8.77

Note: The locations considered are South-Central Kansas for the U.S. and Southeastern Province of Buenos Aires for Argentina. All budgets assume non-irrigated crops. Crop budgets were prepared with information available as of October, 1999, for both countries.
Source: Prepared from data reported in Dhuyvetter and Kastens, Warmann, and *Márgenes Agropecuarios*.

Table A.13. Area harvested, production, and yield of sunflower in the U.S. and Argentina

Crop Years	Area Harvested (million acres)		Yield (cwt/acre)		Production (million pounds)	
	U.S.	Argentina	U.S.	Argentina	U.S.	Argentina
1991/92	1.4	6.9	12.1	12.1	1,618	8,379
1992/93	2.3	5.7	13.6	12.0	3,028	6,836
1993/94	1.9	5.1	12.5	16.6	2,236	8,489
1994/95	2.3	6.9	10.4	18.8	2,160	13,010
1995/96	3.0	7.9	14.4	15.6	4,224	12,348
1996/97	2.9	7.2	12.0	16.6	3,398	11,907
1997/98	2.0	8.2	14.7	14.7	2,844	12,128
1998/99	2.3	9.3	13.5	16.2	2,986	14,994
1999/00	2.9	8.5	15.5	16.6	4,459	14,112

Note: U.S. statistics exclude non-oil varieties of sunflower.
Source: *Agricultural Statistics* and *Oilseeds: World Markets and Trade*.

Table A.14. Sunflower costs of production in the U.S. and Argentina

Input	Cost of Production ($/acre)			Cost of Production ($/cwt)		
	U.S. (14.3 cwt/acre)	Argentina Average Technology (16.1 cwt/acre)	Argentina High Technology (22.3 cwt/acre)	U.S. (14.3 cwt/acre)	Argentina Average Technology (16.1 cwt/acre)	Argentina High Technology (22.3 cwt/acre)
Pre-harvest machinery	26.12	24.77	32.05	1.83	1.54	1.44
Seed	14.72	7.98	6.39	1.03	0.50	0.29
Fertilizer	11.57	0.00	15.05	0.81	0.00	0.68
Herbicide	6.54	10.32	10.32	0.46	0.64	0.46
Insecticide	3.60	4.15	0.77	0.25	0.26	0.03
Harvest machinery	28.35	18.63	25.87	1.98	1.16	1.16
TOTAL	**90.90**	**65.85**	**90.46**	**6.36**	**4.09**	**4.06**
Land rent	46.20	36.45	44.55	3.23	2.26	2.00
Land value	565.00	627.75	627.75	39.51	38.99	28.15

Note: The locations considered are Northeastern South Dakota for the U.S. and Western Province of Buenos Aires for Argentina. All budgets assume non-irrigated crops. Crop budgets were prepared with information available as of July, 1999, and October, 1999, for the U.S. and Argentina, respectively.
Source: Prepared from data reported in Pflueger and Janssen, Peterson, and *Márgenes Agropecuarios*.

Table A.15. Total cattle numbers, cattle slaughtered, and extraction ratios in the U.S. and Argentina

Crop Year	Total Cattle Numbers (millions)		Total Cattle Slaughter (million heads)		Extraction Ratios (percent)	
	U.S.	Argentina	U.S.	Argentina	U.S.	Argentina
1990	95.8	51.6	34.1	13.4	35.6	26.0
1991	96.4	51.9	33.4	13.8	34.7	26.6
1992	97.6	53.0	32.9	12.8	33.7	24.2
1993	99.2	52.7	33.1	13.2	33.3	25.1
1994	101.0	53.2	33.5	13.2	33.2	24.8
1995	102.8	52.6	34.4	12.9	33.4	24.4
1996	103.5	50.8	35.8	12.9	34.6	25.4
1997	101.7	50.1	36.8	12.8	36.2	25.6
1998	99.7	48.1	36.5	11.3	36.6	23.5

Source: *Agricultural Statistics* for the U.S., and *Panorama Ganadero* and *Series Históricas - Ganadería* for Argentina.

Table A.16. Costs of cattle feeding in the U.S. and Argentina

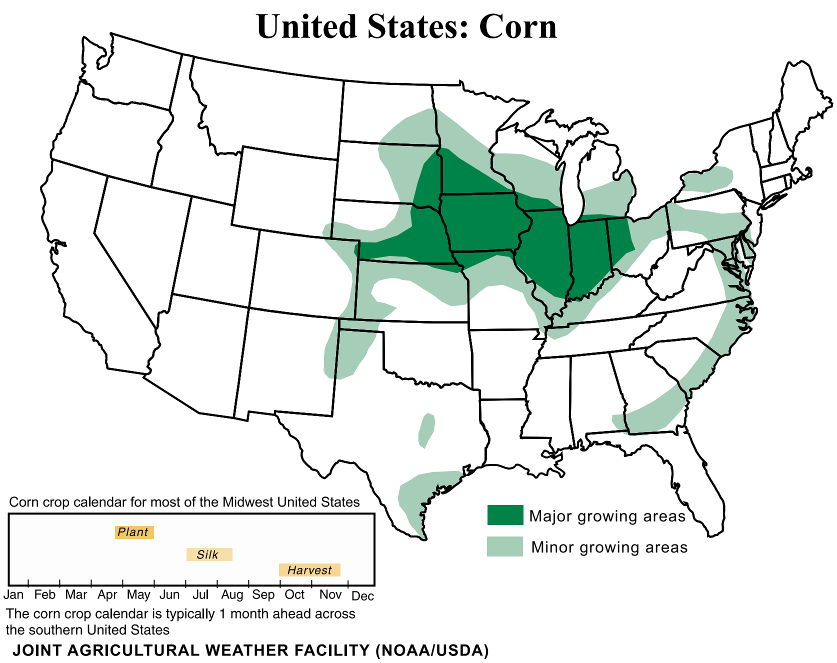
	Cost of Production ($/cwt of weight gain)		
	U.S.	Argentina Average Technology	Argentina Average-to-High Technology
Feed costs ($/cwt of weight gain)	28.35	16.66	22.65
Other variable costs excluding interest ($/cwt of weight gain)	1.34	4.14	3.52
TOTAL VAR. COSTS EXCL. INTEREST ($/cwt of weight gain)	**29.69**	**20.80**	**26.17**
Initial weight per head (lb/head)	750	397	397
Final weight per head (lb/head)	1,150	970	970
Total gain per head (lb/head)	400	573	573
Length of feeding cycle (months)	4	18.4	15.6
Daily gain per head (lb/day/head)	3.33	1.00	1.23

Note: The locations considered are High Plains for the U.S. and Western Province of Buenos Aires for Argentina. Budgets were prepared with information available as of May, 1999.
Source: Prepared from data reported in *Livestock, Dairy and Poultry: Situation and Outlook*, and *Márgenes Agropecuarios*.

Table A.17. Total number of hogs, hogs slaughtered, and extraction ratios in the U.S. and Argentina

Crop Year	Total Number of Hogs (millions)		Hogs Slaughtered (million heads)		Extraction Ratios (percent)	
	U.S.	Argentina	U.S.	Argentina	U.S.	Argentina
1990	54.4	2.7	85.4	1.7	157.0	63.0
1991	57.6	2.7	88.4	1.7	153.4	62.2
1992	58.2	3.0	95.2	1.9	163.5	62.7
1993	57.9	3.4	93.3	2.1	161.0	62.1
1994	59.7	3.4	95.9	2.1	160.5	62.4
1995	58.2	3.0	96.5	2.3	165.9	75.0
1996	56.1	2.2	92.6	1.9	164.9	86.8
1997	61.2	2.0	92.1	1.7	150.6	87.0
1998	62.2	Not available	101.2	1.8	162.8	Not available

Source: *Agricultural Statistics* for the U.S., and *Argentina Agricultural, Agroindustrial and Fishing* and *La Siembra y la Cosecha* for Argentina.



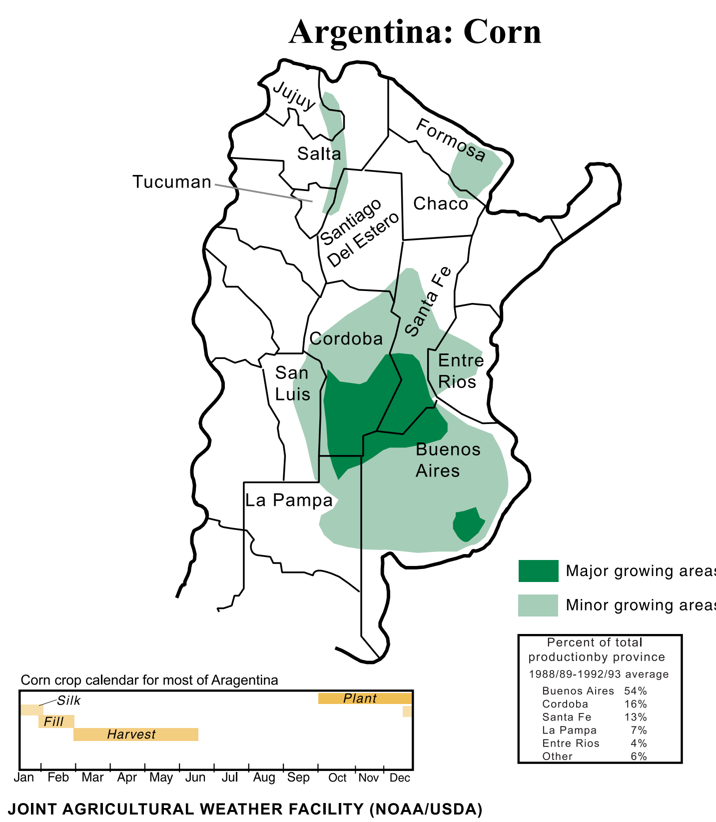


Figure A.1. Corn production areas in the U.S. and Argentina

Source*: Major World Crop Areas and Climatic Profiles Online Version.*

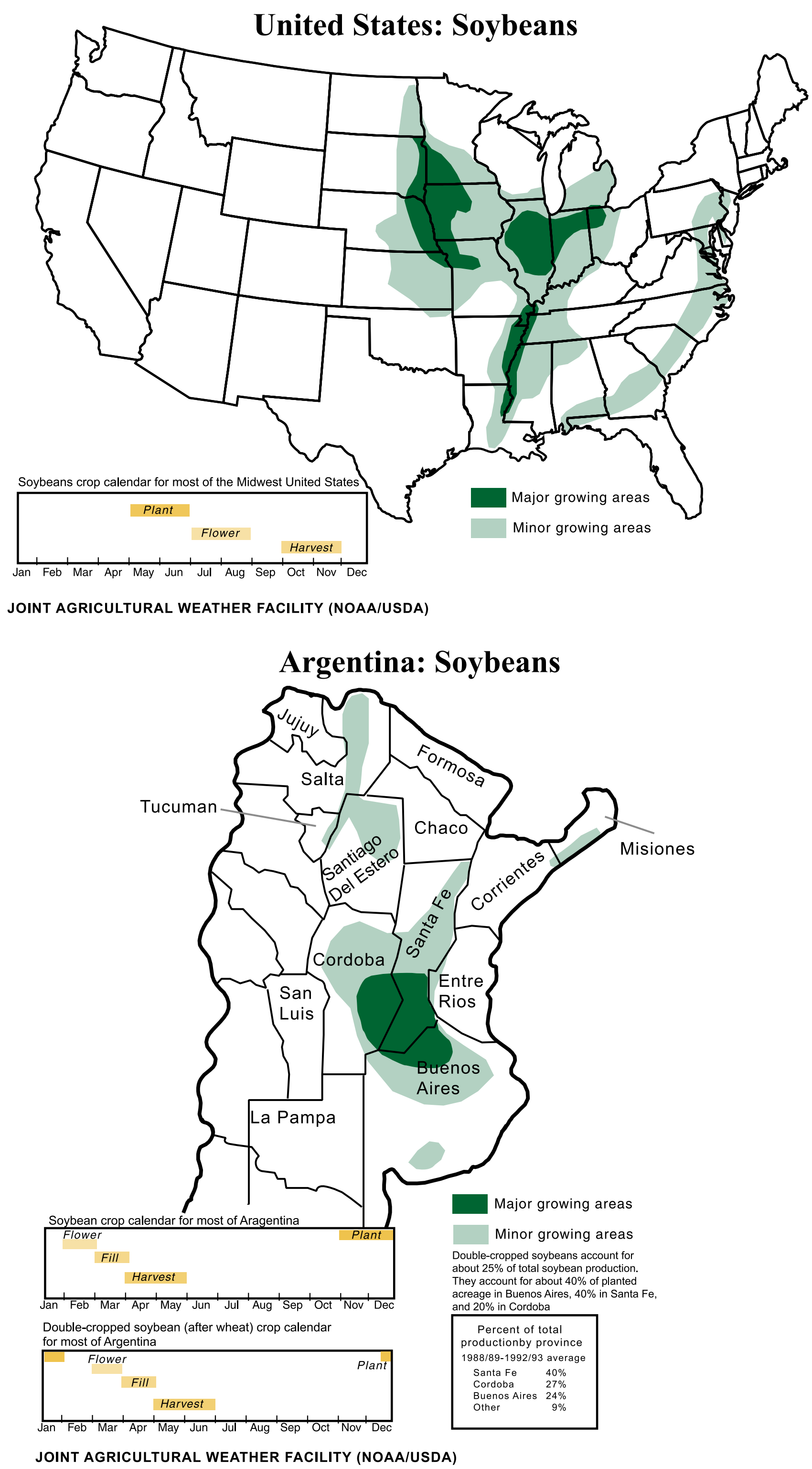
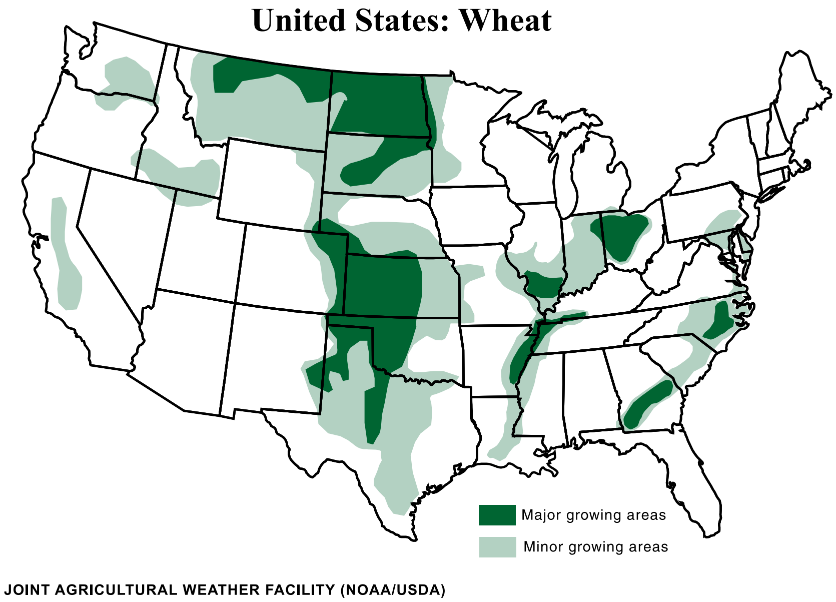


Figure A.2. Soybean production areas in the U.S. and Argentina

Source*: Major World Crop Areas and Climatic Profiles Online Version.*



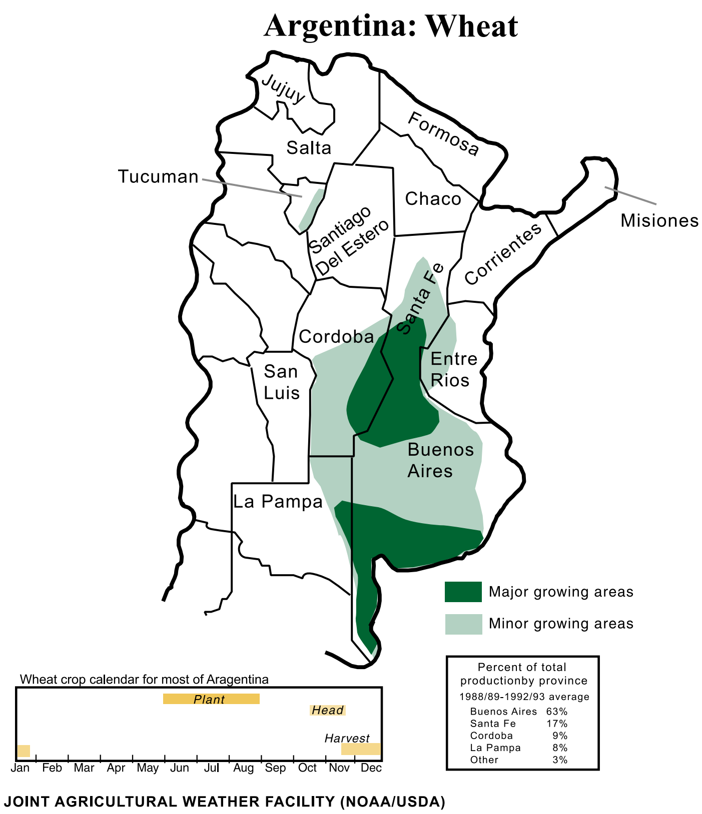
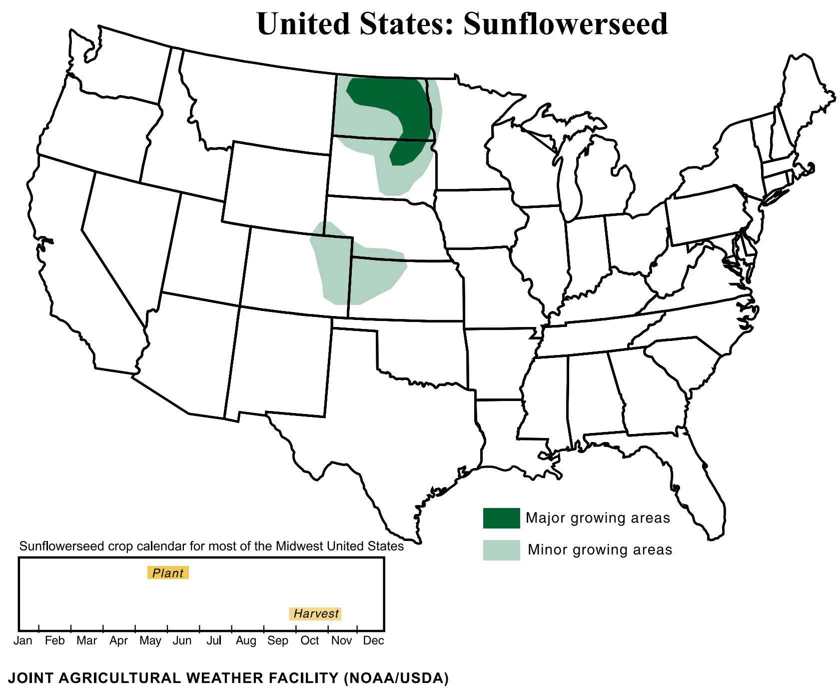


Figure A.3. Wheat production areas in the U.S. and Argentina

Source*: Major World Crop Areas and Climatic Profiles Online Version.*



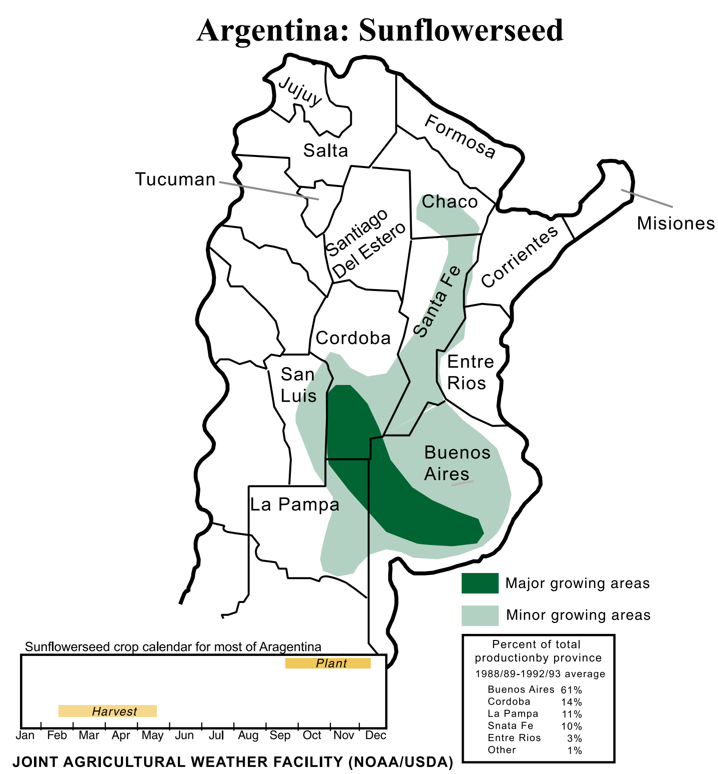


Figure A.4. Sunflower production areas in the U.S. and Argentina
Source*: Major World Crop Areas and Climatic Profiles Online Version.*

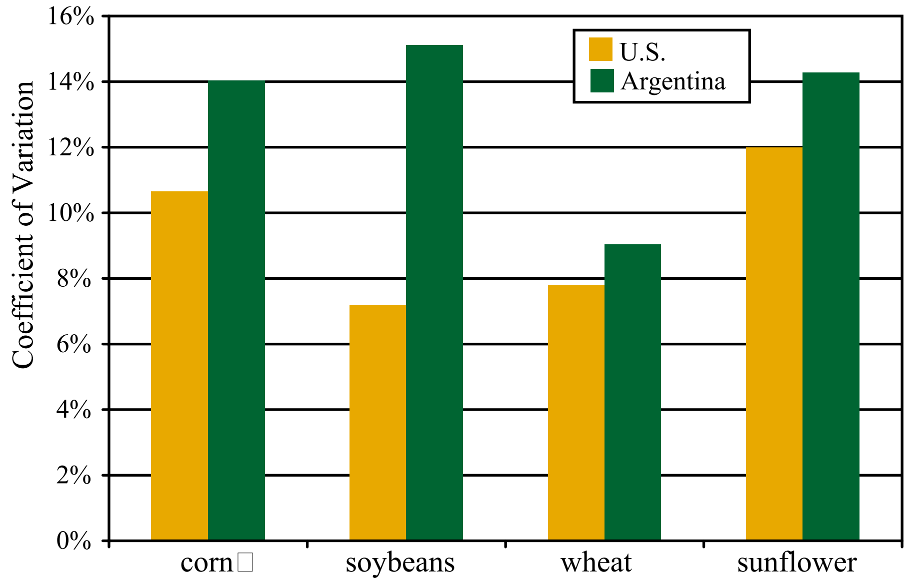


Figure A.5. Coefficient of variation of yields, 1991/92–1900/00
Source: Prepared from data published in *Agricultural Statistics*, *Grains: World Markets and Trade* and *Oilseeds: World Markets and Trade*.

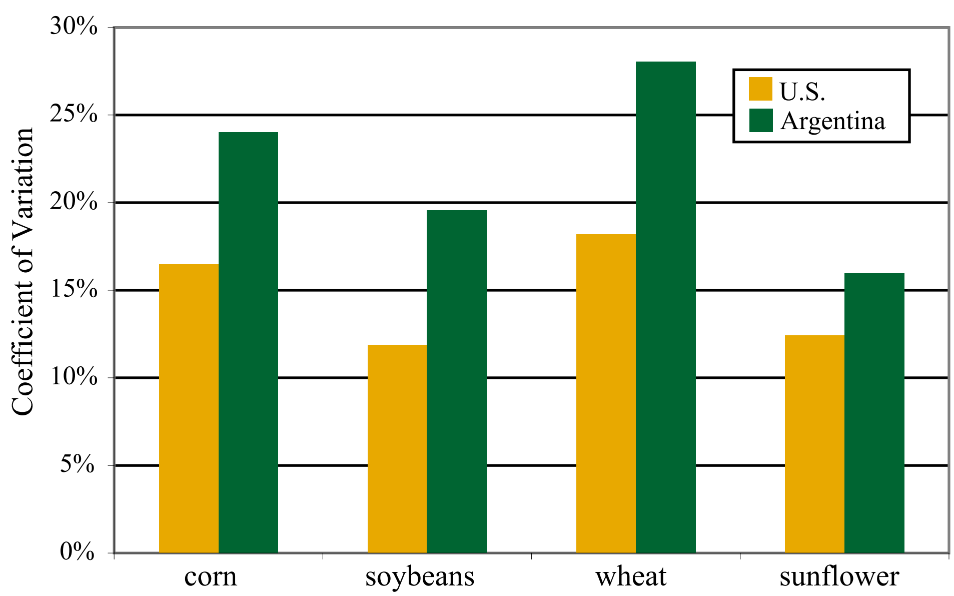


Figure A.6. Coefficient of variation of prices received by farmers, 1991-92–1999/00
Source: Prepared from data published in *Agricultural Statistics*, *Agricultural Statistics* and *Márgenes Agropecuarios.*

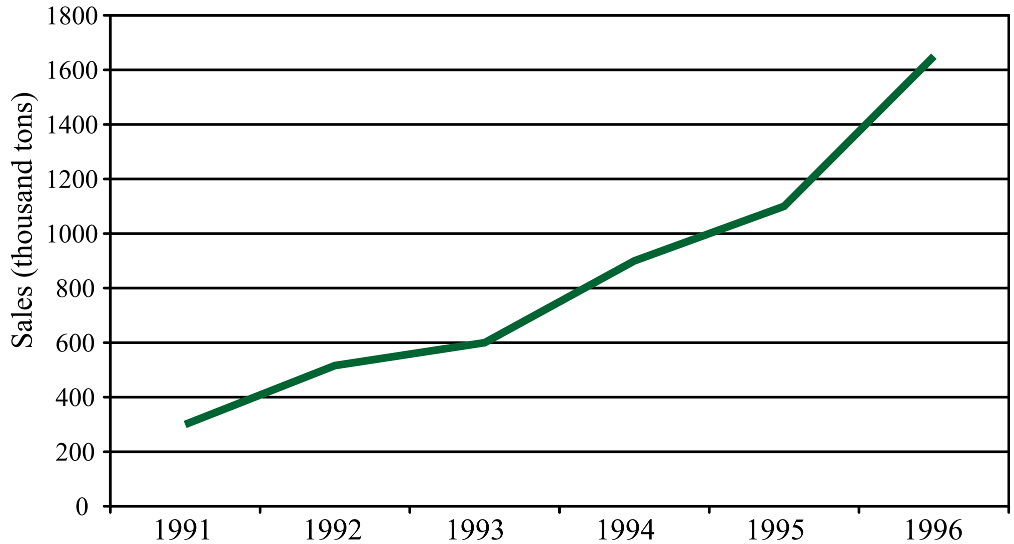


Figure A.7. Fertilizer sales in Argentina, 1991-96
Source: Prepared from data published in *Argentina Agricultural, Agroindustrial and Fishing*.

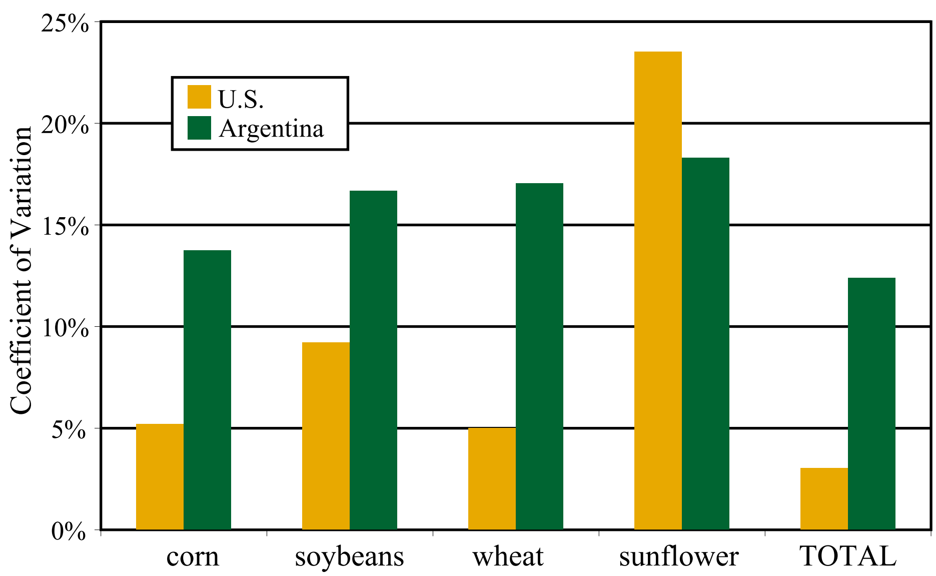


Figure A.8. Coefficient of variation of area cultivated, 1991/92–1999/00
Source: Prepared from data published in *Agricultural Statistics,* and *Argentina Agricultural, Agroindustrial and Fishing.*
Note: “TOTAL” figures correspond to 1990/91–1996/97 for Argentina,and 1993/94–1999/00 for the United States

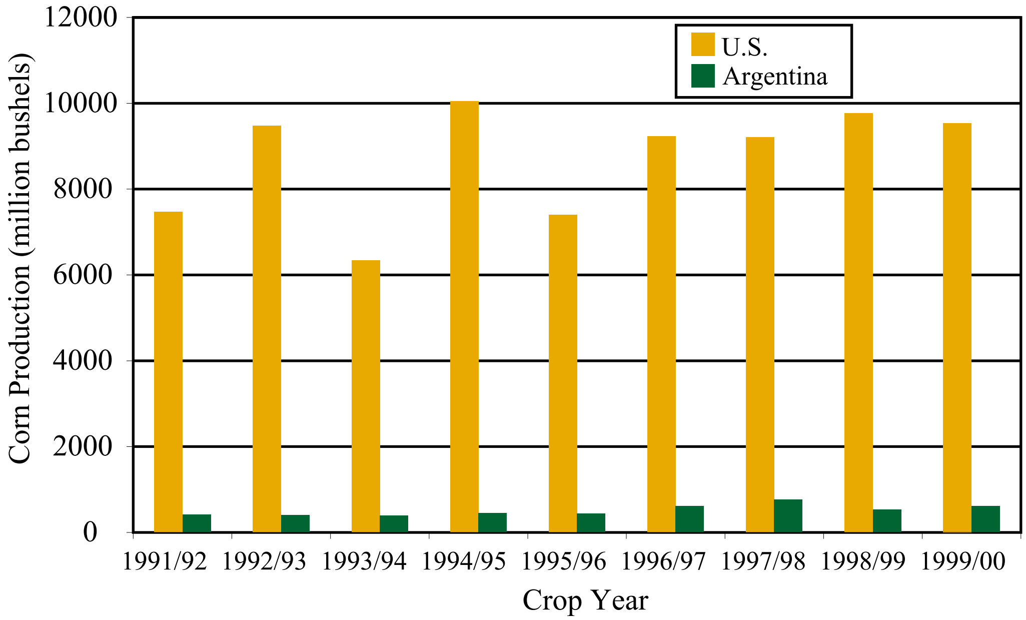


Figure A.9. Corn production in the U.S. and Argentina
Source: Prepared from data published in *Grains: World Markets and Trade.*

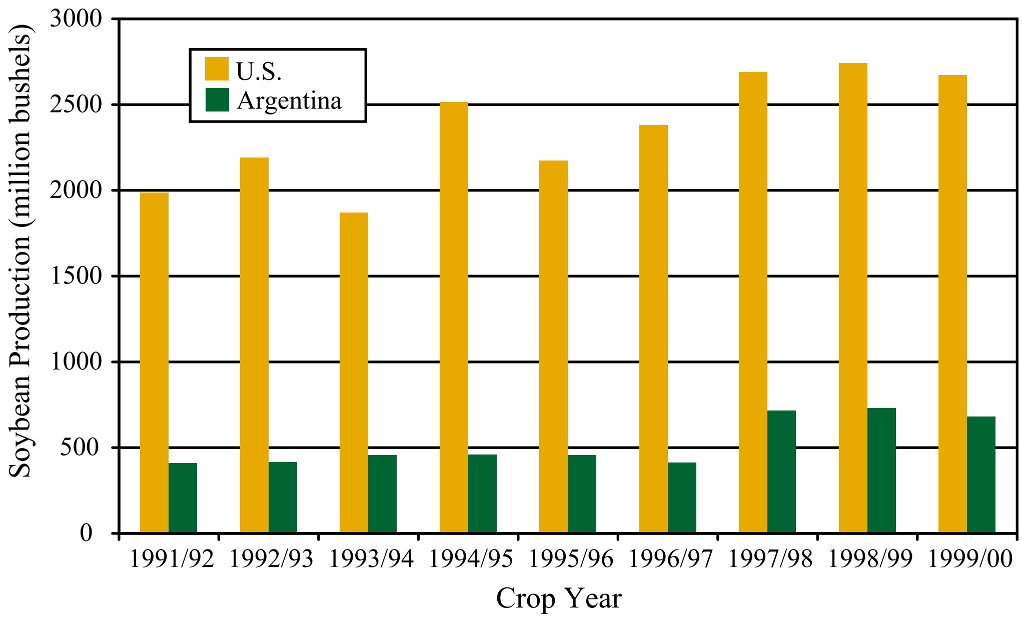


Figure A.10. Soybean productin in the U.S. and Argentina
Source: Prepared from data published in *Oilseeds: World Markets and Trade.*

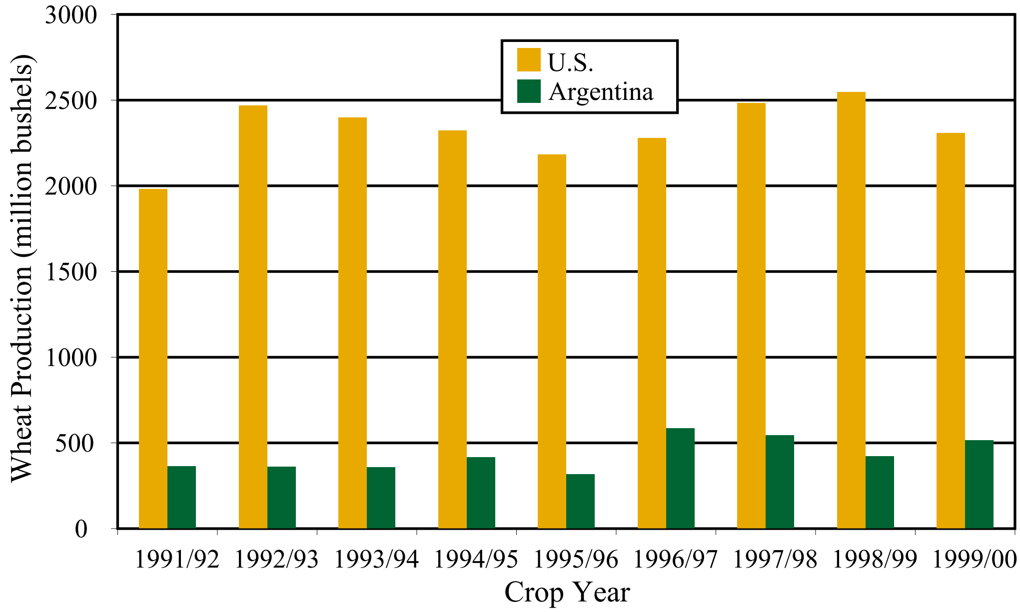


Figure A.11. Wheat production in the U.S. and Argentina
Source: Prepared from data published in *Grains: World Markets and Trade.*

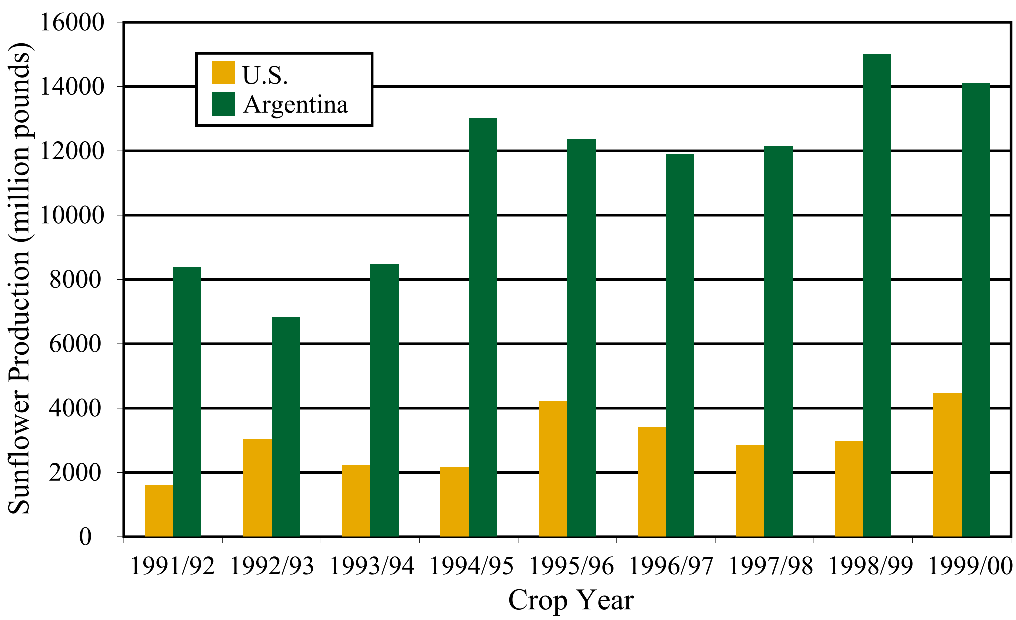
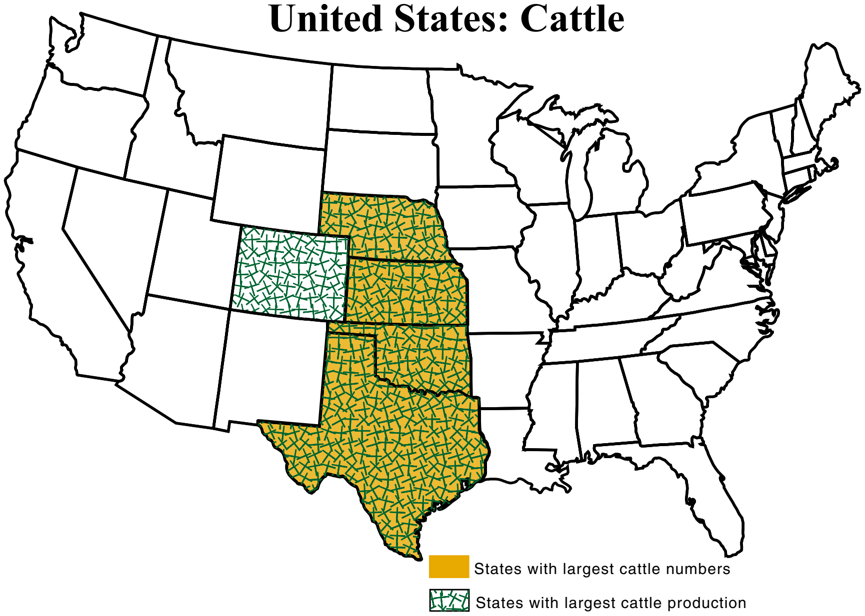


Figure A.12. Sunflower production in the U.S. and Argentina
Source: Prepared from data published in *Agricultural Statistics* and *Oilseeds: World Markets and Trade.*

United States: Cattle



Argentina: Cattle

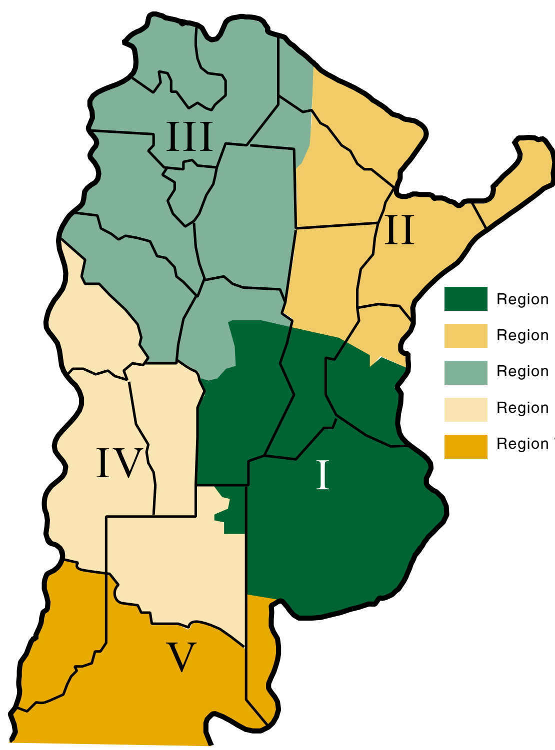


Figure A. 13. Cattle production areas in the U.S. and Argentina

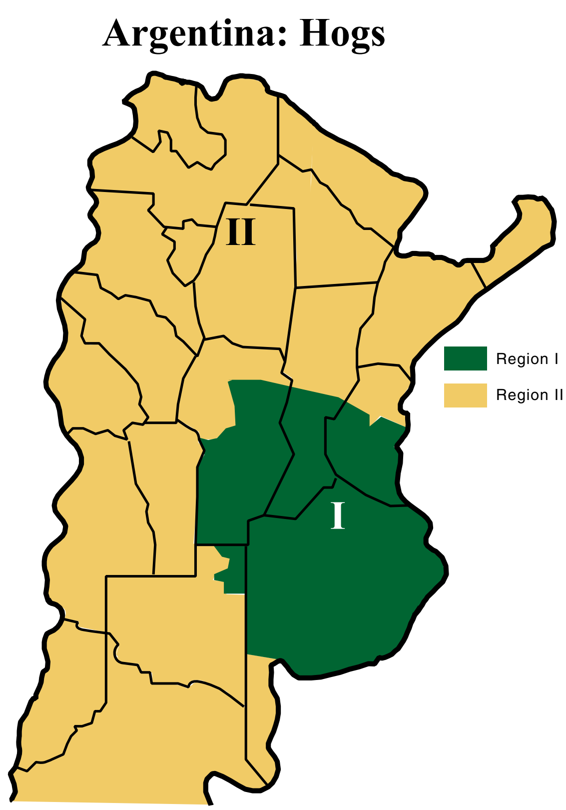


Figure A.14. Hog production areas in the U.S. and Argentina

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SECTION B. MARKETING CHANNELS FOR GRAINS

A schematic representation of the physical flows through the marketing channel for grains is provided in Figure B.1. This figure characterizes the similar physical flow of grains for both the United States and Argentina. It must be noted, however, that despite similarities in grain flow paths, the countries exhibit important differences in the relative importance of their specific flows, in how their institutions facilitate commerce, in their price-discovery mechanisms, in their commercialization costs, and in the ways in which governments intervene.

Physical Flows

The physical flow of grain starts at the farm level. Immediately after harvest, a farmer has the option to either (a) store the grain on-farm for later on-farm consumption or commercialization, or (b) ship it to a country elevator or to a terminal elevator. At this stage, a key difference is that, in relative terms, on-farm storage capacity in Argentina is much smaller than in the United States. Another contrast is that on-farm grain consumption is quite small in Argentina compared to the United States, because Argentina's beef production is not conducted in feedlots and its pork production is negligible.

There is a large difference in storage capacity between the countries in absolute terms (Table B.1). This is to be expected, given the sizeable differences between them in terms of production levels (see, for example, Figures A.9 through A.12). Total storage capacity in Argentina (1.76 billion bushels) is only 9.1 percent of U.S. total storage capacity (19.32 billion bushels). Further, the relative difference is even larger at the farm level, as Argentina's on-farm storage capacity (0.49 billion bushels) represents barely 4.5 percent of the United States on-farm storage capacity (10.95 billion bushels). This is a reflection of the significant differences in the relative location of storage capacity between the two countries. In Argentina, 27.8 (72.2) percent of the storage capacity is on-farm (off-farm), compared to 56.7 (43.3) percent in the United States.

Table B.1 shows that storage capacity in Argentina is less available than in the United States in relative terms, as well. Argentina is able to store up to 91.8 percent of its average total annual crop output, whereas the United States can store up to 128 percent of its average annual harvest. The most striking difference, however, is at the on-farm level. Only one-quarter of the average annual production can be stored on-farm in Argentina, compared to almost three-quarters in the United States. As a result, on-farm grain storage is not a viable option for most Argentine farmers, and they typically must ship their grain to a local country elevator as soon as possible.

Other important differences arise when grain is shipped from the farm to the country elevator. First, the roads linking the farms to the country elevator in Argentina are dirt roads, which are usually poorly maintained and quickly become unusable on rainy days. Second, the typical Argentine farmer does not own trucks or similar vehicles suitable to transport grain from the farm to the country elevator, which is located at an average distance of 15 to 20 miles from the farm. Independent truckers transport the grain from the farm to the country elevator. Because of this, farmers have to pay independent truckers a sizable amount in transportation charges for this short haul, on the order of $0.12/bu for corn and $0.13/bu for soybeans and wheat for an 18-mile trip (*Márgenes Agropecuarios*). By comparison, the analogous hauling charges used in the U.S. crop budgets discussed in the “Agricultural Production” section (see Tables A.7 and A.9) are $0.03/bu for corn and soybeans.

In summary, the farm-country elevator stage of Argentina’s commercialization channel is characterized by (a) little on-farm grain storage capacity, (b) grain hauling not performed by farmers, and (c) country roads in poor conditions. As a consequence, there is a significant bottleneck at this stage of the physical grain flow. From a competitive standpoint, this stage is a source of a clear disadvantage for the Argentine marketing channel vis-à-vis that of the United States.

Most of the grain flows from the farm to a local country elevator. Country elevators’ activities consist of conditioning the grain (e.g., drying and sieving), storing the grain, and coordinating transportation. These activities are of particular relevance for the Argentine marketing channel because, as pointed out earlier, the typical Argentine farmer has no storage capacity or owns no type of grain-handling facility. In Argentina, grain drying is typically done by country elevators instead of farmers. Usually, Argentine country elevators charge $0.10/bu to reduce corn moisture by 3 percentage points, which represents a typical drying operation (*Márgenes Agropecuarios*). By comparison, the drying charge used in the U.S. corn budget reported in Table A.7 is $0.15/bu. Country elevators also grade and commingle the grain, to form large batches of similar quality to be hauled downstream in the marketing channel to processors and/or exporters. In addition, country elevators in Argentina often own and operate small fleets of trucks to haul grain.

Country elevators are of three types: independent elevators, cooperative elevators, and line elevators. Independent elevators are operated and controlled by their individual owners. Cooperative elevators are owned by farmers in their geographic area of influence and organized as a cooperative. Finally, line elevators are part of a group of elevators owned and operated as a chain by a major corporation, which is involved in other steps of the marketing channel (e.g., milling, exports, etc.). Again, at this stage there are important differences between Argentina and the United States. First, most of the grain flows through independent elevators in Argentina, whereas cooperative elevators handle most of the grain in the United States. Second, storage capacity is more restrictive for country elevators in Argentina than in the United States.[1] Evidence in this regard is the much higher annual storage turnover rate that characterizes country elevators in Argentina. Turnover rate is volume through put divided by storage capacity (tons or bushels).

The constraints in storage capacity faced by Argentine country elevators translate into noticeably high seasonal fluctuations in demand for grain transportation downstream, to either processors or terminal port elevators. At harvest time, there is a significant pressure for transportation services, and the opposite is true towards the end of the

[1]The total storage capacity of country elevators in Argentina amounts to 693 million bushels, or 36 percent of the average annual grain and oilseed output over 1995/96–1997/98 (*Acopiadores de Granos en la Argentina*).

commercial year. The ensuing bottleneck at harvest time is another clear source of disadvantage for the marketing channel of Argentina compared to that of the United States.

The extreme seasonality of grain flows in Argentina compared to the United States is best illustrated by means of Figures B.2 and B.3. According to Figure B.2, over 20 percent of the annual exports of corn from Argentina occur in the second month of the commercial year, and fully one-half of the annual total is exported in the quarter beginning in that month. The lowest level of corn exports from Argentina takes place toward the end of the commercial year, when only 2 percent of the annual exports occur in a single month. In the United States, in contrast, neither more than 9 percent nor less than 7 percent of the annual corn exports take place in any single month.

Figure B.3 shows that export patterns are very similar for wheat. In Argentina, 21 percent of the annual shipments are done during the second month of the commercial year, and one-half of the annual exports occur in the first quarter of the commercial year. By the end of the year, barely 4 percent of the annual exports take place in any single month. Such seasonality is far greater than in the United States, where monthly wheat exports range from a peak of 11 percent early in the commercial year to a trough of 7 percent toward the end of the commercial year.

The problems associated with the sudden increase in demand for grain transportation services that occurs in Argentina at harvest time are compounded by Argentina's notorious lack of reliable rail freight services. For this reason, in Argentina most of the grain hauling (over 80 percent) downstream from the country elevators is performed by truck. In contrast, most of this transportation is done either by rail or barge in the United States. On a per-bushel basis, truck transportation is significantly more expensive than railroad or barge hauling. For example, in Argentina it costs \$0.70 (\$0.40) to transport one bushel of corn 300 (150) miles by truck, versus \$0.31 (\$0.24) to do so by rail (*Informe Mensual de Insumos Agrícolas*). Therefore, this is another important disadvantage for Argentina's marketing channel.

From the country elevators, grains flow either to processors or to terminal port elevators for shipment abroad. For grains that flow into processor facilities, the final destination may be either for domestic consumption or for export. After the country elevator stage, the relevance of each flow depends substantially on the specific grain analyzed. For this reason, such flows are discussed below separately for corn, soybeans, wheat, and sunflower.

Marketing Channels for Corn

Downstream from the country elevators, there are substantial differences in the relative importance of the physical corn flows observed in the United States and Argentina. Such differences are illustrated in Figure B.4. The major destination of Argentine corn is the export market, which accounts for around 60 percent of the total corn usage. In contrast, only 20 percent of U.S. corn is exported. Most U.S. corn (almost 60 percent) is used domestically for feeding purposes, whereas domestic feed takes about 30 percent of the corn output in Argentina. Domestic usage for non-feed purposes takes the smallest share of corn in both countries, at almost 20 percent for the United States and slightly over 10 percent for Argentina.

A natural advantage of Argentina for exporting purposes is that its ports are much closer to the major producing region. This is illustrated in Figure B.5. In Argentina, most of the corn is shipped abroad from the ports located on the Parana River (Secretaría de Agricultura, Ganadería, Pesca y Alimentación de la República Argentina). In 1997–1998, the ports of Rosario and San Lorenzo/San Martin accounted for 29 percent and 28 percent, respectively, of all corn exports. These ports were followed by Necochea, Bahia Blanca, and Buenos Aires, with 13 percent, 10 percent, and 7 percent, respectively, of all corn shipped during 1997–1998. The heart of the northernmost (southernmost) major corn producing area in Argentina, shown in Figure B.5, is about 140 (100) miles from the Rosario and San Lorenzo/San Martin (Necochea) ports.

In the United States, the Mississippi Gulf ports are by far the most active for corn shipments (*Grain Transportation Report*). In 1997–1998, 72 percent of U.S. corn exports were from the Mississippi Gulf ports, followed by 17 percent from ports in the Pacific region. The distance from North Central Iowa to the Mississippi Gulf (Pacific region) ports is about 1,000 (1,800) miles. Such distances are significantly greater than the corresponding distances in Argentina.

As illustrated in Figure B.6, the volume of U.S. corn exports is about six times the volume of corn exports from Argentina. However, the export differential is not nearly as substantial as the output differential (see Figure A.9) because Argentina exports a much larger share of its corn output than the United States. The U.S. share of the world corn export market is around 75 percent compared to about 13 percent for Argentina, ranking first and second, respectively, in the world corn export market. Despite such difference in market shares, both countries compete actively in the export market. The extent of such competition is better appreciated by means of Figure B.6, which shows that, even in absolute terms, U.S. corn exports move in an opposite direction to Argentina's.

The major buyers of corn from Argentina and the United States over the three-year period 1996–1998 are listed in Table B.2. In decreasing order of importance (by volume of exports), the top destinations for corn exports from the United States (Argentina) were Japan, South Korea, and Mexico (Iran, Egypt, Japan, and Brazil). Some interesting points become apparent by reading Table B.2. First, the buyers of U.S. corn are much more concentrated than the buyers of corn from Argentina. The single largest buyer of U.S. corn (Japan) acquired almost one-third, and the top four buyers imported two-thirds, of all of the corn exported by the United States over the period analyzed. In contrast, the analogous figures for Argentina were slightly less than one-tenth and about one-third, respectively. Second, there is little overlap between the major importers of corn from the United States and from Argentina. Only two countries (Japan and Egypt) are included in the top-eight importer lists corresponding to both the United States and Argentina.

Most U.S. corn output is used domestically for feeding purposes (Figure B.4). In particular, feedlots and pork production are two of the major destinations of such corn. Relative to the United States, domestic feed usage of corn in Argentina constitutes a relatively small share of total output. This is explained primarily by two facts. First, unlike in the United States, most beef in Argentina is raised and fattened using direct grazing methods as opposed to feedlots. Second, pork production is virtually nonexistent in Argentina.

Domestic non-feed usage of corn consists mostly of wet milling (i.e., production of corn starch, gluten, germ, syrup, sugar, oil, and ethanol) and dry milling (e.g., production of corn meal and cereal). In the United States, wet milling takes up about 15 percent of the total production of corn and dry milling only about 2 percent (U.S. Census Bureau 1999b). In Argentina, the respective shares are on the order of 6 percent and 2 percent, respectively (*Argentina Agricultural, Agroindustrial and Fishing*).

Marketing Channels for Soybeans

The three main destinations of soybeans produced by the United States and Argentina over the period 1994/95–1999/00 are depicted in Figure B.7, as shares of their respective domestic outputs. For both countries, domestic crushings absorb by far the largest share of their soybean output. Exports are the second major destination, accounting for about one-third of soybean output for the United States, and about one-sixth for Argentina. Domestic non-crush usage of soybeans consists mostly of seed usage, and accounts for roughly 5 percent of total output in the United States, as well as in Argentina.

Because soybean output in the United States is considerably higher than in Argentina (see Figure A.10) and the proportion of output that is exported is also greater, soybean exports from the United States are far greater (almost ten times) than those from Argentina. In fact, the United States is the world's largest exporter of soybeans, with a market share of around 60 percent. Argentina ranks third in the world export market behind the United States and Brazil, with a share of about 6 percent. The dynamics of soybean exports from the United States and Argentina from 1994/95 through 1999/00 are depicted in Figure B.8. Despite the large differential in the magnitudes of both countries' soybean exports, Argentina still seems to compete aggressively with the United States, as exports from the former tend to move in the opposite direction to the exports from the latter.

As with corn exports, exports of soybeans from Argentina have the comparative advantage of having ports much closer to the major producing region (see Figure B.9). Most of the soybeans from Argentina are shipped abroad through the ports located on the

Parana River (Secretaría de Agricultura, Ganadería, Pesca y Alimentación de la República Argentina). The ports of Rosario and San Lorenzo/San Martin accounted for 43 percent and 36 percent, respectively, of all soybean exports during 1997–1998. These ports were followed by San Pedro and Diamante, shipping 6 percent each of all of the soybeans during that period. The epicenter of the major soybean-producing region in Argentina, shown in Figure B.9, is about 100 miles from the Rosario and San Lorenzo/San Martin ports.

In the United States, most soybean shipments take place at the Mississippi Gulf ports (*Grain Transportation Report*). In 1997–1998, the Mississippi Gulf ports accounted for 72 percent of the U.S. soybean exports, followed by only 5 percent each from the Texas Gulf ports and the Pacific region ports. As mentioned earlier, the distance from North Central Iowa to a Mississippi Gulf port is about 1,000 miles, which is substantially greater than the analogous distance in Argentina.

The main destinations of soybean exports from the United States and Argentina over the three-year period 1996–1998 are reported in Table B.3. It can be observed that exports from both countries are relatively concentrated among a few importers. The top four buyers took roughly one-half of all of the exports from Argentina as well as from the United States over the period analyzed. There is also an overlap among the main destinations of soybeans shipped by the United States and Argentina. One-half of the top-eight importers of U.S. soybeans (Japan, The Netherlands, Taiwan, and Spain) are also on the top-eight list of importers of soybeans from Argentina.

It is worth noting the relative importance of the demand for soybeans from the European Union (EU), especially with regard to Argentina's exports. Four countries of the EU (The Netherlands, Spain, Italy, and Greece) are on the top-six list of importers of soybeans from Argentina, accounting for almost one-half of Argentina's soybean exports. Similarly, three countries from the EU (The Netherlands, Spain, and Germany) are on the top-seven list of importers of U.S. soybeans, constituting one-fourth of all of the soybean shipments from the United States. The relevance of the demand from the EU has to do with the Roundup Ready® soybean controversy that erupted during 1999. Producers in the United States and especially in Argentina have been keen to plant Roundup Ready®

soybeans as a way to reduce costs of, and simplify, the production process. However, consumers in the EU seem strongly opposed to the proliferation of transgenic organisms such as Roundup Ready® soybeans.

By far, most of the soybeans produced in Argentina and the United States are crushed domestically (Figure B.7). Over the period 1994/95–1999/00, 84 percent and 59 percent of the soybean outputs of Argentina and the United States, respectively, were crushed domestically. The main products obtained from soybean crushing are oil and meal. Although the United States exports a larger share of its soybean output than Argentina, the United States produces more soybean oil and meal than Argentina because soybean output in the former is so much larger than in the latter (see Figure A.10). Figure B.10 shows that the United States produces about three times as much soybean oil and meal as Argentina does.

The primary destinations for the soybean oil and meal produced by the United States and Argentina are fundamentally different (Figures B.11 and B.12). In the United States, soybean crushing is mainly done to serve the domestic demand for oil and meal. Over 1994/95–1999/00, 87 percent of the soybean oil and 80 percent of the soybean meal produced in the United States were consumed domestically. In stark contrast, the analogous figures for Argentina were only 4 percent and 4 percent, respectively. The low domestic consumption of soybean oil in Argentina is due to the preferences of local consumers, who like sunflower oil much better than soybean oil. In Argentina, the per capita annual consumption of soybean oil is only 4.2 lb, compared to 28.6 lb for sunflower oil (Cámara de la Industria Aceitera de la República Argentina). In the United States, in contrast, the per capita annual consumption of soybean oil is 56.9 lb, versus only 0.6 lb of sunflower oil. The explanation for the strikingly smaller fraction of soybean meal used domestically in Argentina is the same as for the low feed usage of corn. That is, Argentina’s beef is produced via direct grazing rather than in feedlots, and Argentina’s pork production is negligible.

Due to the much larger export orientation of Argentina’s soybean crushings, exports of soybean oil and meal from Argentina exceed those from the United States, despite the larger output of both products in the United States. This assertion is apparent from

Figures B.13 and B.14, which illustrate the behavior of both countries' exports of soybean oil and soybean meal, respectively, over the period 1994/95–1999/00. With about 40 percent and 35 percent of the world export markets for soybean oil and meal, respectively; Argentina is the world's major exporter of both commodities. The respective shares for the United States are 17 percent and 14 percent. The United States ranks third and fourth in the world export markets for soybean oil and meal, respectively.

The export focus of Argentina's soybean crushing industry is evidenced by its geographic location. Figure B.15 shows that most of its crushing plants are located very close to the ports on the Parana River. Further, albeit not shown in Figure B.15, more than 70 percent of the soybean crushing capacity in Argentina is located by the river, around the ports of Rosario and San Lorenzo/San Martin (J. J. Hinrichsen S. A.). Most of such plants consist of facilities with ports that allow unloading of barges hauling soybeans from the upper Parana River (produced in Brazil, Paraguay, and the North of Argentina), as well as ports for shipments of soybean oil and meal. This has the considerable advantage of reducing transshipment costs. Also, such processors can fully exploit economies of scale. This is true because most of Argentina's soybeans are produced around Rosario (see Figure B.9), and this soybean output plus the supply of soybeans from the upper Parana River is funneled through the area of Rosario and San Lorenzo/San Martin. Not surprisingly, the world's largest soybean processing plants are located in the area of influence of Rosario and San Lorenzo/San Martin. As of 1998, there were 27 active soybean-processing plants in Argentina, with an average capacity of 36 million bushels of soybeans per plant per year (J. J. Hinrichsen S. A.). The largest plant of all is able to crush 150 million bushels of soybeans per year, or slightly more than 20 percent of the average annual soybean production of Argentina over the 1997/98–1999/00 period.

The U.S. crushing capacity of soybeans versus Argentina is both much farther away from export points and much less concentrated geographically. Most U.S. soybean crushings occur in the corn-belt, close to the production area. In 1997, Iowa and Illinois handled, respectively, 22 percent and 19 percent of all of the soybeans crushed in the United States (U.S. Census Bureau and *1997 Economic Census*). They were followed by

Indiana, Ohio, and Minnesota, with shares of 8 percent, 7 percent, and 6 percent, respectively. As of 1997, there were 93 active soybean-processing plants in the United States (*1997 Economic Census*). Those 93 plants processed an average of 15 million bushels of soybeans per plant in 1997, and the six largest plants processed an average of 38 million bushels of soybeans.

Figure B.13 shows that exports of soybean oil are relatively volatile, in particular those from the United States. Another important observation from Figure B.13 is the noticeable increment in the exports from Argentina starting in 1997/98. Argentina’s oil exports over 1997/98–1999/00 were about 70 percent greater than exports over 1994/95–1996/97. Such an increase was driven by a substantial expansion in crushing capacity.

Soybean oil exports are relatively concentrated among a few destinations, especially for the United States. According to Table B.4, the top three importers accounted for 56 percent and 37 percent of all of the soybean exports from the United States and Argentina, respectively, over 1996–98. Mainland China was the main buyer of soybean oil from both the United States and Argentina, importing 34 percent and 17 percent, respectively, of their corresponding exports of soybean oil. Besides Mainland China, India is the only other country that appears on the top-eight list of importers from Argentina and the United States simultaneously.

As illustrated in Figure B.14, annual exports of soybean meal from Argentina and the United States over 1994/95–1999/00 followed a pattern very similar to their respective exports of soybean oil (see Figure B.13). The major difference is that U.S. soybean meal exports are considerably less volatile than its soybean oil exports.

Exports of soybean meal are less concentrated than for soybean oil (Table B.5). The top-three destinations of soybean meal from the United States (i.e., Canada, Mainland China, and Saudi Arabia) and Argentina (i.e., Italy, Mainland China, and The Netherlands) account for one-quarter and one-third, respectively, of their total exports. Further, there is almost no overlap among the major soybean meal buyers from the United States and Argentina, as Mainland China is the only country on both top-eight importer lists.

Marketing Channels for Wheat

The three main destinations of the wheat produced in Argentina and in the United States are depicted in Figure B.16. For both countries, the export market is the major wheat destination, as roughly two-thirds of Argentina's wheat output and slightly less than one-half of the U.S. wheat output are shipped abroad.

Similar to corn and soybeans, the distance from the major producing regions to the ports is significantly shorter for Argentina than for the United States (Figure B.17). In the case of wheat, however, most shipments from Argentina occur through the ports located on the Atlantic coast rather than on the Parana River (Secretaría de Agricultura, Ganadería, Pesca y Alimentación de la República Argentina). In 1997–98, 32 percent and 30 percent, respectively, of all wheat exports were done through the ports of Necochea and Bahia Blanca, respectively. The Parana River ports of San Lorenzo/San Martin and Rosario ranked third and fourth, accounting for only 14 percent and 13 percent, respectively, of all of the wheat shipped during 1997–98. The heart of the southernmost (northernmost) major wheat producing area in Argentina shown in Figure B.16 is about 120 (100) miles from the Necochea and Bahia Blanca (Rosario and San Lorenzo/San Martin) ports.

In the United States, the majority of wheat exports are shared relatively evenly among the ports of the Pacific region, and the Gulf (*Grain Transportation Report*). For example, in 1997–98 the Pacific region accounted for 42 percent of all wheat exports, the Texas Gulf for 24 percent, and the Mississippi Gulf for 22 percent. Ports in the United States are much farther from the producing regions than in Argentina, as the distance from North Dakota (South Central Kansas) to the Pacific region (Mississippi Gulf) ports is on the order of 1,400 (850) miles.

Figure B.18 shows annual exports of wheat from the United States and Argentina between 1994/95 and 1999/00. It can be observed that, despite exporting a larger proportion of its wheat output than the United States, Argentina exports less than the United States in absolute terms, because its wheat production is substantially smaller. See Figures B.16 and A.11. Over the period depicted in Figure B.18, the United States exported about three-and-one-half times as much wheat as Argentina. The United States is the world's largest exporter of wheat, with a market share of about 30 percent. Argentina ranks fifth, with around 9 percent of the world's total wheat exports. Notwithstanding the sizeable difference between their wheat exports, Argentina seems to compete aggressively with the United States, as there is a clear negative correlation between the volumes of the exports from the two countries.

The top-eight importers of wheat from both countries over the 1996–98 period are listed in Table B.6. The most important point from Table B.6 is that Brazil buys more than one-half of the wheat exported by Argentina, which would seem to make Argentina's exports particularly vulnerable, given the relative instability of the Brazilian economy. Also worth noting from Table B.6 is the little overlap among the major destinations, as Egypt is the only country that appears on the top-eight list of importers from both the United States and Argentina.

The second major usage of wheat for both countries is domestic non-feed consumption, which takes 42 percent and 34 percent of the total wheat produced by the United States and Argentina, respectively. Most of the domestic non-feed wheat production consists of dry milling to obtain flour, and most of the flour produced is consumed domestically. Per capita annual consumption of wheat flour is about 149 pounds in the United States (*Agricultural Statistics*) and 189 pounds in Argentina (*Alimentos Argentinos*). Only 12 (3) percent of the flour produced by Argentina (the United States) between 1996 and 1998 was exported (Figure B.19). Both countries have about the same share (6 percent) of the world's export market for wheat flour, which is greatly dominated by the European Union with around a 56 percent of the world's exports. Wheat flour exports from both are highly concentrated. In 1996–98, the main destination for U.S. flour exports, Haiti, accounted for 26 percent of the total. In the case of Argentina's wheat flour exports, the most important buyer, Brazil, acquired 57 percent of the total for 1996–98.

Domestic feed usage of wheat accounts for about 12 percent of output in the United States, but is negligible (2 percent) in Argentina (see Figure B.16). Similar to corn, little wheat is used for feed purposes in Argentina due to the lack of feedlots and the virtually nonexistent pork sector.

Marketing Channels for Sunflower

The three main destinations of the U.S. and Argentine output of sunflower are shown in Figure B.20. In both countries, sunflower exports only account for less than 10 percent of the amount produced. Only a small fraction of sunflower is exported directly because of the relatively high transportation cost of sunflower. Due to sunflower's low density, its transportation cost per ton is at least 20 percent higher than the transportation cost per ton of corn, wheat, or soybeans.

The behavior of sunflower exports from Argentina and the United States in recent years is depicted in Figure B.21. Three conclusions can be drawn from this graph. First, Argentina's exports of sunflower are typically substantially greater than those from the United States. Second, sunflower exports are highly volatile, and especially so for Argentina. Third, exports from both countries follow the same patterns over time, indicating a strong competitive environment in the world export market of sunflower. Although their market shares are volatile, in a typical year, Argentina and the United States are, respectively, the world's second and fourth largest exporters of sunflower.

Sunflower exports are concentrated among a few destinations (Table B.7). The three top importers from the United States (Spain, Germany, and The Netherlands) bought one-half of its shipments over 1996–98. Exports are even more concentrated in the case of Argentina, as the top three destinations (The Netherlands, Spain, and France) accounted for almost two-thirds of its exports over the same period. Also noteworthy from Table B.7 is the high overlap of the top destinations for the exports from the United States and Argentina, as there are five countries that appear on both of their corresponding top-eight importer lists.

For the United States, and especially for Argentina, domestic crushing is the major destination of sunflower output. About 90 percent and 67 percent of the total sunflower output is crushed domestically in Argentina and the United States, respectively. Due to Argentina's larger output of sunflower and the larger proportion of it that is crushed domestically, its output of oil and meal is about four times that of the United States (see Figure B.22).

The export market is the main destination of the oil produced by both countries. Figure B.23 shows that Argentina and the United States export almost four-fifths of their respective production of sunflower oil. Argentina is the world's largest exporter of sunflower oil, accounting for about 55 percent of the world export market. Further, Figure B.24 reveals that the volume of sunflower oil exports from Argentina has exhibited a strong upward trend in recent years. The United States ranks a distant second; with approximately 13 percent of the world export market.

According to Table B. 8, destinations for the sunflower oil exported by Argentina are concentrated. The top four importers from Argentina (India, Iran, South Africa, and Egypt) bought one-half of Argentina's total exports over the 1996–98 period. Sunflower oil exports from the United States are even more concentrated, as its major buyer (Mexico) imported 40 percent of the U.S. total exports over the 1996–98 period, and the second and third buyers (Algeria and Egypt) together imported an additional one-third of the U.S. total exports. There are three countries (Mexico, India, and Egypt) simultaneously on the top-eight list of importers from the United States and Argentina.

For sunflower meal, unlike sunflower oil, there is a substantial difference in usage between Argentina and the United States. As depicted in Figure B.25, the shares of exports and domestic consumption for Argentina and the United States are almost reversed. More than 90 percent of the sunflower meal produced in Argentina is exported, whereas less than 10 percent of the U.S. output is exported. Figure B.26 reveals that U.S. exports of sunflower meal are negligible relative to those from Argentina. This figure also shows that Argentina's exports have been very stable, except for a sudden increase in the most recent year. Argentina is by far the world's largest exporter of sunflower meal, with a share of almost four-fifths of the world's export market.

Table B.9 demonstrates that Argentina's exports of sunflower meal are highly concentrated. Its major importer, The Netherlands, bought more than two-thirds of the total exported by Argentina over the 1996–98 period. The EU is the dominant market for Argentina's sunflower meal exports, as it accounted for more than 80 percent of the total shipped by Argentina between 1996 and 1998.

In addition to crushings and exports, other destinations for the domestic production of sunflower include birdseed and planting seed. These other usages are labeled domestic non-crush in Figure B.20, which account for about one-fourth of U.S. sunflower output; of this amount, only a negligible amount is used as planting seed. Domestic non-crush usage in Argentina is insignificant, and is almost entirely for planting seed use.

Institutions Facilitating Commerce

There are a number of auxiliary activities that facilitate the physical flow of grain and enhance the performance of the marketing channel as a whole. Among others, such activities include those performed by brokers, by institutional markets, and by regulators.

In Argentina, the price, and other contract terms and conditions in a grain transaction between country elevators as sellers and processors and exporters as buyers, typically are not negotiated directly. Instead, they are negotiated by brokers (*corredores*). Brokers do not take title to the grain transacted at all; they only act as negotiators between sellers and buyers. Historically, brokers have charged 0.5 percent of the value of the grain transacted to sellers and one percent to buyers, as payment for their facilitating services. However, competitive pressures in recent years have motivated many buyers and sellers to trade without the help of brokers, as a means to reduce costs.

In Argentina there are also private institutional markets, or boards of trade (*bolsas*), which provide a physical place for buyers and sellers to interact, as well as other facilitating services. Such services include trade regulation, arbitration of trade disputes, lobbying, etc. *Bolsas* are very important facilitating institutions in Argentina that have no obvious counterparts in the United States. There are six major *bolsas* in Argentina, but three concentrate most of the grain marketing activity. The most active *bolsas* are located near the most active ports, namely, Rosario, Buenos Aires, and Bahia Blanca.

Grain contracts can be registered in a particular *bolsa* by paying a fee on the order of 0.15 to 0.20 percent of the transaction's value (Bini et al.). By registering a contract within a particular *bolsa*, the contracting parties subject themselves to the arbitration of that particular *bolsa* to settle any problems arising from the execution of the contract. In recent years, contracts covering approximately 35 percent of Argentina's grain production have been registered in *bolsas* (Bini et al.). This is a marked decline from the previous decade, when contracts for almost two-thirds of Argentina's total output of grain were registered. Much of this decline followed a trend to streamline the commercialization channel for grains, such as the tendency toward more vertical integration by many exporters and processors.

Each *bolsa* has an arbitration board (*cámara arbitral*) that deals with trade disputes and sets spot settlement prices (*precios pizarra*). The importance of *precios pizarra* is twofold. First, *precios pizarra* are supposed to be indicative of the prices at which transactions are being conducted in the spot market, and are regarded as such by many market participants. Second, *precios pizarra* are used in a type of transaction very popular in Argentina, called *ventas a fijar*. *Ventas a fijar* are transactions by which a seller delivers grain to a buyer on a certain date, and has the right to choose a date to settle the price of the grain delivered within a certain period afterwards. The price at which the transaction is executed is the *precio pizarra* corresponding to the date chosen by the seller.

Like the United States, Argentina has futures markets in which futures and options contracts are traded. The two most important futures markets in Argentina function in the facilities of the *bolsas* of Rosario and Buenos Aires. Such futures markets are affiliated with the respective *bolsas*, but are separate legal entities from them. A fundamental difference between futures markets in Argentina and in the United States (particularly with the Chicago Board of Trade [CBOT]) is their liquidity. For example, in 1998 the total volume of futures and options contracts traded in the futures market of Rosario was as follows: 54 million bushels of soybeans, 6 million bushels of corn, and 9 million bushels of wheat (Bolsa de Comercio de Rosario).[2] By comparison, the respective volumes at the CBOT were 81,385 million bushels, 100,314 million bushels, and 35,239 million bushels (Chicago Board of Trade). In addition to trading a much smaller volume, the illiquidity of the futures markets in Argentina is exacerbated because there are often many more futures contracts available for trade than in the United States. That is,

[2]It must be noted that the 1998 volumes corresponding to Rosario were substantially greater than for previous years.

Argentina's smaller volume of futures trading is spread over more contracts, rendering them much thinner. As an example, at the end of 1999 there were 15 different futures contracts for wheat available for trading at the futures market of Buenos Aires, versus 9 at the CBOT.

Another difference between the U.S. and Argentine futures markets is that the proportion of the volume traded that is finally delivered is much smaller in the former than in the latter. In effect, futures contracts in Argentina are often used as forward contracts. Due to the substantially lower liquidity of the Argentine futures markets, those involved in grain trading in Argentina often hedge in the CBOT instead of in the local futures markets, despite the obviously greater basis risk implied in such strategy. This is particularly true of exporting firms, as Argentine export prices tend to be more correlated with CBOT prices (i.e., have smaller basis risk) than domestic prices.

Price Discovery and Commercialization Costs

In the United States and Argentina, the basic institutional arrangements through which prices are established are (a) informal negotiations between individuals or firms, and (b) trading on organized exchanges. Numerous pricing arrangements are found in both countries. Spot and futures transactions are quite popular in both countries. However, other types of contracts seem much more prevalent in one country than in the other, as discussed next.

Forward transactions are quite usual in the United States, but not in Argentina. However, the opposite is true of forward barter deals. In Argentina, forward barter deals are typically negotiated before or at planting time between farmers and country elevators, and between wholesale input suppliers and country elevators. Such deals establish a specific ratio of commodity to be delivered at harvest in exchange for specific amounts of inputs provided at planting time. This arrangement is very popular in Argentina because it provides a relatively straightforward means for farmers to finance their production. Another important reason for the popularity of barter deals in Argentina has to do with the value-added tax. Filing claims for value-added tax refunds involves a substantial amount of paperwork that is greatly simplified when barter deals are used. This implies that barter deals may yield significant cost savings for the transactions involved.

Another type of transaction widely used in Argentina is the aforementioned *venta a fijar*, by which a seller delivers the commodity immediately to the buyer, but the settlement price is fixed at a date chosen by the seller within a certain period following delivery. *Ventas a fijar* are a popular arrangement among market participants who face storage constraints (as do most in Argentina). Thus, *ventas a fijar* are similar to deferred pricing contracts in the United States. The major difference, however, is that the price used to settle most *ventas a fijar* is the *precio pizarra*, which does not have a counterpart in the United States.

But perhaps the most fundamental difference between the price discovery process in the United States and Argentina is that in the latter there are virtually no specific prices for country locations. For example, a corn producer requesting a bid from a country elevator in Venado Tuerto (a town in the heart of Argentina's corn-belt) will typically be given a quote for corn FAS Rosario, which is the nearest relevant port and is located approximately 100 miles from Venado Tuerto. To obtain a net price, the farmer will have to deduct commissions, transportation, registration fees, unloading, and other relevant charges. It is not uncommon to find that a bid by a country elevator yields a lower net price for the farmer than a lower bid by a competing country elevator. Because of the numerous charges involved in a typical grain transaction, it is very difficult for farmers to compare the net prices implicit in the bids from different potential buyers. This pricing system is clearly less transparent than the one in the United States. However, it prevails because many years ago it was required by law, as it was felt (paradoxically) that it would enhance market transparency.

It is of interest to compare the levels of prices received by farmers in the United States and Argentina for their crops. Unfortunately, there are no published series of prices received by farmers in Argentina, because of the aforementioned method used by Argentine country elevators to quote grain prices. For this reason, such a series was constructed from raw data obtained from reliable sources, and the results for the four crops under study are exhibited in Figures B.27 through B.30.[3] For comparison purposes, Figures B.27 through B.30 also include the corresponding “Marketing Year Average Price Received by U.S. Farmers” series reported in *Agricultural Statistics* and, for corn and wheat, the sum of the latter series, and the “Income Support Payment Rates” for the United States, also reported in *Agricultural Statistics*.

According to Figure B.27, the corn prices received by farmers were higher in the United States than in Argentina in five of the last eight years. From 1991/92 through 1998/99, the average corn prices received by farmers in the United States and Argentina were $2.44/bushel and $2.33/bushel, respectively. In addition, corn prices received by farmers in Argentina were more volatile, as the corresponding coefficients of variation for the period analyzed were 24.0 percent and 16.5 percent, respectively. However, the difference in favor of U.S. farmers becomes much greater once income support payments are taken into account. Including income support payments, U.S. farmers received an average of $2.83/bushel of corn over the 1991/92–1998/99 period, with a coefficient of variation of only 9.1 percent.

As illustrated in Figure B.28, the prices received by farmers for soybeans in the United States were also higher than in Argentina in five of the last eight years. Between 1991/92 and 1998/99, prices received by farmers for their soybeans averaged $6.11/bushel in the United States, versus only $5.45/bushel in Argentina. Besides soybean prices being lower in Argentina, their volatility was higher as well. The coefficient of variation over the period under study was 19.5 percent for Argentina, compared to only 11.9 percent for the United States.

In the case of wheat, prices received by farmers in the United States were higher in all but one of the last eight years (see Figure B.29). On average, U.S. farmers received $3.55/bushel for wheat between 1991/92 and 1998/99, whereas farmers in Argentina were paid only $3.14/bushel over the same time period. Farmers in the United States

[3] More specifically, the series of prices received by farmers in Argentina displayed in Figures B.27 through B.30 correspond to the net price received by a farmer for grain delivered at the facilities of a country elevator located in the representative production region corresponding to that particular grain. To account for the high seasonality of grain deliveries in Argentina, the annual figures consist of the weighted average of monthly prices, where the weights are proportional to monthly exports for corn and wheat, and to monthly exports plus crushings for soybeans and sunflower.

were also exposed to less volatile wheat prices, as the coefficient of variation was 18.2 percent in the United States versus 28.1 percent in Argentina. Furthermore, U.S. farmers also benefited from large income support payments for wheat. Including such payments, U.S. farmers received an average of $4.31/bushel of wheat, with a coefficient of variation of only 12.9 percent.

Figure B.30 shows that prices received by farmers for sunflower in the United States were higher than in Argentina in all of the last eight years. Over the 1991/92–1998/99 period, the average price received by farmers for sunflower was $10.25/cwt in the United States, versus only $8.61/cwt in Argentina. As for the other crops under study, Argentine farmers were also exposed to more volatile sunflower prices. This is true because the coefficient of variation was 16.0 percent in Argentina, compared to 12.4 percent in the United States.

The lower average prices received by Argentine farmers are somewhat surprising, in light of the aforementioned geographic advantage provided by the much closer location of the major producing areas to the ports in Argentina. This warrants a closer inspection of the price levels at different stages of the commercialization channel, to uncover the reasons for the lower prices received by Argentine farmers. In addition, analysis of the price differentials observed at different stages of the commercialization channel provide a means for assessing the overall efficiency of the grain marketing channels in Argentina and the United States.

Table B.10 compares the implicit costs of commercialization for corn, between a country elevator located in the typical production areas (North Central Iowa for the United States and Northern Buenos Aires/Southern Santa Fe for Argentina) and the ports more often used for corn shipments abroad (Mississippi Gulf for the United States and Rosario for Argentina). Interestingly, the implicit commercialization costs corresponding to the country elevator-export port were about $0.50/bushel for both countries between 1996 and 1998, even though corn had to be hauled 1,000 miles in the United States and only 125 miles in Argentina. Since approximately three-fourths of the implicit commercialization costs in Argentina arise from transportation, it is clear that the high cost of its transportation system completely offsets the natural geographic advantage of Argentina.

In addition to the relatively high implicit costs of the country elevator-export port stage for corn in Argentina, it is worth noting its high implicit cost of transforming corn from FAS into FOB at the export location. Over the 1996–98 period, the average price of corn FOB Rosario was $3.23/bushel. Since over the same period the average price of corn FAS Rosario was $3.02/bushel (Table B.10), the implicit cost of this stage is a whopping $0.21/bushel. That is, the high cost of the FAS-FOB stage can easily account for the average differential in the corn prices received by farmers in the United States and Argentina, which amounted to $0.11/bushel from 1991/92 through 1998/99.

The implicit costs of the country elevator-export port commercialization stage for soybeans are reported in Table B.11. As for corn, the similarity of such costs for the United States ($0.63/bushel) and Argentina ($0.62/bushel) is remarkable, given the large differential in the respective hauling distances (1,000 for the United States and only 125 miles for Argentina). Transportation costs account for approximately 60 percent of the implicit soybean commercialization costs in Argentina. Hence, it may be concluded that the costs of transporting soybeans to the export locations in Argentina are unusually high compared to those in the United States.

Over the 1996–98 period, the average FOB Rosario price for soybeans was $7.29/bushel. Hence, the FAS-FOB differential averaged $0.27/bushel in Argentina, which explains, in part, the lower soybean prices received by Argentine farmers compared to their U.S. counterparts. However, most of the FAS-FOB differential is attributable to the taxes levied on Argentine soybean exports, rather than to inefficiencies in the commercialization channel. This is true because soybean-export taxes amounted to 3.5 percent of the FOB price, or about $0.26/bushel. Historically, taxes on Argentine exports of soybeans and sunflowers have been higher than taxes on the exports of their respective products (i.e., oil and meal). The purpose of such policy has been to favor the domestic processing of soybeans and sunflower, so as to export value-added products rather than raw materials. To a large extent, Argentina’s significant investment in processing capacity has been a result of the relatively favorable tax treatment toward domestic oilseed crushings.

The soybean processing stage seems much less costly in Argentina than in the United States. Table B.12 shows the average prices of soybeans, soybean oil, and soybean meal over the 1996–98 period, along with the extraction percentages in both countries. From such figures it is possible to calculate the implicit costs of processing soybeans, which amount to $31/tn in the United States and to only $13.50/tn in Argentina. These estimates confirm that the large processing plants in Argentina enjoy important cost savings arising from economies of scale. Nonetheless, the magnitude of such economies of scale—as implied by the processing cost differential between the United States and Argentina—is surprisingly high.

In the case of wheat, Table B.13 shows that the implicit commercialization cost for the country elevator-export port stage is higher in the United States ($0.69/bushel) than in Argentina ($0.50/bushel). But it is evident that this stage of the commercialization channel is more expensive in Argentina relative to the United States, given the substantially greater distance over which wheat is transported in the United States (1,000 miles) compared to Argentina (125 miles). Transportation costs account for 70 percent of Argentina's $0.50/bushel implicit cost of commercialization, so it seems that much can be gained by improving the transportation system in Argentina.

Besides the relatively high cost of the country elevator-export port stage for wheat in Argentina, the FAS-FOB transformation appears to be extremely expensive. This is true because the average price of wheat FOB Necochea was $4.50/bushel over the 1996–98 period, which yields an implicit cost of $0.42/bushel for the FAS-FOB transformation. Given that the average differential in the wheat prices received by farmers in the United States and Argentina was $0.41/bushel from 1991/92 through 1998/99, it is safe to conclude that such differential can be largely explained by the high cost of the FAS-FOB commercialization stage in Argentina.

Sunflower commercialization costs for the country elevator-export location stage in the United States cannot be estimated, because there are no published series of U.S. sunflower export prices. However, it is still possible to estimate the commercialization costs implicit in the movement of sunflower from a country elevator in the United States to its final destination in Rotterdam. As reported at the bottom of the first column of Table B.14, such a cost is estimated at an average of $52/tn. For Argentina, the implicit cost of the country elevator stage alone is $34.50/tn, of which 80 percent consists of transportation costs. In other words, moving sunflower 250 miles from a country elevator to an export location in Argentina costs two-thirds of the cost of moving sunflower all the way from South Dakota to Rotterdam. As for the other crops analyzed, it is clearly the case that the transportation systems give the United States a significant competitive advantage over Argentina.

In addition, Table B.14 shows the costs of the FAS-FOB stage in Argentina. At $35.50/tn, such costs also seem quite high. However, similar to soybean exports, exports of sunflowers are taxed at 3.50 percent of the FOB price to encourage domestic processing of oilseeds. Further, domestic regulations require that sunflower sellers be paid a two percent premium for every one percent in oil content in excess of a certain base. After accounting for a cost of four percent arising from such a quality premium (Bini et al.), plus the 3.5 percent export tax, the implicit cost of the FAS-FOB stage may be estimated to be approximately $16/tn. This FAS-FOB cost still seems unduly high compared to the cost of moving sunflower from South Dakota to Rotterdam, and appears to be another source of competitive advantage for the United States.

Another interesting aspect of the commercialization channel is that related to intertemporal allocations. As discussed in connection with Table B.1, the supply of storage capacity relative to the demand for storage is noticeably smaller in Argentina. Therefore, a higher implicit price for storage could be expected in Argentina. Indeed, when measured by the carrying charges implicit in the futures prices for a specific grain corresponding to the same marketing year, the price of storage in Argentina is noticeably higher. For example, the storage charge implicit in wheat (corn, soybeans) futures prices of Buenos Aires during the first quarter of 1999 averaged 2.3 (1.8, 1.7) percent of the price of wheat (corn, soybeans) per month. In contrast, the average storage charge implicit in the futures prices of wheat (corn, soybeans) at the CBOT over the same period was only 1.0 (1.1, 0.7) percent of the price of wheat (corn, soybeans) per month.

In summary, the preceding analysis reveals that Argentina’s transportation system is very expensive compared to that of the United States, and that the price of storage in Argentina is much higher than in the United States. Also, the FAS-FOB transformation at the export locations in Argentina seems very costly, in general. However, it is worth pointing out that oilseed processing in Argentina is significantly less onerous than in the United States.

Competition

The levels of competition and concentration vary along the commercial channel in both countries. Perhaps the most competitive of all of the stages along the marketing channel is the first one, involving the country elevators. Country elevators tend to be relatively small and numerous. In the United States, it was estimated that there were about 7,500 country elevators in the mid-1990s (Kohls and Uhl). In Argentina, as of 1998 there were about 900 country elevators (Federación de Centros y Entidades Gremiales de Acopiadores de Cereales).

The four-firm concentration ratios of various other activities along the commercialization channel are reported in Table B.15. The degree of concentration is relatively high in the exporting sector of Argentina, with four-firm concentration ratios ranging from a low of 43 percent for corn exports, through a high of 78 percent for sunflower exports. Unfortunately, equivalent figures are not available for the United States. However, anecdotal evidence suggests that the degrees of concentration among U.S. exporters are likely to be similar to the ones observed in Argentina. Furthermore, it is often the case that the most important exporting firms are multinational companies with a major presence in both the Argentine and the U.S. export markets, such as Cargill, Dreyfus, and Andre.

Data availability only allows comparison of the four-firm concentration ratios for Argentina and the United States for a few processing industries; namely, wet corn milling, wheat milling, and soybean processing. Overall, the evidence is mixed as to which country is characterized by the most competitive environment. This is true because wet corn milling is a more concentrated industry in Argentina than in the United States, whereas the opposite is true for wheat milling and, especially, soybean processing.

In analyzing the figures reported in Table B.15, however, it is important to note that they are somewhat dated. For example, according to *Alimentos Argentinos* the top three wheat-milling firms accounted for almost 50 percent of all of the wheat milled in Argentina in 1998. Further, concentration in Argentina's wheat-milling industry increased in early 1999, when Cargill bought a major wheat-milling firm, to become the largest wheat miller in Argentina.

Perhaps the least competitive of all of the commercialization activities performed in either country is truck transportation in Argentina. Within Argentina, over 80 percent of the grains are hauled by truck. Since the vast majority of trucks are owned by firms that possess only one or, at most, a few trucks, one might expect this to be an extremely competitive industry. Nevertheless, trucking firms have been highly successful at making collusion arrangements and at enforcing them, so as to maintain artificially high freight rates. It must be stressed that the types of collusion arrangements that characterize the trucking industry are not illegal in Argentina.

Government Intervention

A striking contrast between the U.S. and Argentine agricultural sectors is the qualitative and quantitative differences in government intervention. Historically, the U.S. government has had a myriad of programs to support grain production (at the expense of other sectors in the economy). Such programs have ranged from direct support (or deficiency) payments and direct subsidized loans, to more indirect means of support such as export subsidies, credit guarantees, subsidized storage, and subsidized crop insurance. Since 1988, annual U.S. government expenditures in support programs for all crops ranged from a low of \$6.3 billion in 1996 to an estimated high of \$24.2 billion in 2000 (*FAPRI 2000 U.S. Agricultural Outlook*).

Government intervention in Argentine agriculture is qualitatively different than in the United States, because its main objective has never been to support grain production. It is quantitatively different also, because government intervention in Argentina is substantially smaller in magnitude and variety. More specifically, before the early 1990s, agricultural production in Argentina was *taxed* as a whole to support the development of the domestic industrial sector. Argentina's agricultural production was taxed mainly through export taxes, often higher than 30 percent of the FOB Argentine port prices. Since the early 1990s such transfers from the agricultural sector to the industrial sector have been greatly reduced or even eliminated. But it is still the case that exports of soybeans, sunflower, and other oilseeds are taxed at 3.5 percent of their FOB prices. The main purpose of this export tax is to promote the domestic processing of oilseeds, as evidenced by the fact the respective oilseed products are not subject to such taxes.

Table B.1. Storage capacity in the U.S. and Argentina, 1997

Capacity Location	Storage Capacity (million bushels)		Storage Capacity (percent of average annual grain and oilseed output over 1995/96–1997/98)	
	U.S.	Argentina	U.S.	Argentina
On-Farm	10,950	489	72.6	25.5
Off-Farm	8,374	1,272	55.5	66.2
Total	19,324	1,762	128.0	91.8

Source: Prepared from data published in *Stocks of Grains, Oilseeds, and Hay - Final Estimates* 1993–98, *Agricultural Statistics*, *Capacidad de Almacenaje en Argentina - Cosecha* 1997/98, and data reported by the Secretaría de Agricultura, Ganadería, Pesca y Alimentación de la República Argentina.

Table B.2. Major destinations for corn exports from the U.S. and Argentina, 1996–98

Rank	U.S. Destination (percent of U.S. corn exports)		Argentina Destination (percent of corn exports from Argentina)	
1	Japan	(32.89)	Iran	(9.73)
2	South Korea	(11.78)	Egypt	(7.20)
3	Taiwan	(10.84)	Japan	(7.08)
4	Mexico	(10.47)	Brazil	(7.04)
5	Egypt	(4.60)	Peru	(6.45)
6	Colombia	(2.69)	Malaysia	(5.65)
7	Canada	(2.28)	Venezuela	(5.08)
8	Saudi Arabia	(2.16)	Chile	(4.38)

Source: Prepared from data reported in *Foreign Agricultural Trade of the United States* and *Series Históricas - Agricultura*.

Table B.3. Major destinations for soybean exports from the U.S. and Argentina, 1996–98

Rank	U.S. Destination (percent of U.S. soybean exports)		Argentina Destination (percent of soybean exports from Argentina)	
1	Japan	(15.19)	The Netherlands	(20.76)
2	The Netherlands	(13.12)	Spain	(15.32)
3	Mexico	(12.05)	China (Mainland)	(10.96)
4	Taiwan	(8.40)	Taiwan	(6.44)
5	Spain	(6.45)	Italy	(6.16)
6	South Korea	(5.66)	Greece	(4.20)
7	Germany	(5.19)	Malaysia	(3.87)
8	Indonesia	(3.08)	Japan	(2.86)

Source: Prepared from data reported in *Foreign Agricultural Trade of the United States* and *Series Históricas - Agricultura*.

Table B.4. Major destinations for soybean oil exports from the U.S. and Argentina, 1996–98

Rank	U.S. Destination (percent of U.S. soybean oil exports)		Argentina Destination (percent of soy. oil exports from Argentina)	
1	China (Mainland)	(33.94)	China (Mainland)	(17.24)
2	Hong Kong	(14.11)	Iran	(10.12)
3	Mexico	(8.47)	Bangladesh	(9.68)
4	Peru	(4.44)	Venezuela	(9.09)
5	Canada	(4.13)	Pakistan	(8.26)
6	India	(3.85)	Colombia	(5.36)
7	South Korea	(3.35)	Brazil	(4.42)
8	Morocco	(2.89)	India	(4.08)

Source: Prepared from data reported in *Foreign Agricultural Trade of the United States* and *Series Históricas - Agricultura*.

Table B.5. Major destinations for soybean meal exports from the U.S. and Argentina, 1996–98

Rank	U.S. Destination (percent of U.S. soybean meal exports)		Argentina Destination (percent of soy. meal exports from Argentina)	
1	Canada	(10.93)	Italy	(12.28)
2	China (Mainland)	(7.72)	China (Mainland)	(11.21)
3	Saudi Arabia	(5.91)	The Netherlands	(10.76)
4	Venezuela	(5.40)	Spain	(7.79)
5	Colombia	(4.04)	Iran	(5.90)
6	Japan	(3.94)	Denmark	(5.89)
7	Dominican Republic	(3.85)	Belgium	(5.31)
8	Algeria	(3.71)	Egypt	(4.57)

Source: Prepared from data reported in *Foreign Agricultural Trade of the United States* and *Series Históricas - Agricultura*.

Table B.6. Major destinations for wheat exports from the U.S. and Argentina, 1996–98

Rank	U.S. Destination (percent of U.S. wheat exports)		Argentina Destination (percent of wheat exports from Argentina)	
1	Egypt	(14.44)	Brazil	(56.38)
2	Japan	(11.12)	Iran	(5.68)
3	Pakistan	(6.82)	Egypt	(5.01)
4	Philippines	(5.90)	Turkey	(3.98)
5	South Korea	(5.32)	Peru	(3.12)
6	Mexico	(5.07)	Kenya	(2.33)
7	Taiwan	(3.35)	Sri Lanka	(2.09)
8	Nigeria	(2.97)	Indonesia	(1.84)

Source: Prepared from data reported in *Foreign Agricultural Trade of the United States* and *Series Históricas - Agricultura*.

Table B.7. Major destinations for sunflower exports from the U.S. and Argentina, 1996–98

Rank	U.S. Destination (percent of U.S. sunflower exports)		Argentina Destination (percent of sunflower exports from Argentina)	
1	Spain	(20.80)	The Netherlands	(33.91)
2	Germany	(18.18)	Spain	(16.16)
3	The Netherlands	(10.89)	France	(14.95)
4	Mexico	(8.12)	Mexico	(12.24)
5	Canada	(8.06)	Portugal	(6.98)
6	France	(7.46)	Turkey	(5.95)
7	Turkey	(5.27)	Italy	(3.97)
8	Belgium	(4.52)	Belgium	(1.84)

Source: Prepared from data reported in *Foreign Agricultural Trade of the United States* and *Series Históricas - Agricultura*.

Table B.8. Major destinations for sunflower oil exports from the U.S. and Argentina, 1996–98

Rank	U.S. Destination (percent of U.S. sunflower oil exports)		Argentina Destination (percent of sunflower oil exports from Argentina)	
1	Mexico	(39.84)	India	(14.48)
2	Algeria	(17.30)	Iran	(13.99)
3	Egypt	(15.15)	South Africa	(11.07)
4	Canada	(4.29)	Egypt	(10.65)
5	Guatemala	(3.18)	Russia	(6.03)
6	The Netherlands	(2.94)	Mexico	(5.42)
7	India	(2.67)	Turkey	(5.14)
8	Taiwan	(1.99)	Venezuela	(3.22)

Source: Prepared from data reported in *Foreign Agricultural Trade of the United States* and *Series Históricas - Agricultura*.

Table B.9. Major destinations for sunflower meal exports from Argentina, 1996–98

Rank	Destination (percent of sunflower meal exports from Argentina)	
1	The Netherlands	(43.02)
2	United Kingdom	(15.04)
3	Denmark	(7.41)
4	Italy	(5.52)
5	France	(4.51)
6	Belgium	(3.82)
7	South Africa	(3.11)
8	Thailand	(2.96)

Source: Prepared from data reported in *Series Históricas - Agricultura*.

Table B.10. Corn price differentials between farm level and FAS export locations for the U.S. and Argentina, average 1996–98

	U.S.	Argentina
Country elevator price	$2.76/bushel in North Central Iowa.	$2.55/bushel in North Bs. As.-South Sta. Fe.
Export location price	$3.27/bushel FAS Gulf Mississippi port.	$3.02/bushel FAS Rosario port.
Implicit commercialization cost	Price differential = $0.51/bushel.	Price differential = $0.47/bushel.
Distance	1,000 miles.	125 miles.

Note: U.S. prices correspond to No. 2 Yellow corn.
Source: Prepared from data reported in *Market News Report* for the U.S. For Argentina, prices were calculated from data reported in *Series Históricas - Agricultura* and *Márgenes Agropecuarios*.

Table B.11. Soybean price differentials between farm level and FAS export locations for the U.S. and Argentina, average 1996–98

	U.S.	Argentina
Country elevator price	$6.80/bushel in North Central Iowa.	$6.40/bushel in North Bs. As.-South Sta. Fe.
Export location price	$7.43/bushel FAS Gulf Mississippi port.	$7.02/bushel FAS Rosario port.
Implicit commercialization cost	Price differential = $0.63/bushel.	Price differential = $0.62/bushel.
Distance	1,000 miles.	125 miles.

Note: U.S. prices correspond to No. 1 Yellow soybeans.
Source: Prepared from data reported in *Market News Report* for the U.S. For Argentina, prices were calculated from data reported in *Series Históricas - Agricultura* and *Márgenes Agropecuarios*.

Table B.12. Implicit costs of processing soybeans in the U.S. and Argentina, average 1996–98

	U.S.	Argentina
Soybean price	$262/tn at Illinois processor plant.	$258/tn FAS Rosario port.
Soybean oil price	$535/tn FOB Decatur, Illinois.	$557/tn FOB Rosario port.
Soybean meal price	$248/tn FOB Decatur, Illinois.	$216/tn FOB Rosario port.
Value of soybean products[a]	$293/tn.	$271.50/tn.
Implicit processing cost	Price differential = $31/tn.	Price differential = $13.50/tn.

[a]The values of soybean products were calculated using the average amounts of oil and meal produced from a ton of soybeans in each country (i.e., 18.36 percent of oil and 78.51 percent of meal in the U.S., and 17.72 percent of oil and 79.96 percent of meal in Argentina).
Note: U.S. prices correspond to No. 1 Yellow soybeans, crude oil in tanks, and 48 percent solvent protein meal.
Source: Prepared from data reported in *Market News Report* for the U.S. For Argentina, prices were calculated from data reported in *Series Históricas - Agricultura* and *Márgenes Agropecuarios*.

Table B.13. Wheat price differentials between farm level and FAS export locations for the U.S. and Argentina, average 1996–98

	U.S.	Argentina
Country elevator price	$3.79/bushel in Western Kansas (Dodge City).	$3.58/bushel in Southern Buenos Aires.
Export location price	$4.48/bushel FAS Gulf Mississippi port.	$4.08/bushel FAS Necochea port.
Implicit commercialization cost	Price differential = $0.69/bushel.	Price differential = $0.50/bushel.
Distance	1,000 miles.	125 miles.

Note: U.S. prices correspond to Hard Red Winter No. 1 ordinary protein wheat.
Source: Prepared from data reported in *Market News Report* for the U.S. For Argentina, prices were calculated from data reported in *Series Históricas - Agricultura* and *Márgenes Agropecuarios*.

Table B.14. Sunflower prices at different stages of the commercialization level for the U.S. and Argentina, average 1996–98

	U.S.	Argentina
Country elevator price	$240/tn in Watertown, North East South Dakota.	$180/tn in West Buenos Aires.
FAS export location price		$224.50/tn FAS Bahia Blanca port.
Implicit country elevator-export port cost		Price differential = $34.50/tn.
Distance between country elevator and export port		250 miles.
FOB export location price		$260/tn FOB Bahia Blanca port.
Implicit FAS-FOB cost		Price differential = $35.50/tn.
CIF final destination price	$292/tn CIF Rotterdam, The Netherlands.	
Implicit commercialization cost country elevator-CIF final destination.	Price differential = $52/tn.	

Note: U.S. sunflower prices correspond to No. 1, 40 percent oil content.
Source: Prepared from data reported in *Market News Report* for the U.S. For Argentina, prices were calculated from data reported in *Series Históricas - Agricultura* and *Márgenes Agropecuarios*.

Table B.15. Four-firm concentration ratios for selected sectors in the U.S. and Argentina

	U.S.	Argentina
Corn Exports		43
Soybean Exports		44
Soybean Oil Exports		49
Soybean Meal Exports		49
Wheat Exports		50
Sunflower Exports		67
Sunflower Oil Exports		78
Sunflower Meal Exports		72
Corn Feed		45
Dry Corn Milling		66
Wet Corn Milling	73	80
Wheat Milling	56	44
Soybean Processing	71	
Soybean/Sunflower Processing Capacity		47

Note: Four-firm concentration ratios provide the market share (in percent) accounted for by the top four firms in the respective industry. U.S. figures correspond to 1992. The figures for Argentina correspond to the average for 1993–96.
Source: Prepared from data reported in *Concentration Ratios in Manufacturing* for the U.S., and in Elizagaray and Alaimo plus data reported by the Secretaría de Agricultura, Ganadería, Pesca y Alimentación de la República Argentina for Argentina.

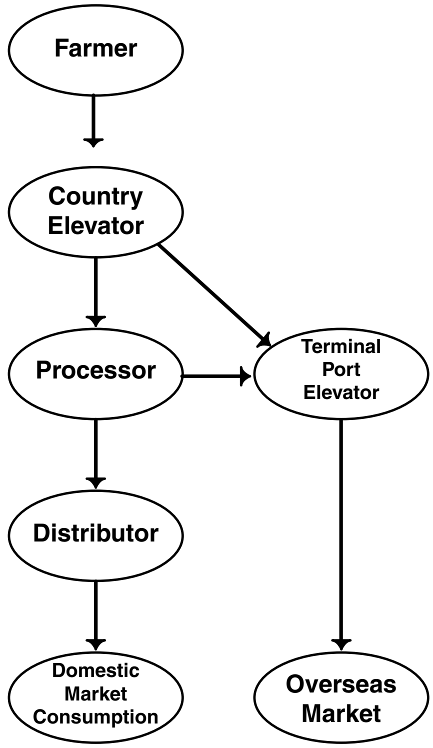


Figure B.1. Physical flows in the marketing channel for grains

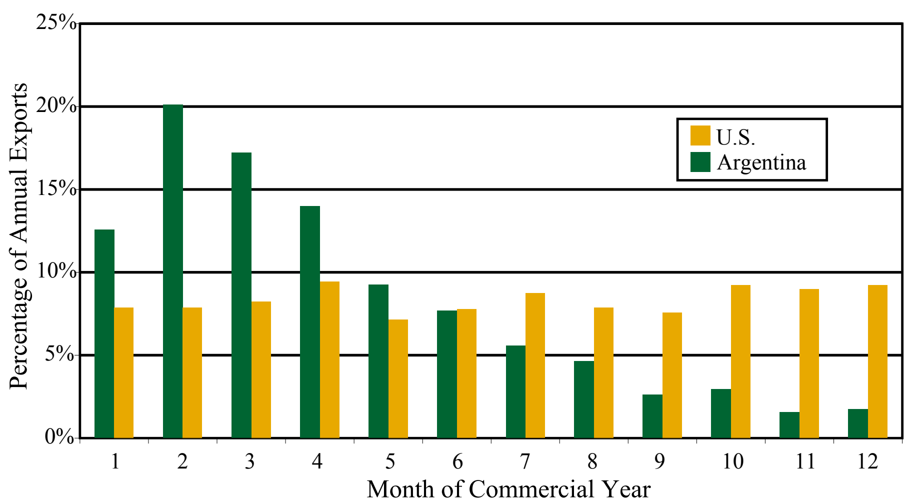


Figure B.2. Percentage of annual corn exports during specific months in Argentina and the U.S., 1997/98-1999/00
Source: Prepared from data reported by the USDA and the Secretaría de Agricultura, Ganadería, Pesca y Alimentación de la República Argentina.

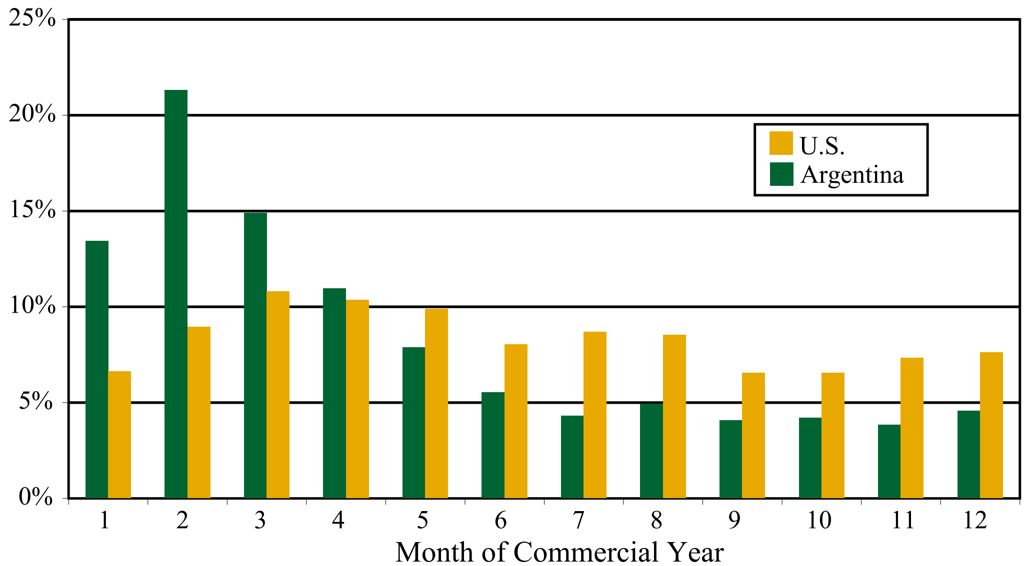


Figure B. 3. Percentage of annual wheat exports during specific months in Argentina and the U.S., 1997/98-1999/00
Source: Prepared from data reported by the USDA and the Secretaría de Agricultura, Ganadería, Pesca y Alimentación de la República Argentina.

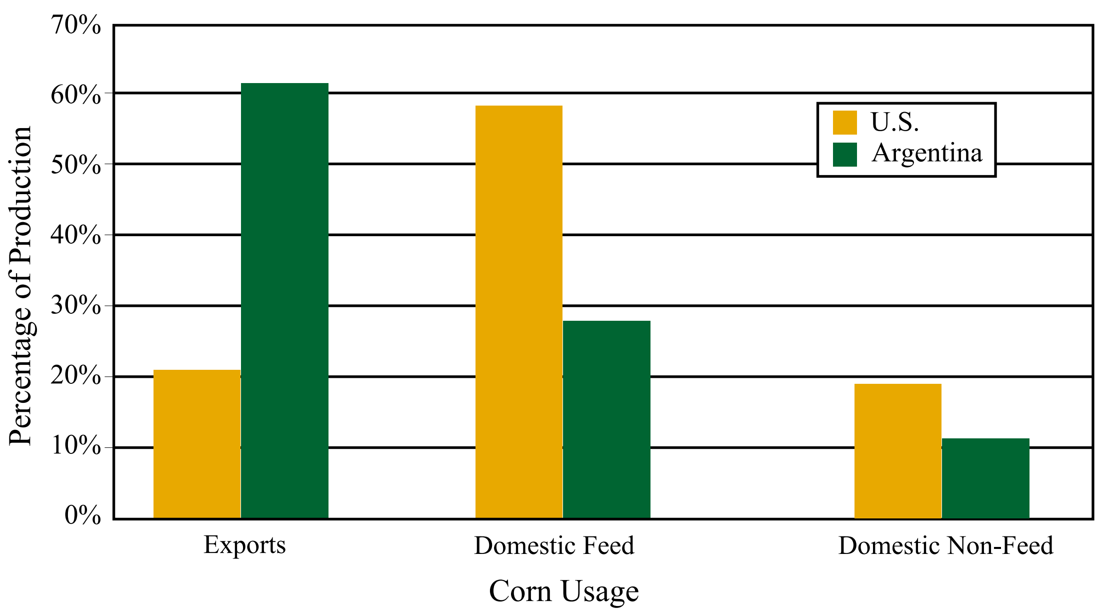
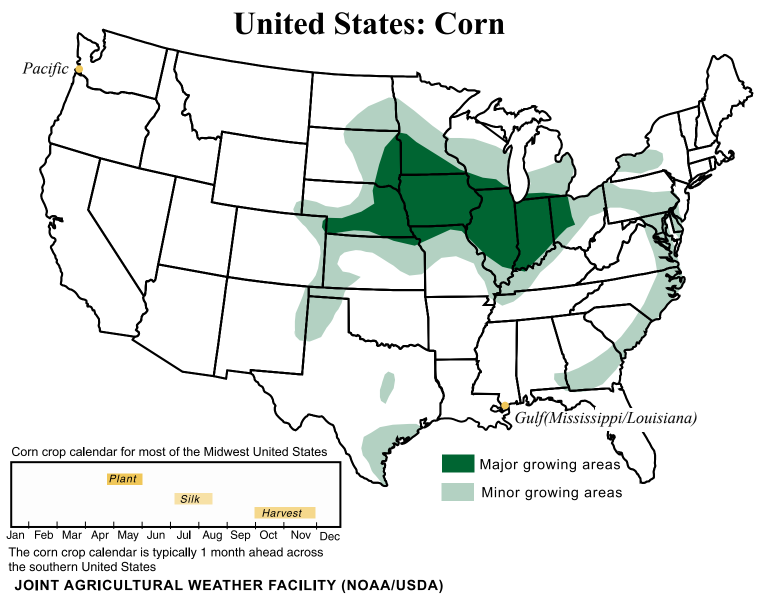


Figure B.4. Corn usage as percentage of production, average 1994/95-1999/00
Source: Prepared from data published in *Grains: World Markets.*



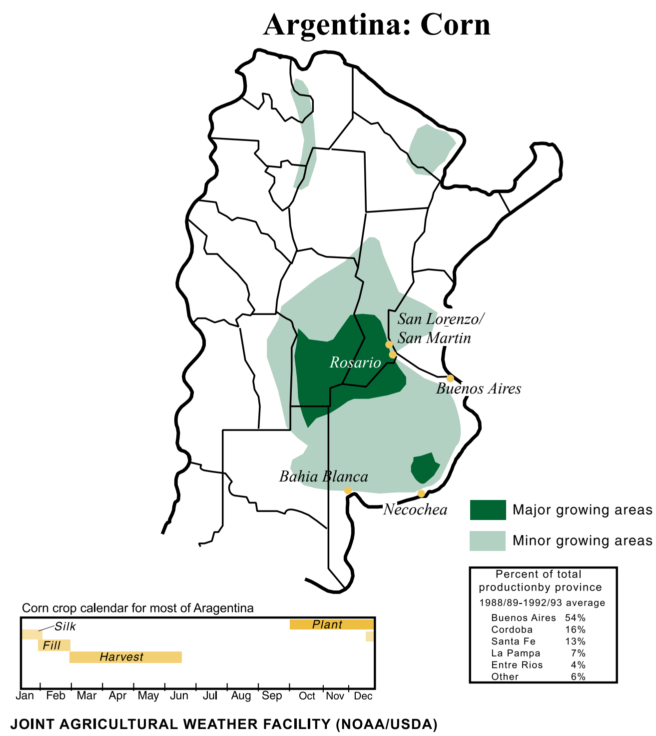


Figure B. 5. Location of major ports relative to corn production areas in the U.S. and Argentina

Source: Adapted from *Major World Crop Areas and Climatic Profiles Online Version.*

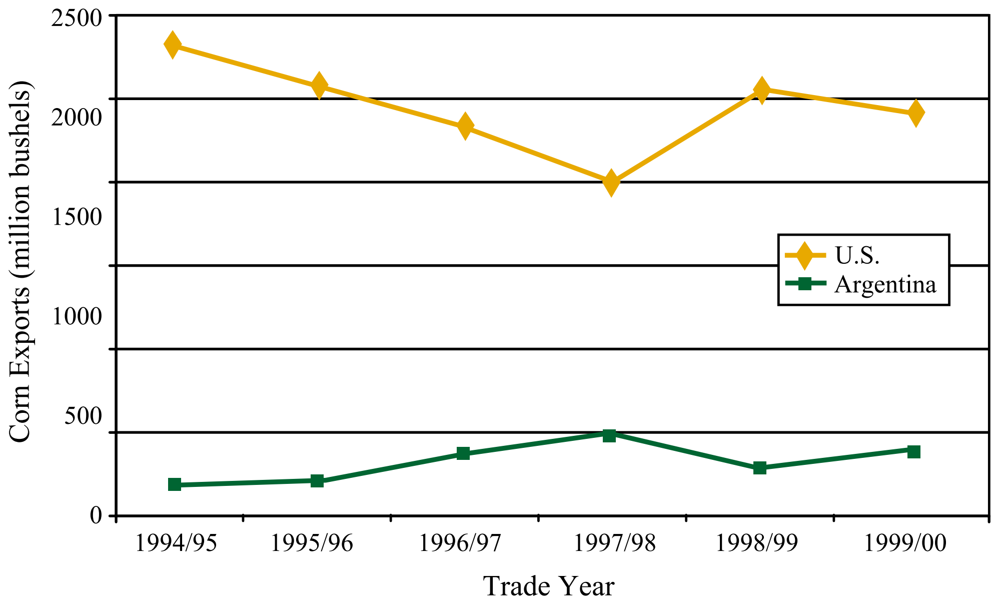


Figure B. 6. Corn exports from the U.S. and Argentina
Source: Prepared from data published in *Grains: World Markets and Trade.*

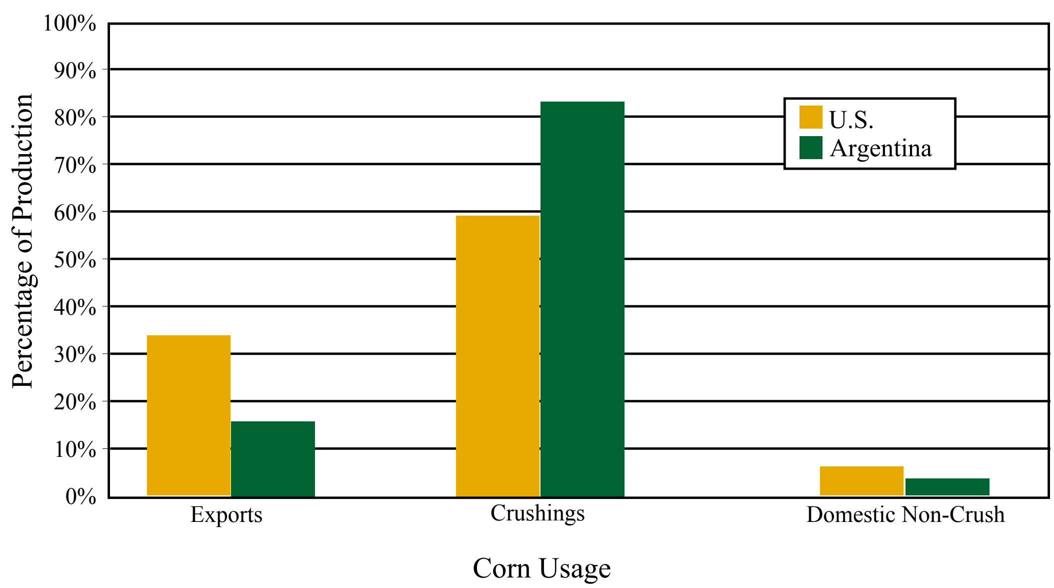


Figure B. 7. Soybean usage as percentage of production, average 1994/95-1999/00
Source: Prepared from data published in *Oilseeds: World Markets and Trade.*

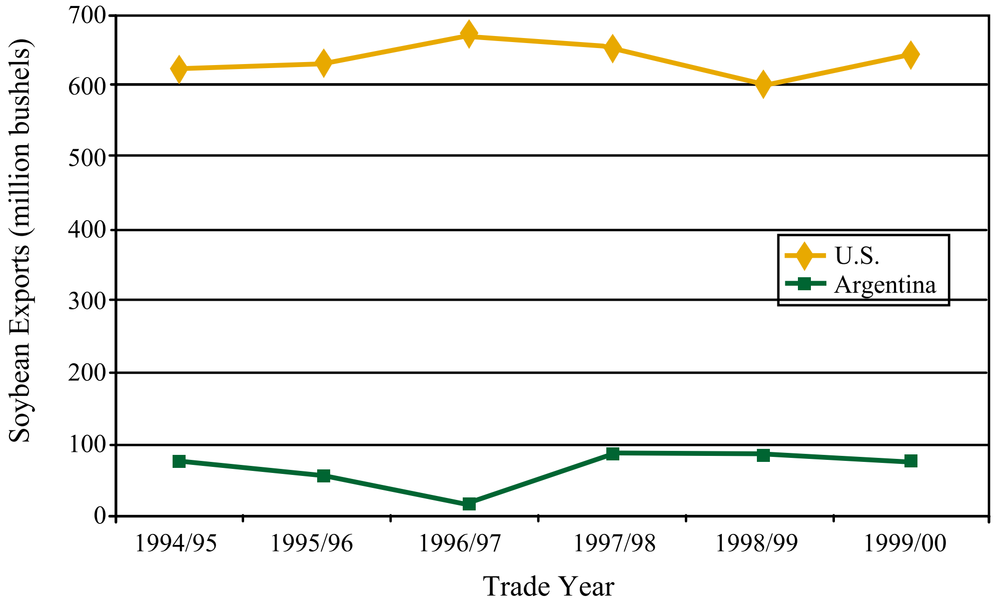


Figure B.8. Soybean exports from the U.S. and Argentina
Source: Prepared from data published i*n Oilseeds: World Markets and Trade.*

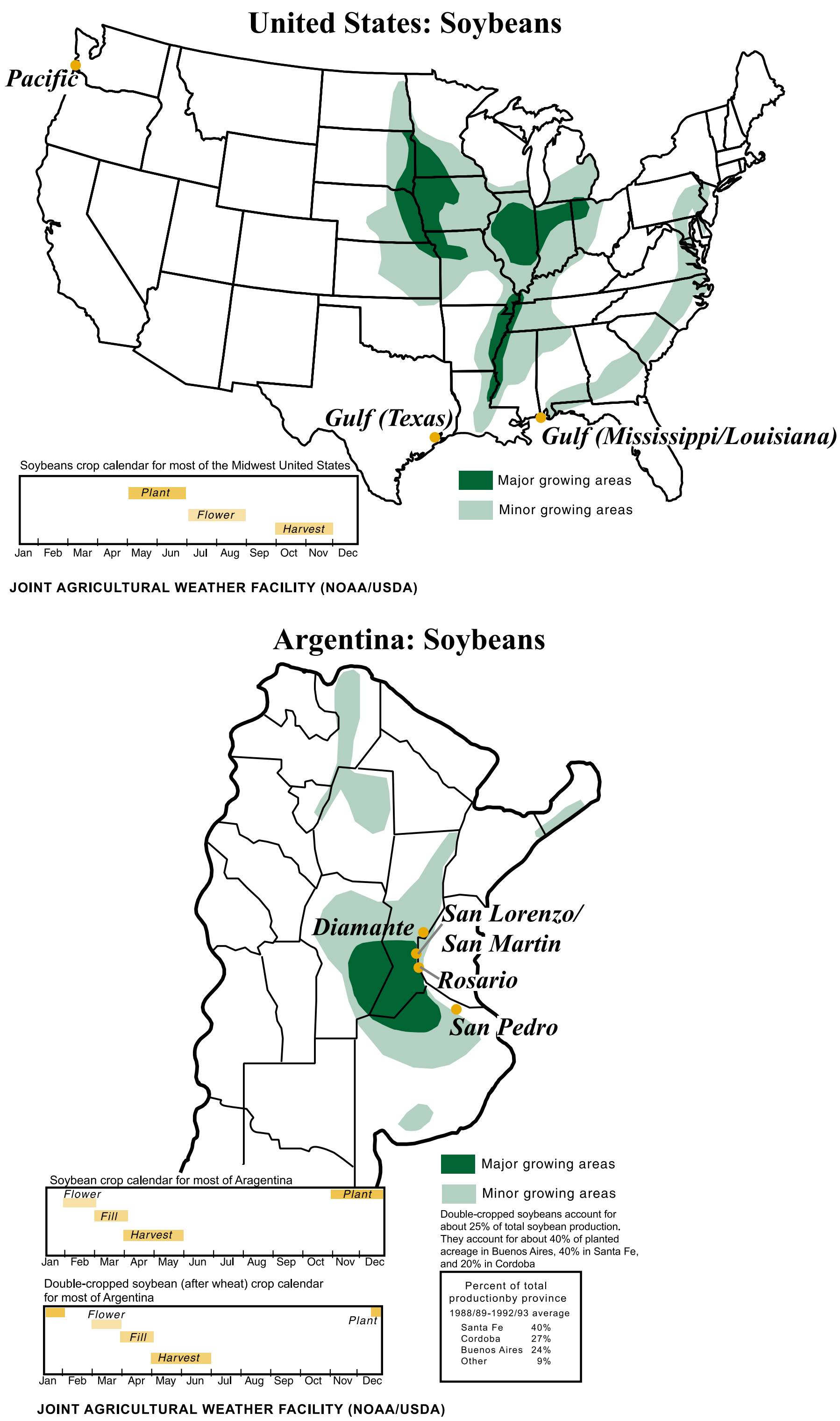


Figure B.9. Location of major ports relative to soybean production areas in the U.S. and Argentina

Source: Adapted from *Major World Crop Areas and Climatic Profiles Online Version.*

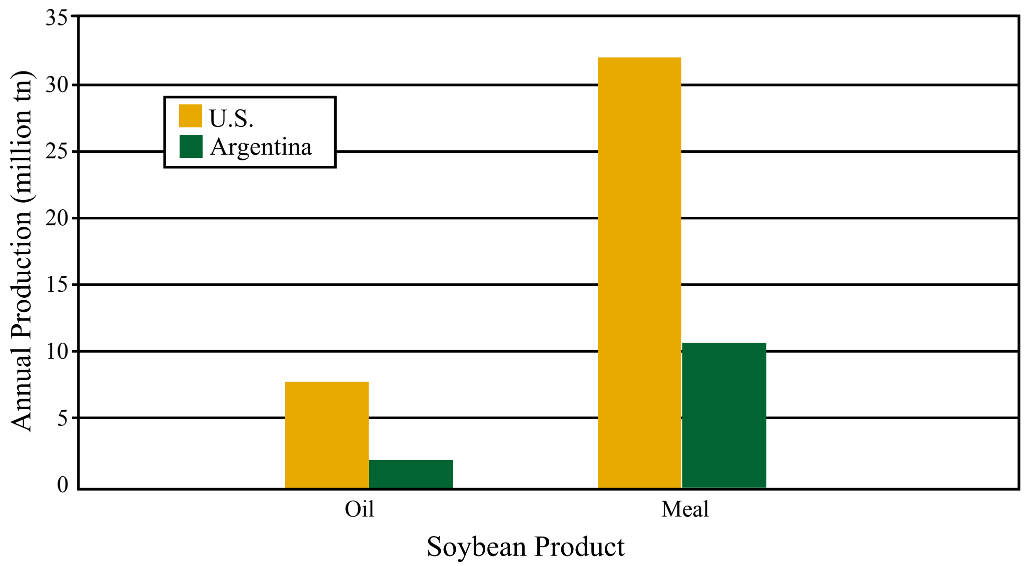


Figure B.10. Production of soybean oil and meal in the U.S. and Argentina, average 1994/95-1999/00
Source: Prepared from data published in *Oilseeds: World Markets and Trade.*

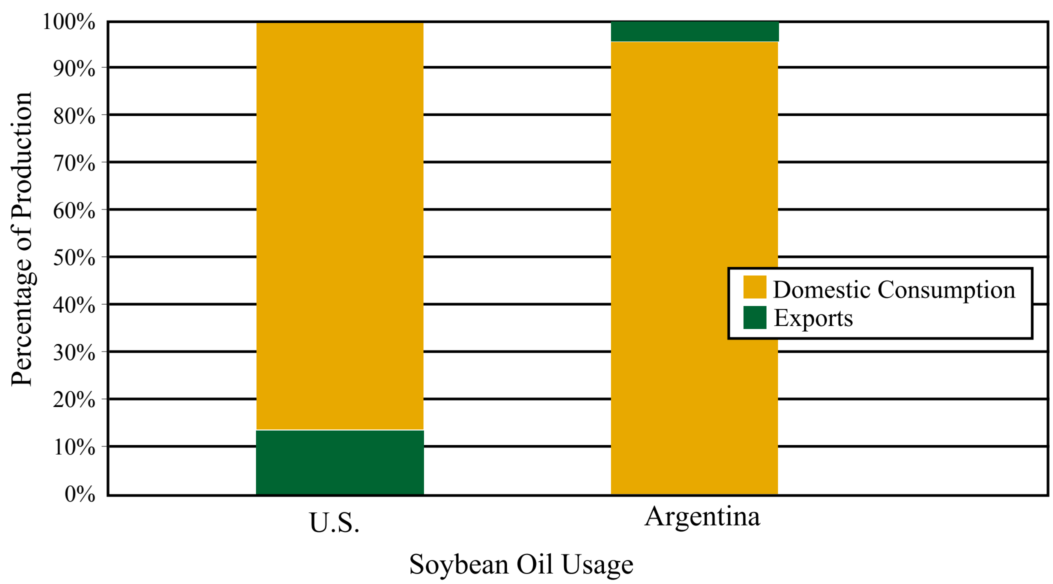


Figure B.11. Soybean oil usage as percentage of production, average 1994/95-1999/00
Source: Prepared from data published in *Oilseeds: World Markets and Trade.*

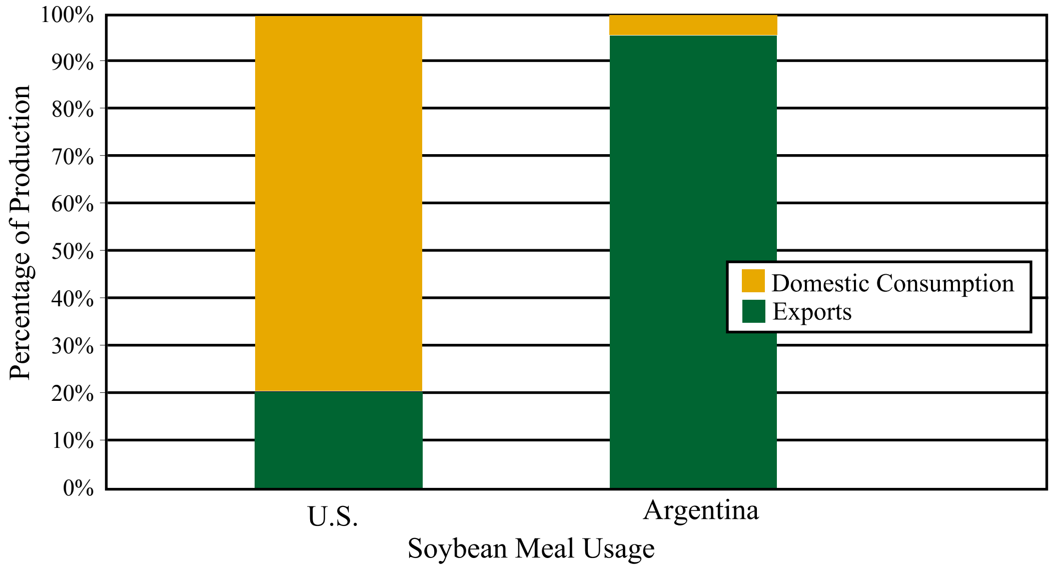


Figure B.12. Soybean meal usage as percentage of production, average 1994/95-1999/00
Source: Prepared from data published in *Oilseeds: World Markets and Trade.*

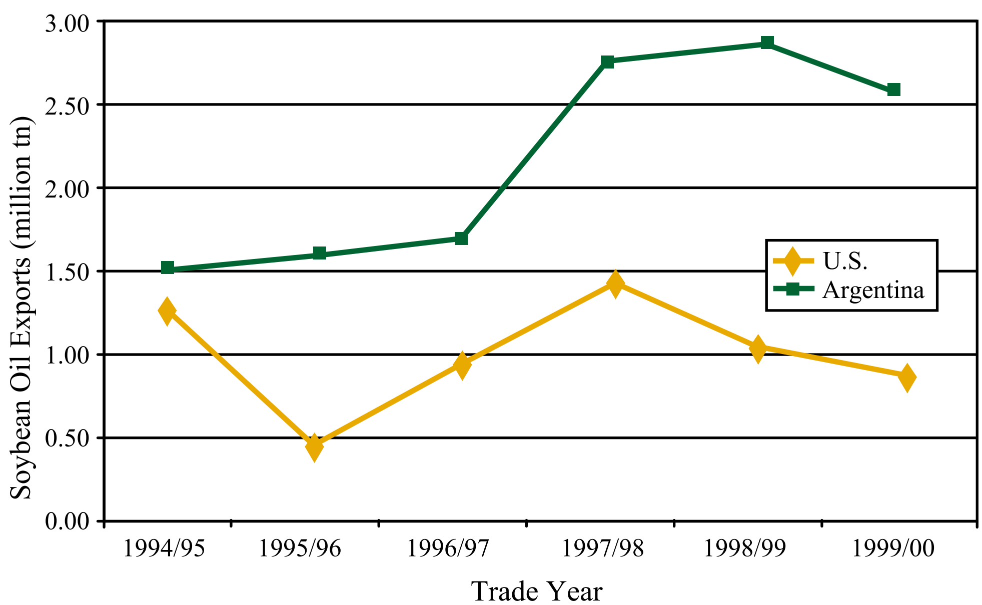


Figure B.13. Soybean oil exports from the U.S. and Argentina
Source: Prepared from data published in *Oilseeds: World Markets and Trade.*

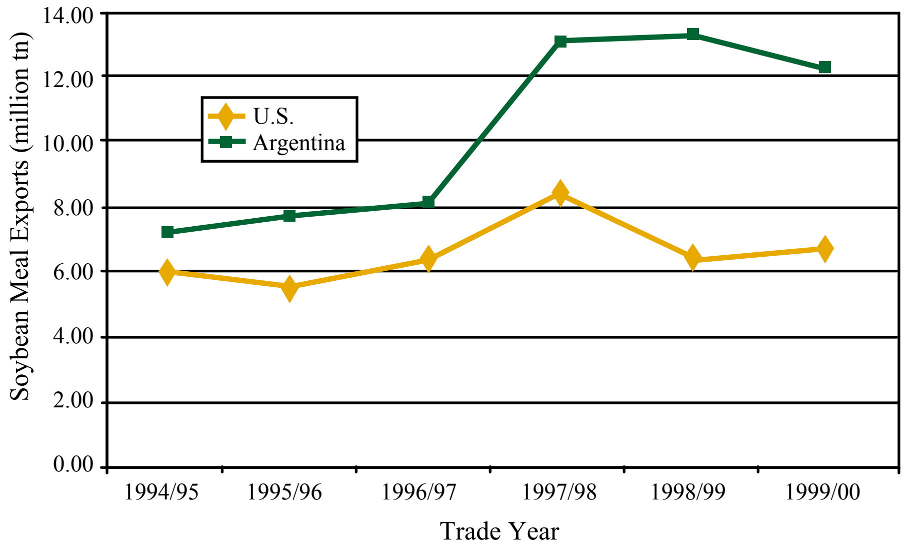


Figure B.14. Soybean meal exports from the U.S. and Argentina
Source: Prepared from data published in *Oilseeds: World Markets and Trade.*

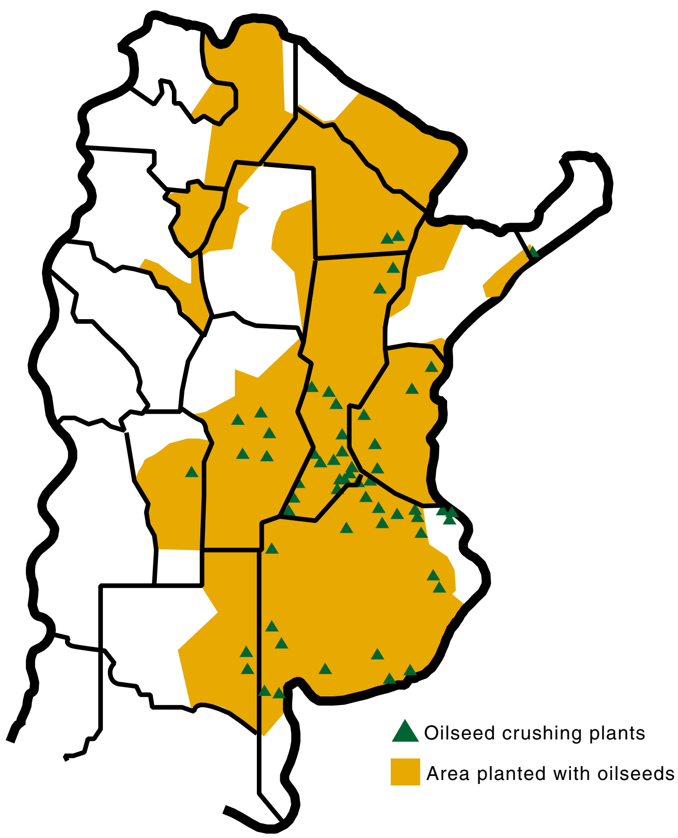


Figure B.15. Location of major oilseed crushing facilities in Argentina
Source: Adapted from Cámara de la Industria Aceitera de la República Argentina.

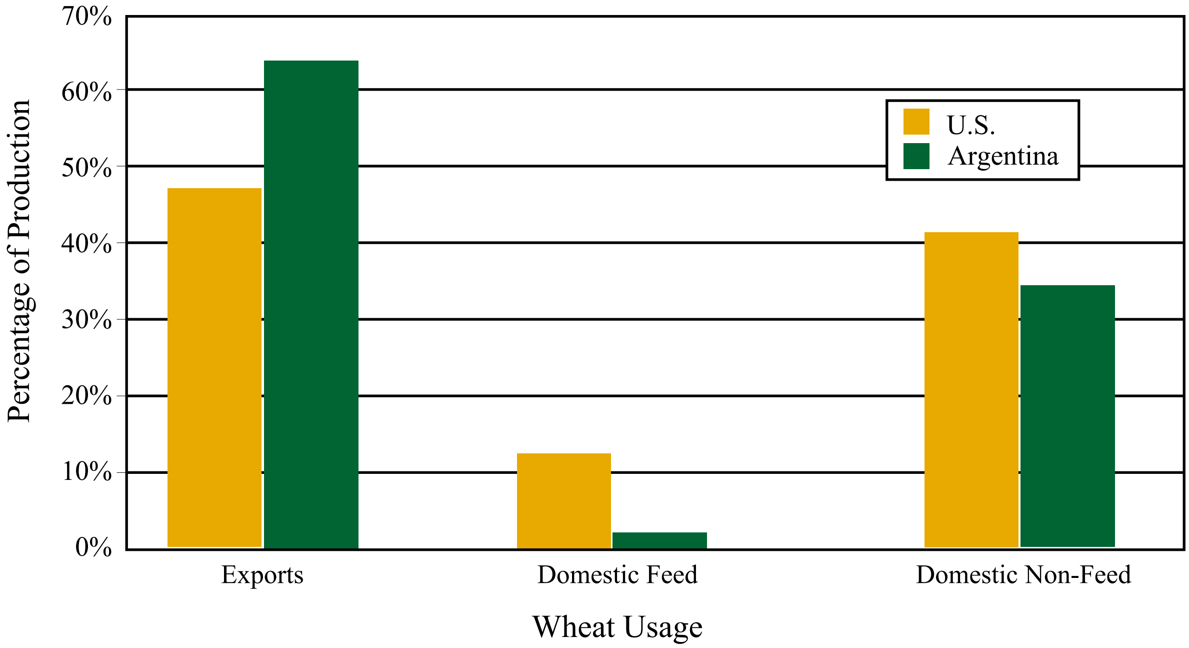
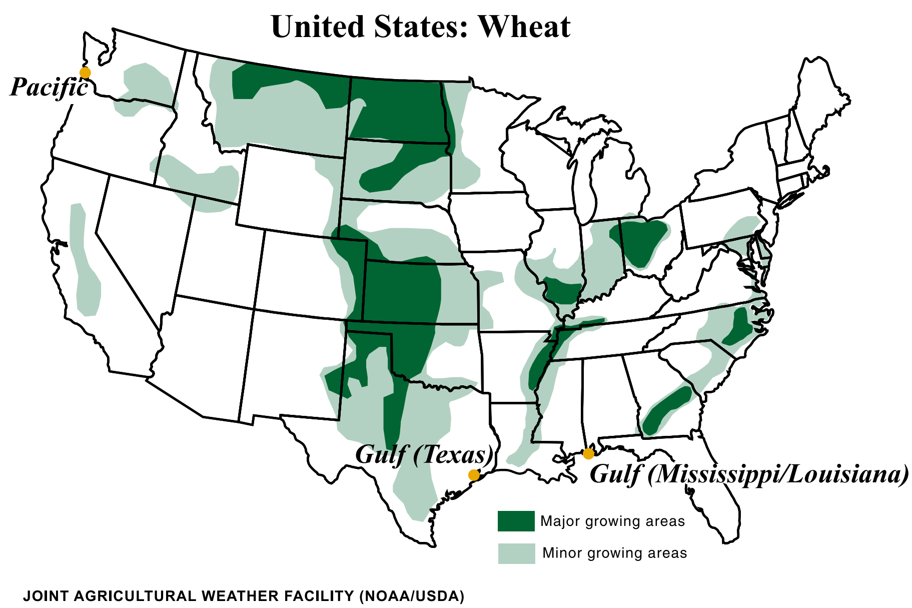


Figure B.16. Wheat usage as percentage of production, average 1994/95-1999/00
Source: Prepared from data published in *Grains: World Markets and Trade.*



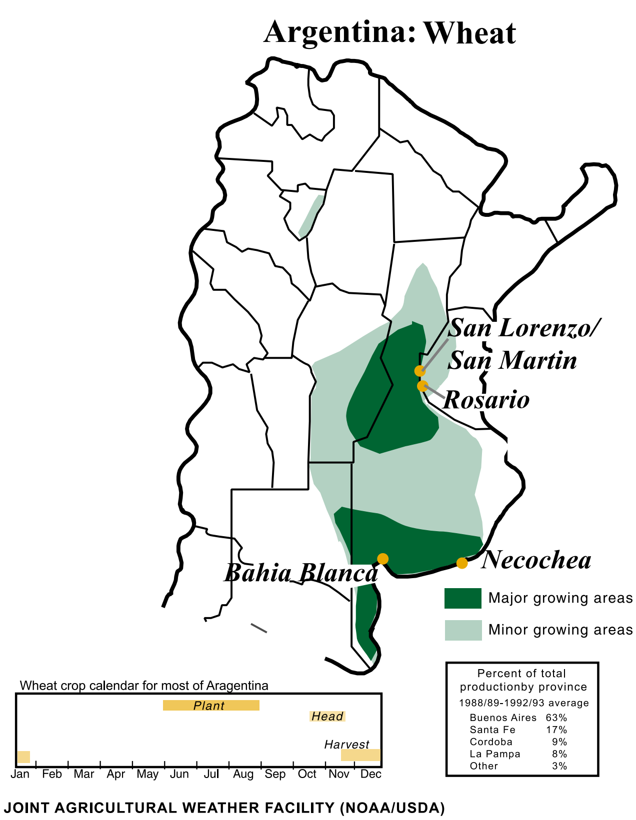


Figure B.17. Location of major ports relative to wheat production areas in the U.S. and Argentina

Source: Adapted from *Major World Crop Areas and Climatic Profiles Online Version.*

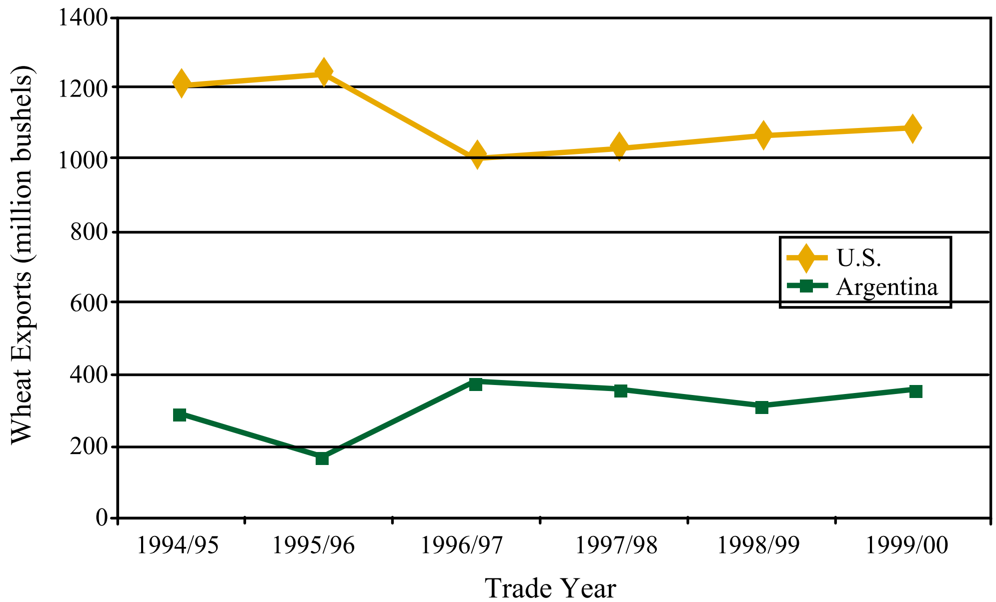


Figure B.18. Wheat exports from the U.S. and Argentina
Source: Prepared from data published in *Grains: World Markets and Trade.*

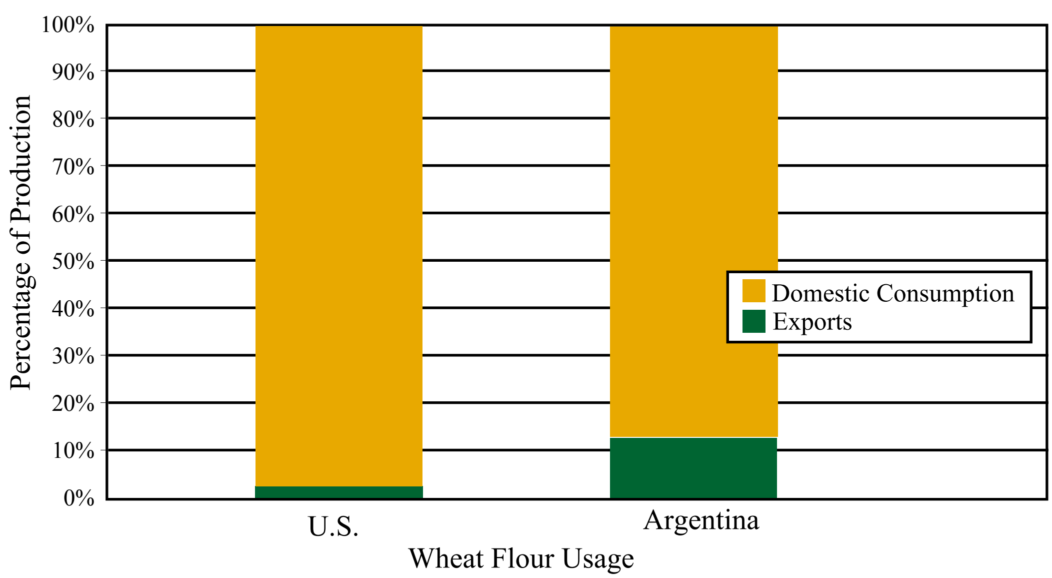


Figure B.19. Wheat flour usage as percentage of production, average 1996-1998
Source: Prepared from data published in *Current Industrial Reports - Flour Milling and Alimentos Argentinos*, and data reported by the Economic Research Service.

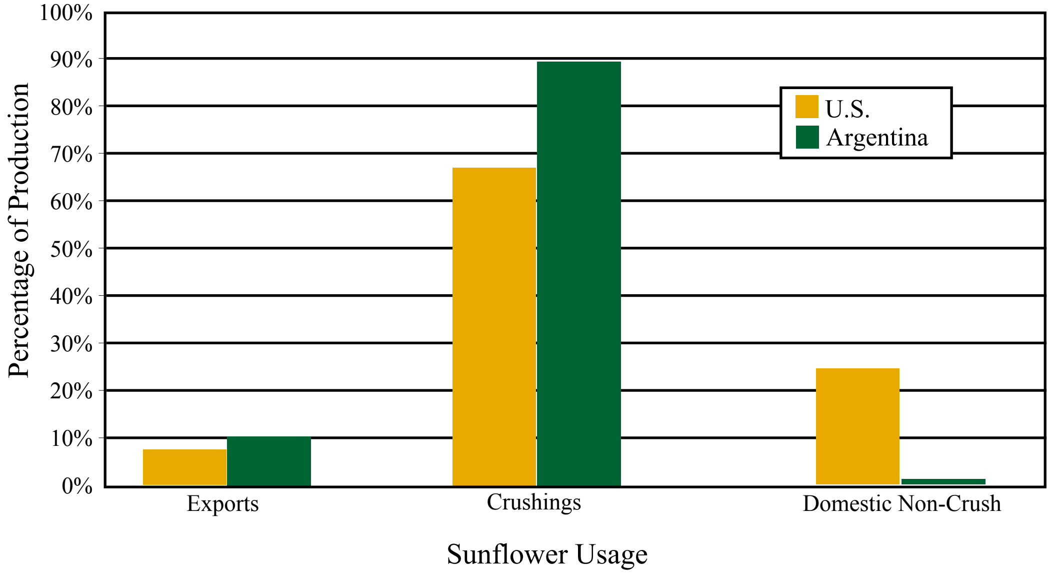


Figure B.20. Sunflower usage as percentage of production, average 1994/95-1998/99
Source: Prepared from data reported by the National Sunflower Association (for the U.S.) and data published in *Oilseeds: World Markets and Trade* (for Argentina).

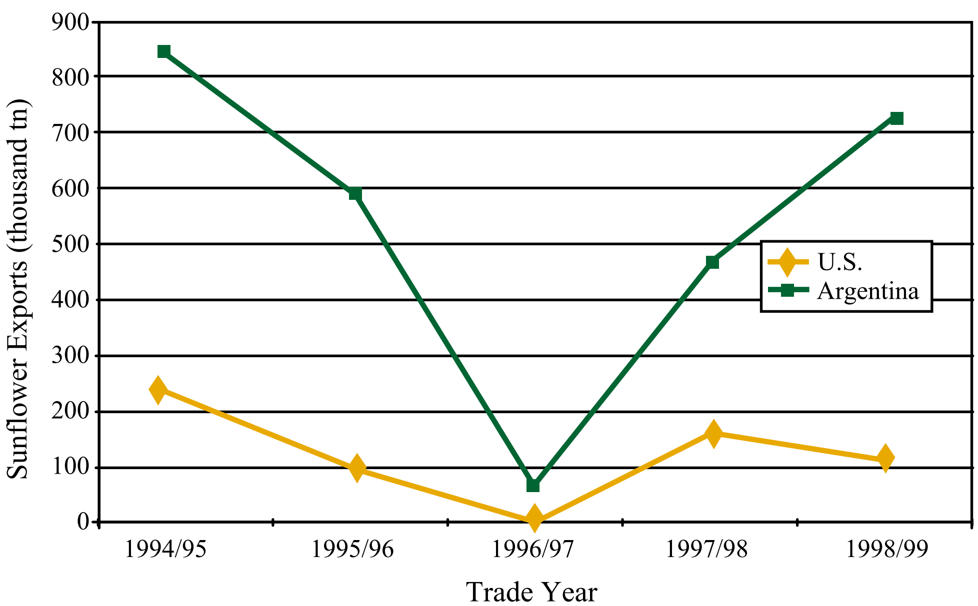


Figure B.21. Sunflower exports from the U.S. and Argentina
Source: Prepared from data reported by the National Sunflower Association.

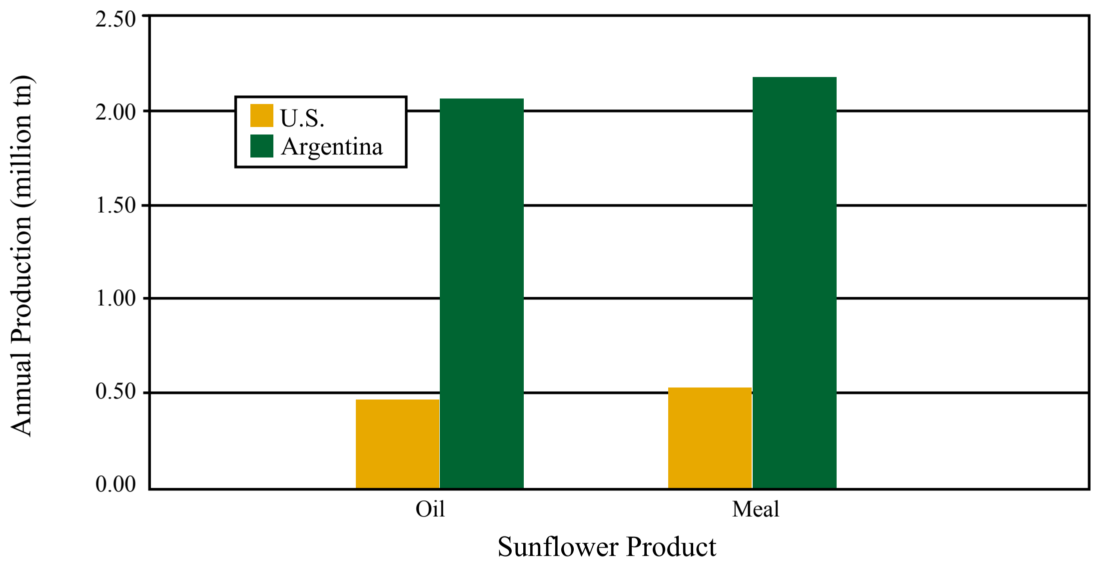


Figure B.22. Production of sunflower oil and meal in the U.S. and Argentina, average 1994/95-1998/99
Source: Prepared from data reported by the National Sunflower Association (for the U.S.) and data published in *Oilseeds: World Markets and Trade* (for Argentina).

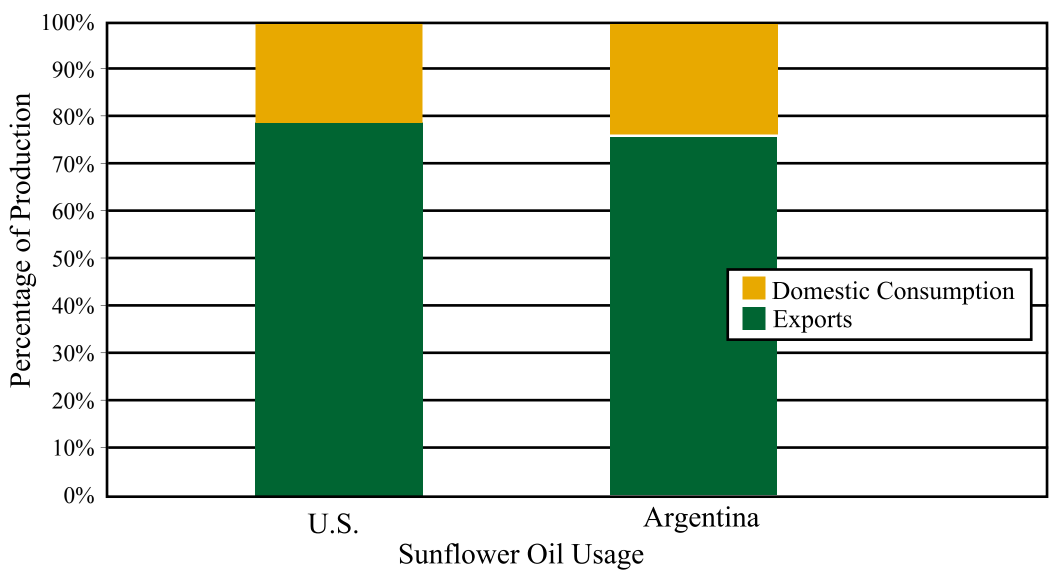


Figure B.23. Sunflower oil usage as percentage of production, average 1994/95-1998/99
Source: Prepared from data reported by the National Sunflower Association (for the U.S.) and data published in *Oilseeds: World Markets and Trade* (for Argentina).

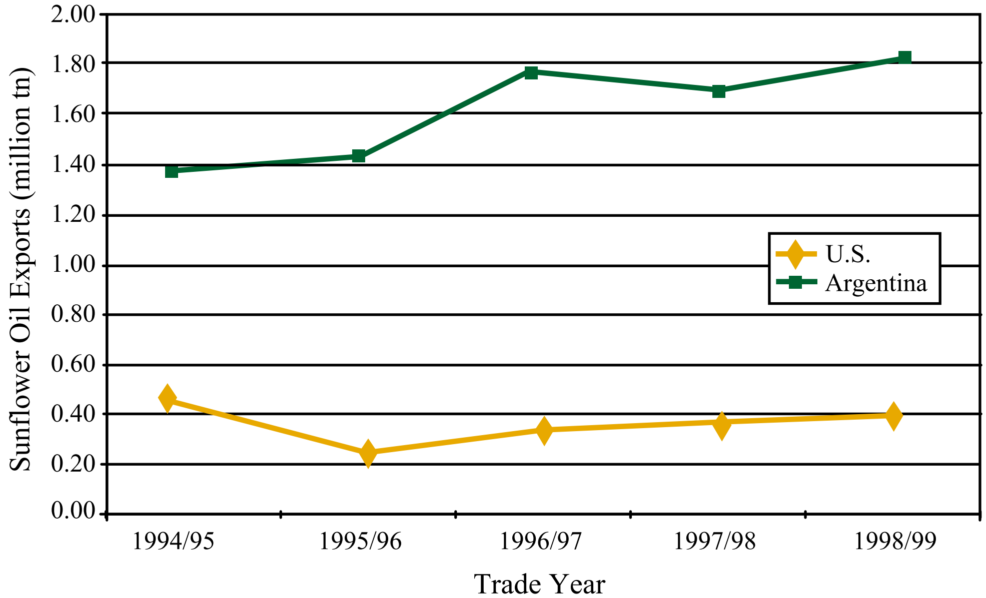


Figure B.24. Sunflower oil exports from the U.S. and Argentina
Source: Prepared from data reported by the National Sunflower Association.

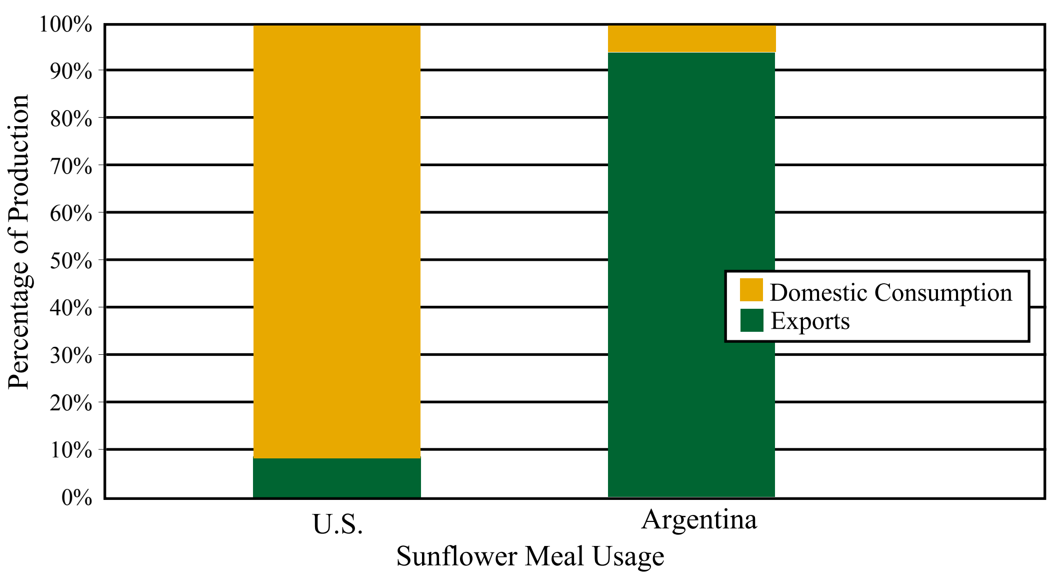


Figure B.25. Sunflower meal usage as percentage of production, average 1994/95-1998/99
Source: Prepared from data reported by the National Sunflower Association (for the U.S.) and data published in *Oilseeds: World Markets and Trade* (for Argentina).

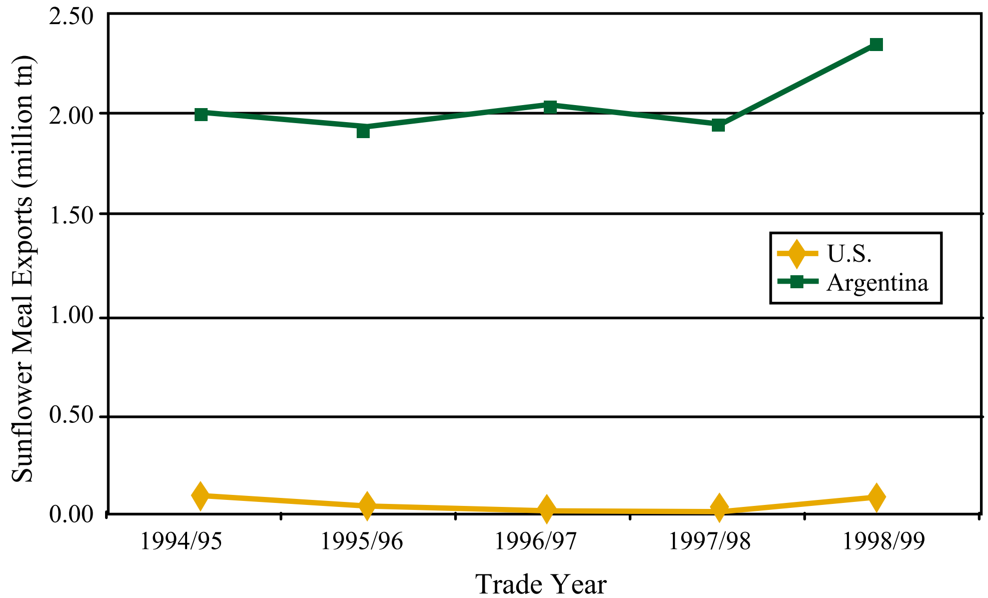


Figure B.26. Sunflower meal exports from the U.S. and Argentina
Source: Prepared from data reported by the National Sunflower Association (for the U.S.) and data published in *Oilseeds: World Markets and Trade* (for Argentina).

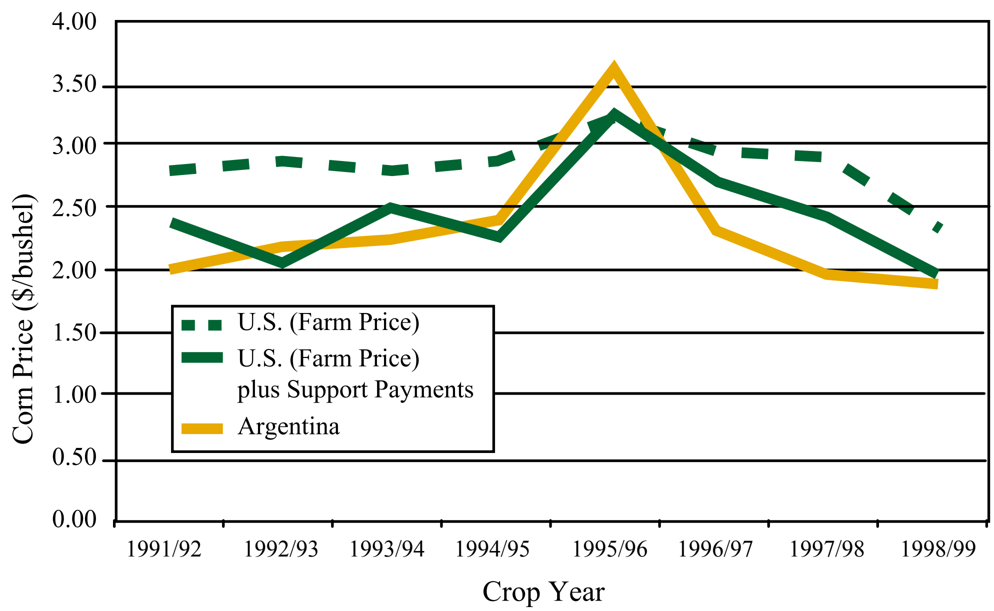


Figure B.27. Prices received by farmers for corn in the U.S. and Argentina
Source: Prepared from data reported in *Agricultural Statistics* for the U.S. For Argentina, prices were calculated from data reported in *Series Históricas - Agricultura* and *Márgenes Agropecuarios.*

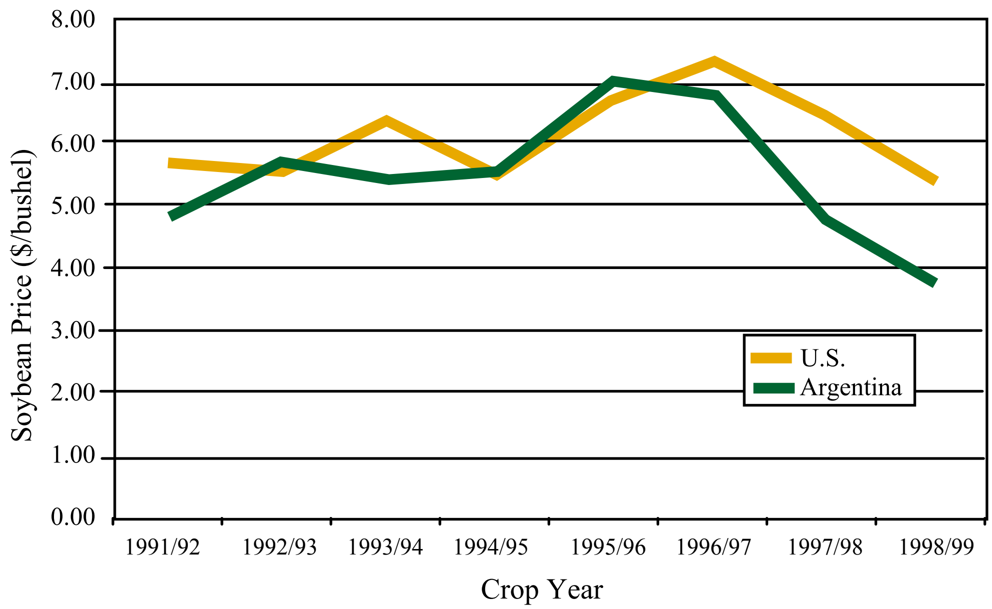


Figure B.28. Prices received by farmers for soybeans in the U.S. and Argentina
Source: Prepared from data reported in *Agricultural Statistics* for the U.S. For Argentina, prices were calculated from data reported in *Series Históricas - Agricultura* and *Márgenes Agropecuarios.*

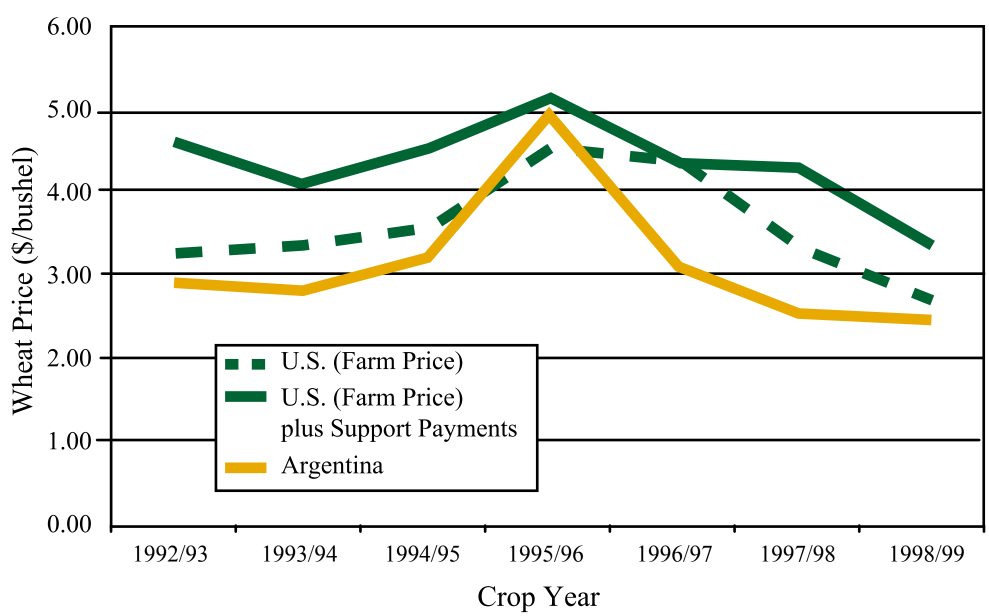


Figure B.29. Prices received by farmers for wheat in the U.S. and Argentina
Source: Prepared from data reported in *Agricultural Statistics* for the U.S. For Argentina, prices were calculated from data reported in *Series Históricas - Agricultura* and *Márgenes Agropecuarios.*

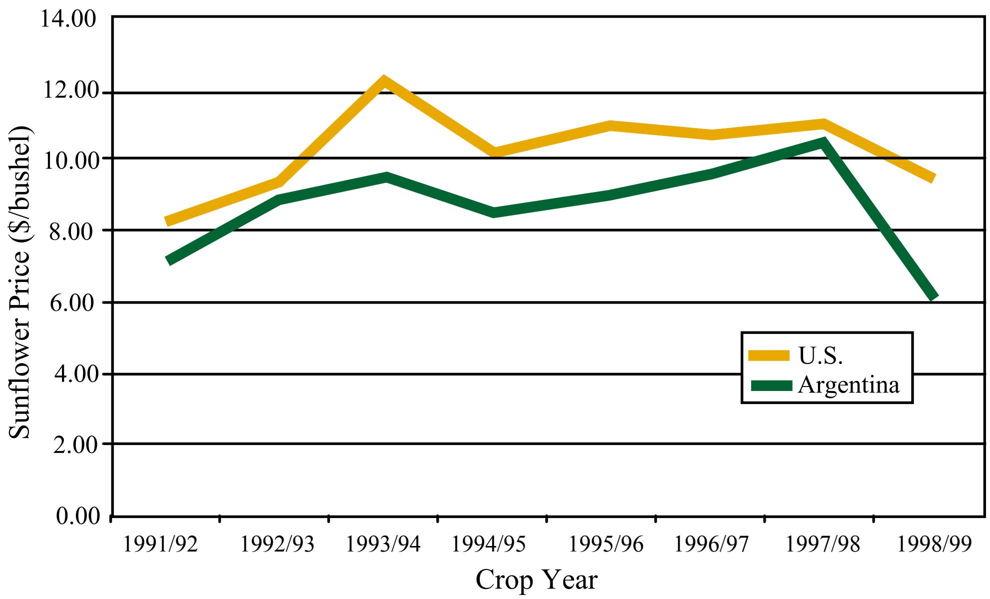


Figure B.30. Prices received by farmers for sunflower in the U.S. and Argentina
Source: Prepared from data reported in *Agricultural Statistics* for the U.S. For Argentina, prices were calculated from data reported in *Series Históricas - Agricultura* and *Márgenes Agropecuarios.*

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SECTION C. MARKETING CHANNELS FOR LIVESTOCK

The basic physical flows involved in the marketing channels for livestock are the same for both the United States and Argentina. Schematically, such flows are depicted in Figure C.1. As is the case for the grain-marketing channel, however, there are significant differences between the countries in many aspects of the commercialization channel for livestock. Such differences include, among others, the relative magnitudes of the physical flows, the kinds of institutions that facilitate commerce, the commercialization costs, and the price-discovery mechanisms. These issues are examined in more detail in the following subsections.

Physical Flows

In the production of red meats, there are two stages that can be clearly differentiated: (a) feeder production, and (b) finished livestock production. In the case of cattle in particular, feeder production is considerably less demanding in terms of feed quality than the production of finished cattle. For this reason, feeder cattle production tends to be confined either to rangeland areas, or to poor quality land in the agricultural areas. Thus, for example, cattle Region II in Argentina specializes in the production of feeder cattle, which is then finished in Region I (Figure A.13).

Due to the significant differences between feeder and finished cattle production, the two stages are typically conducted in different geographic areas, and by different firms. Hence, large movements of cattle occur within both the United States and Argentina. In the United States, the largest movements of feeder cattle take place toward the largest production region, depicted in Figure A.13, from elsewhere in the country. In Argentina, feeder cattle flow mostly from Region II and the Southeast of Region I toward the Center West of Region I (Figure A.13).

In Argentina, a large proportion of the feeder cattle sales is performed at rural auctions (*remates ferias*). These are relatively small auctions that take place at hundreds of locations in the countryside. Sales at these auctions are conducted by agents (*consignatarios*). For relatively small cattle producers, rural auctions have the advantage of allowing the sale of small lots of animals.

Once fattened, livestock is shipped to a slaughterhouse. This is sometimes accomplished indirectly, through a terminal market. In the United States, terminal markets once used to be a major link between the producers of finished livestock and the slaughterhouses. For example, Figure C.2 shows that the share of terminal markets decreased from 89 (76) percent to 6 (10) percent of all cattle (hog) purchases by U.S. slaughterhouses between 1923 and 1984. According to Kohls and Uhl (1998, p. 403), two of the basic reasons for such a decline of the terminal markets in the United States are:

- transportation costs became more favorable toward transporting refrigerated meat rather than live animals; and

- relative costs decreased substantially for slaughterhouses to send their buyers to finished-livestock production facilities as a result of the significant increase in size of the firms producing finished livestock.

In contrast, in Argentina there is a terminal market, Liniers, that is still of paramount importance for the commercialization of finished cattle. There are other terminal markets in Argentina, but their importance is overshadowed by that of Liniers. The Liniers terminal market is located within the city limits of Buenos Aires, and in 1998 about 16 percent of all cattle destined to slaughter (approximately 1.8 million head) in Argentina went through this market. Prior to the exit of hog trading in August 1996, the vast majority of hogs for slaughter (about 45 percent) also were marketed through Liniers.

Unlike terminal markets in the United States, the importance of the Liniers terminal market for cattle has not faded over time. This can be explained by the differences in cattle production and consumption between the countries. First, in Argentina most of the finished cattle are produced in an area relatively close (within 350 miles) to the major consumption center, Buenos Aires. This is quite different from the United States, where a Texas feedlot is more than 1,000 miles away from the major consumption centers of New York, Chicago, and Los Angeles. Hence, there are little savings to be made from transporting meat instead of live animals in Argentina. Second, the firms producing finished cattle in Argentina are much smaller than the U.S. feedlots. Therefore, in

Argentina it is relatively more expensive for slaughterhouses to send their buyers to finished-livestock production facilities.

Given the major differences between the flows of beef and pork at subsequent stages of the marketing channel, they are next discussed separately.

Marketing Flow of Beef

Most of the beef produced by the United States and Argentina is consumed domestically. Beef consumption actually exceeds production in the United States, which implies that the United States is a net importer of beef (Figure C.3). In Argentina, domestic consumption equals about 85 percent of the beef output. U.S. beef exports have averaged about 7 percent of output, whereas the analogous figure for Argentina is 15 percent.

The United States and Argentina are both major beef exporters. The United States is the world's second largest exporter of beef, behind Australia, whereas Argentina ranks sixth in the world beef export market. Specific trading figures for the United States and Argentina are reported in Table C.1. Beef exports in the United States have exhibited a strong upward trend, whereas those from Argentina have declined considerably in the last five years. As a result, in 1998 and 1999, beef exports from the United States were more than three times greater than exports from Argentina.

Table C.1 also shows that the United States is a major importer of beef, whereas Argentina's beef imports are negligible. In fact, the United States is the largest importer of beef in the world. Since U.S. imports exceed exports, net exports are negative, as depicted in Figure C.4. From this graph it is apparent that U.S. net exports have tended to become less negative during the last decade. This happened because the strong upward trend in U.S. exports more than outweighed the increase in imports that occurred over the same period (Table C.1). Argentina's net exports have exhibited no clear trend over the last decade, but they display a very characteristic cyclical pattern.

The aggregate trade figures reported in Table C.1 obscure some important differences regarding the kind of beef products exported by both countries. To this end, the major beef-export categories are broken down by weight and by value in Table C.2.

In relative terms, the United States tends to export more fresh, chilled, and frozen beef than Argentina. On average over the 1997–1998 period, about 98 (98) percent of the weight (value) of U.S. beef exports consisted of fresh, chilled, and frozen beef, whereas the analogous figure for Argentina was only 69 (72) percent.

The major destinations for the export of fresh, chilled, and frozen beef from Argentina and the U.S. are shown in Table C.3. Exports from the United States are highly concentrated, as the top buyer (Japan) imports more than one-half of them, and the next three top customers (Mexico, Canada, and the Republic of Korea) account for more than one-third of the total. Exports from Argentina are also concentrated, but not nearly as much. The main destination of Argentina's exports is Germany, with almost 40 percent of the total; the top three importers (Germany, Chile, and Brazil) buy about two-thirds of the total fresh, chilled, and frozen beef exported by Argentina.

There are clear regional patterns in the destinations of fresh, chilled, and frozen beef. The United States ships mostly to countries in Southeast Asia and to members of the North American Free Trade Agreement. Japan, Republic of Korea, Taiwan, and Hong Kong buy two-thirds of U.S. exports, and Mexico and Canada approximately one-fourth of U.S. exports. Instead, Argentina exports mostly to its neighbors and to the EU. Chile and Brazil buy approximately 30 percent of Argentina's shipments, whereas Germany, Italy, The Netherlands, and France import approximately one-half of Argentina's shipments.

Exports of prepared and preserved beef from the two countries are also highly concentrated among a few buyers (see Table C.4). For the United States, the top three importers of its prepared and preserved beef (Canada, Japan, and Mexico) are also the top three importers of its fresh, chilled, and frozen beef, and account for about 85 percent of U.S. exports. For Argentina, EU countries are important destinations for its prepared and preserved beef, as in the case of its shipments of fresh, chilled, and frozen beef. More specifically, the United Kingdom, The Netherlands, Germany, Italy, and France account for almost 40 percent of Argentina's exports of prepared and preserved beef. However, the United States is the top buyer of prepared and preserved beef from Argentina, importing almost one-half of the total.

A major recent development affecting beef exports from Argentina was the declaration that it is a country free of foot-and-mouth disease (FMD), with vaccination, by the International Office of Epizootics in May 1997 (*Argentina Agricultural, Agroindustrial and Fishing*). Further, Argentina will be declared free of FMD, without vaccination, in the year 2000. These declarations allow Argentina to sell refrigerated raw meat to countries belonging to the "FMD-free circuit," which it could not do previously for sanitary reasons. The economic significance of this is that refrigerated raw meat commands a high price in the FMD-free circuit, which includes high-income countries such as the EU and the United States. Hence, it is to be expected that the composition of beef exports from Argentina (see Table C.2), as well as the destinations of its fresh beef (see Table C.3), will change in the near future.

Beef imports by the United States and Argentina are heavily tilted toward fresh, chilled, and frozen beef (see Table C.5). For the United States, 92 (87) percent of beef imports by weight (value) consists of this category. For Argentina, beef imports are almost nil and involve only fresh, chilled, and frozen beef. In comparing the trade balances implicit in Tables C.2 and C.5, it is interesting to note that the United States is a net importer of beef by weight (net imports of 153 thousand metric ton per year), but a net exporter by value (net exports of $670 millions per year). This implies that the per-unit value of the U.S. exports is significantly greater than the per-unit value of its imports. More specifically, the average price of the beef exported by the United States is $3,466/tn, whereas the analogous figure for imports is $2,044/tn.

As reported in Table C.6, a handful of suppliers account for most U.S. beef imports. Further, suppliers vary greatly depending on the categories of beef imported by the United States. Canada, Australia, and New Zealand provide more than 93 percent of the value of the U.S. imports of fresh, chilled, and frozen beef. In the case of prepared and preserved beef, Argentina and Brazil alone account for slightly more than 85 percent of the value of U.S. imports.

Marketing Flow of Pork

As reported in Table C.7, pork production is substantially (about 50 times) larger in the United States than in Argentina. The United States is the world's third largest producer of pork, behind Mainland China and the EU. Figure C.5 reveals that, on average over the time period 1990–98, the United States and Argentina consumed 1 percent and 19 percent more pork than their respective outputs, which implies that they were net importers of pork over that period. An important difference in pork consumption between the two countries is that most pork is consumed as fresh meat in the United States, whereas most pork is consumed as processed products in Argentina. On average, the United States and Argentina exported about 4 percent and 1 percent of their respective outputs over the same period.

Figure C.6 shows that the dynamics of the net exports from the United States and Argentina followed quite different paths during the 1990s. Argentina's net pork exports presented a clear negative trend over the time interval analyzed. This behavior is explained by the increase in Argentina's pork imports, as exports remained flat and almost negligible throughout the decade (see Table C.7). In contrast, net exports of pork from the United States followed a very strong upward trend. The United States started the decade as a large net importer of pork, but finished it as a large net exporter. This was due to a remarkable increase in exports, as well as a decline in imports, over the 1990–98 period (Table C.7). In recent years, the United States has been the world's second largest exporter of pork (behind the EU) and the third largest importer of pork (behind Japan and the Russian Federation).

Pork exports from the United States and Argentina are highly concentrated among a few countries. Table C.8 shows that the U.S. main customer is Japan, which purchased more than 40 percent of U.S. pork exports between 1997 and 1998. Japan plus the next three customers (Russian Federation, Canada, and Mexico) accounted for almost 80 percent of all U.S. pork shipments during the 1997–98 period. Destinations are even more concentrated for Argentina, as Bolivia imported 86 percent of Argentina's pork exports between 1998 and 1999. It is clear from Table C.8 that the (almost negligible) exports from Argentina go to neighboring countries.

The sources of the pork imported by the United States and Argentina over the 1998–99 period are reported in Table C.9. It can be seen that pork imports are highly concentrated, as well. Canada accounted for almost 70 percent of the U.S. imports, and Denmark for an additional 20 percent. Argentina's major pork suppliers were neighboring countries, Brazil and Chile, with 62 percent and 17 percent, respectively, of the total pork imported by Argentina.

Institutions Facilitating Commerce

The physical flows of livestock and meat are facilitated by various institutions. Such institutions tend to enhance the performance of the marketing channel as a whole and include, among others, institutional markets, intermediaries, and regulators.

With regard to institutional markets, there are active feeder cattle markets in both the United States and Argentina. In both countries, a large number of feeder cattle are sold through auction markets. There are also "order buyers," middlemen who specialize in buying and selling feeder animals. In the United States, the flow of animals from feeder operations to feedlots is often coordinated by intermediaries known as "stockers" or "backgrounders." A recent development in the U.S. feeder cattle and pig markets has been the introduction of an electronic market system called CATTLEX.

As discussed earlier, only a small share of finished cattle sales occurs through terminal markets in the United States, although in Argentina a significant proportion of finished cattle is still being auctioned at the Liniers terminal market. In the United States, more than 80 percent of the finished cattle are sold either directly to slaughterhouses or through country dealers, without going through any auction market. No comparative figures are available for Argentina, but anecdotal evidence suggests that the proportion of direct sales and sales through country dealers is relatively small.

In Argentina, the single most important type of intermediary is the *consignatario*. Consignatarios are cattle brokers who act as sales agents for the cattle producers. Cattle sales at auctions are conducted by consignatarios. They have historically charged about a 2 percent sales commission for their services. Importantly, consignatarios are liable to the seller if the buyer does not pay the amount corresponding to a given transaction. This additional financial safety is a major reason why producers typically use consignatarios for their cattle sale. Consignatarios are also often involved in sales at meat auctions. In this instance, the consignatario arranges for the collection of animals from the farm, for their slaughter at a particular slaughterhouse, and for transportation. The slaughterhouse gets the byproducts, for which it pays the consignatario. The consignatario then auctions the carcass to retail butchers at a public meat auction center. Upon completion of the carcass sale, the consignatario forwards the payments received for the byproducts and the carcass to the cattle producer, minus commission charges, transportation, etc.

An important difference between the United States and Argentina is the availability of futures and options markets, which can greatly improve the management of risks along the commercial channel. In the United States, five cattle products and four pork products can be traded at the Chicago Mercantile Exchange. The cattle products currently traded at the Chicago Mercantile Exchange are feeder cattle, stocker cattle, live (finished) cattle, boneless beef, and boneless beef trimmings. The pork products are lean hogs, pork cutout, fresh pork bellies, and frozen pork bellies. In contrast, in Argentina there are futures and options for only one cattle product, and none for pork products. There was a failed attempt to start trading cattle futures in Argentina in the early 1990s. In 1999, the Rosario Board of Trade launched futures and options contracts on an index based on the prices of steers at the Liniers terminal market. Given that the steer index contract started trading so recently, it is too early to assess its viability.

Price Discovery and Commercialization Costs

Livestock prices in both countries are usually established by informal negotiations between individuals or firms, or by trading at auctions. However, the former price discovery mechanism is much more prevalent in the United States, whereas the latter is the typical one in Argentina. In Argentina, the vast majority of transactions are performed in the spot market. In the United States, spot transactions are the most typical type, but market agreements and forward arrangements are also found. In 1993, these three types of transactions accounted for 82 percent, 8 percent, and 7 percent of the total cattle sale lots in the United States, respectively (Ward). Production under contracts with slaughterhouses, or “captive supplies” (which comprise packer feeding, forward contracting, and marketing agreements), is far more widespread in the United States than in Argentina. As of 1993, 18 percent of the total U.S. cattle and hog output was produced under contracts (*Farmers’ Use of Marketing and Production Contracts*).

In Argentina, virtually all of the cattle sales are performed on a live-weight basis. By comparison, only 45.6 percent of U.S. slaughter cattle transactions were on a live-weight basis in the early 1990s (Ward). The other kinds of cattle pricing methods used in the United States are carcass-weight basis and formula pricing, which accounted for 37.6 percent and 16.8 percent of the transactions in the early 1990s, respectively (Ward). In the case of hogs, most transactions in the United States are on a carcass-weight basis. In Argentina, virtually all hog transactions were made on a live-weight basis until the early 1990s. However, in recent years there has been a tendency toward more carcass-weight basis pricing.

Figures C.7 through C.10 depict the behavior of cattle prices at different stages of the production and commercialization channel for the United States and Argentina. The most noticeable aspect of these graphs is the significantly higher prices for cattle in the United States in all stages. On average, calf prices in the United States were 83 percent higher than in Argentina over the 1992–97 period. Similarly, on average, between 1992 and 1998 the prices of steers and feeder steers in the United States were 77 percent and 89 percent higher, respectively, than in Argentina.

The observed price differentials are mostly due to two factors. First and most importantly, for the period analyzed the United States and Argentina belonged to different beef market segments. More specifically, Argentina was in the FMD-circuit whereas the United States was in the FMD-free circuit. This meant that Argentina could not export refrigerated meat to the United States (or to any other country belonging to the foot-and-mouth disease-free circuit), thereby preventing cattle prices from converging across the two countries. The second factor is that Argentine beef and U.S. beef are not perfect substitutes in consumption because of their different characteristics. In Argentina, cattle are grazed on pastures. In contrast, U.S. cattle are grain fed in feedlots. The differences in cattle diets and the ensuing differences in the length of the fattening cycle and in the exercise performed by the animals result in significantly different beef characteristics (e.g., homogeneity, tenderness, flavor, texture, etc.).

As discussed earlier, Argentina is now part of the FMD-free circuit. Hence, it seems reasonable to expect that cattle prices in Argentina will become more in line with those of the United States. However, the quality differential between United States and Argentine beef, along with transportation costs and other barriers to trade, imply that price differentials between the two countries are unlikely to disappear.

It is interesting to note that, although the price of beef at the retail level is higher in the United States than in Argentina, in relative terms the price differential is substantially smaller than at earlier stages of the commercialization channel. At the calf, feeder steer, and steer levels, on average, U.S. prices were between 77 and 89 percent higher than in Argentina. At the retail level, however, the U.S. price was only 37 percent higher than in Argentina over the 1992–98 period (Figure C.10). The most likely culprit in this is the lower efficiency of the meatpacking and meat distribution sectors in Argentina compared to the United States.

According to a study by Rabobank International, the U.S. meatpacking industry is the most efficient in the world. The study estimated that processing meat in the United States costs approximately $13 per cwt of beef ready for commercialization, versus $33 in Argentina. Furthermore, U.S. slaughterhouses obtain higher revenues from the sale of byproducts (approximately $19 per hundredweight of beef ready for commercialization) than their counterparts in Argentina (approximately $16 per hundredweight of beef ready for commercialization), which allows an additional reduction in the price of the beef ready for commercialization.

To a large extent, the low processing costs for the U.S. plants are due to large scale and high capacity utilization, which allows the exploitation of economies of scale. The largest U.S. plants can slaughter 1.5 million head per year, and operate at an average capacity of 80 percent. In contrast, the largest plants in Argentina can only slaughter 0.25 million head per year. Other contributors to the low processing cost in the United States are the use of cold spray (which reduces losses due to weight loss during the cooling process), and relatively small inspection costs. Slaughter plants in Argentina have high costs because many of them are operated at much less than full capacity, they face high prices of some inputs (e.g., packaging), and because some plants are old and/or obsolete.

The behavior of hog prices is depicted in Figure C.11. Unlike cattle prices, hog prices are noticeably higher in Argentina than in the United States. Over the 1992–98 period, the prices of barrows and gilts in Argentina were about 42 percent higher. One possible explanation for this is the very primitive technology used to produce pigs in Argentina compared to that of the United States, along with relatively high transaction costs for international trade. As a result of the primitive technology, production efficiency is much lower and conversion ratios are much poorer in Argentina, which translates into high production costs. And, in the presence of high transaction costs, the price premium in Argentina cannot be reduced by imports from cheaper sources, such as the United States.

Even more interesting is that, on average from 1992 through 1998, the live-weight prices of barrows and gilts were 19 percent higher than live-weight steer prices in Argentina. By comparison, in the United States the former were 52 percent lower than the latter. The beef/pork ratio in Argentina is anomalous, in the sense that hogs have a much higher grain conversion ratio than cattle. Thus, pork should command a lower price than beef, as happens in the United States, except that cattle production in Argentina is based on direct grazing of pastures as opposed to grain feeding, which may lead to lower production costs (see Table A.16).

Competition

Cattle production is characterized by a highly competitive environment in both Argentina and the United States. In Argentina, the average cattle herd consists of 184 head. About 60 percent of the cattle producers have herds of 1 to 100 head, 30 percent of cattle producers have herds of 101 to 500 head, and the remaining 10 percent of the producers have herds of more than 500 head (*Análisis Comparativo de la Industria Procesadora de Carne Vacuna en el Mundo*). In the United States, the average cattle herd has 88 head, and the distribution of producers is as follows: 80 percent have between 1 to 100 head, 18 percent have between 101 and 500 head, and 2 percent have more than 500 head (*Agricultural Statistics*). However, the herd distribution in the United States is considerably skewed, as the 2 percent of producers with herds exceeding 500 head accounts for about 38 percent of the cattle stocks (*Agricultural Statistics*). Analogous figures are not available for Argentina, but the lack of large feedlots and anecdotal evidence suggest that the herd distribution is not nearly as skewed as in the United States.

The meatpacking sector is much more concentrated than the cattle production sector, especially in the United States. According to Rabobank International, 75 percent of all U.S. cattle is slaughtered by the five largest slaughterhouses. In contrast, the five largest slaughterhouses account for only 16 percent of all cattle slaughtered in Argentina. It must be noted, however, that there is a higher concentration among Argentine meatpackers who process for export, as the five largest meatpackers account for approximately 40 percent of Argentina's beef exports.

Despite the high degree of concentration exhibited by the U.S. meatpacking industry, numerous studies have failed to demonstrate that it behaves in a non-competitive fashion. Further, comprehensive studies of this industry have found that the largest U.S. slaughterhouses generally pay higher prices for cattle than smaller competitors, thereby appearing to pass back some of their efficiency gains to feeders in the form of higher prices (Ward).

At the wholesale and retail levels, anecdotal evidence suggests that concentration is much higher in the United States than in Argentina. For example, in Argentina there were 35,000 retail butcher shops in the late 1980s. Although there has been a trend in recent years toward substitution of supermarkets and even supermarket chains for grocery shops and butcher shops, the latter are still quite common in Argentina. As of the mid–90s, butcher shops accounted for 60 percent of the retail beef market in Argentina, compared to 28 percent of the retail market for supermarkets.

Government Intervention

In the United States, the extent of government intervention in the livestock sector is much smaller than for the grain sector. In particular, there are no direct subsidies such as price support schemes or deficiency payments. However, the government supports the livestock sector through indirect means, such as subsidized credit and the promotion of U.S. beef exports.

As with its grain sector, the livestock sector in Argentina historically has been subject to government intervention aimed at favoring the development of the domestic industrial sector. The policies used to this end included export taxes, price controls at the wholesale and retail levels, official export prices, and quotas. But the extent of such intervention has decreased significantly since the early 1990s. Further, in recent years there have been some efforts by the government to coordinate marketing and promotion efforts to improve the image of Argentine beef abroad, and to open new markets for it.

Table C.1. Production, consumption, imports, and exports of beef in the U.S. and Argentina

Year	Production (million pounds of carcass-weight equivalent)		Exports (million pounds of carcass-weight equivalent)		Imports (million pounds of carcass-weight equivalent)	
	U.S.	Argentina	U.S.	Argentina	U.S.	Argentina
1990	22,743	6,629	1,006	1,045	2,356	50
1991	22,917	6,433	1,189	907	2,406	51
1992	23,086	6,138	1,324	653	2,440	36
1993	23,049	6,191	1,275	618	2,401	5
1994	24,386	6,135	1,611	829	2,368	7
1995	25,222	5,926	1,821	1,146	2,103	28
1996	25,525	5,939	1,878	1,050	2,072	67
1997	25,490	5,979	2,136	964	2,344	26
1998	25,762	5,406	2,171	642	2,643	71
1999	25,081	5,393	2,328	646	2,874	31

Note: Imports for Argentina are expressed in million pounds of product weight for 1997–1999.
Source: Prepared from data in *Agricultural Statistics*, *Red Meat Yearbook*, *Livestock, Dairy, and Poultry Situation and Outlook*, and *Panorama Ganadero*.

Table C.2. Exports of beef from the U.S. and Argentina, average 1997–98

	Exports (thousand metric tn of product weight per year)		Exports (million dollars per year)	
	U.S.	Argentina	U.S.	Argentina
Exports of fresh, chilled, and frozen beef	676	144	2,342	523
Exports of prepared and preserved beef	15	64	53	201
Total beef exports	691	208	2,395	724

Source: Prepared from data in *Dairy, Livestock and Poultry: U.S. Trade and Prospects*, and in *Situación del Mercado de Carnes*.

Table C.3. Major destinations for fresh, chilled, and frozen beef exports from the U.S. and Argentina, 1997–98

Rank	U.S.		Argentina	
	Destination (percent of the value of fresh, chilled, and frozen beef exports from the U.S.)		Destination (percent of the value of fresh, chilled, and frozen beef exports from Argentina)	
1	Japan	(56.68)	Germany	(38.19)
2	Mexico	(14.77)	Chile	(21.22)
3	Canada	(11.06)	Brazil	(9.13)
4	Republic of Korea	(9.21)	Italy	(4.08)
5	Taiwan	(1.59)	The Netherlands	(3.70)
6	Hong Kong	(1.48)	Israel	(3.66)
7	Russian Federation	(0.49)	United States	(2.95)
8	Brazil	(0.46)	France	(2.77)

Source: Prepared from data in *Dairy, Livestock and Poultry: U.S. Trade and Prospects*, and in *Situación del Mercado de Carnes*.

Table C.4. Major destinations for prepared and preserved beef exports from the U.S. and Argentina, 1997–98

Rank	U.S.		Argentina	
	Destination (percent of the value of prepared and preserved beef exports from the U.S.)		Destination (percent of the value of prepared and preserved beef exports from Argentina)	
1	Canada	(54.24)	United States	(47.95)
2	Japan	(24.21)	United Kingdom	(15.10)
3	Mexico	(4.22)	The Netherlands	(7.71)
4	Republic of Korea	(2.47)	Germany	(6.87)
5	Russian Federation	(0.80)	Italy	(6.78)
6	Not available		Canada	(2.57)
7	Not available		Japan	(1.15)
8	Not available		France	(0.88)

Source: Prepared from data in *Dairy, Livestock and Poultry: U.S. Trade and Prospects*, and in *Situación del Mercado de Carnes*.

Table C.5. Imports of beef by the U.S. and Argentina, average 1997–98

	Imports (thousand metric tn of product weight per year)		Imports (million dollars per year)	
	U.S.	**Argentina**	**U.S.**	**Argentina**
Fresh, chilled, and frozen beef	778	19	1,508	30
Prepared and preserved beef	66	0	218	0
Total	844	19	1,725	30

Source: Prepared from data in Dairy, Livestock and Poultry: U.S. Trade and Prospects, and in Situación del Mercado de Carnes.

Table C.6. Major sources of beef imported by the U.S., 1997–98

Rank	Fresh, chilled, and frozen beef		Prepared and preserved beef	
	Source (percent of the value of fresh, chilled, and frozen beef imported by the U.S.)		Source (percent of the value of prepared and preserved beef imported by the U.S.)	
1	Canada	(43.96)	Argentina	(48.13)
2	Australia	(27.13)	Brazil	(38.74)
3	New Zealand	(21.72)	Canada	(3.49)
4	Uruguay	(2.21)	Mexico	(1.88)

Source: Prepared from data in Dairy, Livestock and Poultry: U.S. Trade and Prospects.

Table C.7. Production, consumption, imports, and exports of pork in the U.S. and Argentina

Year	Production (million pounds of carcass-weight equivalent)		Exports (million pounds of carcass-weight equivalent)		Imports (million pounds of carcass-weight equivalent)	
	U.S.	Argentina	U.S.	Argentina	U.S.	Argentina
1990	15,356	310	218	7	854	3
1991	16,003	312	262	1	749	20
1992	17,236	347	363	0	624	58
1993	17,091	401	402	1	719	63
1994	17,700	401	495	1	714	71
1995	17,854	393	711	4	643	57
1996	17,120	327	883	2	602	92
1997	17,276	302	993	2	619	105
1998	19,014	343	1,101	3	686	137

Source: Prepared from data in *FAOSTAT*.

Table C.8. Major destinations of pork exported by the U.S. and Argentina

Rank	U.S.		Argentina	
	Destination (percent of the product weight of pork exported by the U.S. during 1997–1998)		Destination (percent of the product weight of pork exported by Argentina during 1998–1999)	
1	Japan	(42.15)	Bolivia	(85.64)
2	Russian Federation	(15.35)	Brazil	(5.72)
3	Canada	(11.07)	Uruguay	(4.55)
4	Mexico	(10.22)	Paraguay	(3.03)
5	Hong Kong	(5.15)	Not available	
6	Republic of Korea	(2.76)	Not available	

Source: Prepared from data in *Livestock, Dairy, and Poultry Situation and Outlook* (for the U.S.) and in *Noticias en los Mercados de la Carne, Lácteos y Lanas* (for Argentina).

Table C.9. Major sources of pork imported by the U.S. and Argentina, 1997–98

Rank	U.S. Source (percent of the product weight of pork imported by the U.S.)		Argentina Source (percent of the product weight of pork imported by Argentina)	
1	Canada	(69.16)	Brazil	(61.77)
2	Denmark	(19.36)	Chile	(17.23)
3	Poland	(2.60)	Denmark	(6.00)
4	The Netherlands	(1.35)	Italy	(4.89)
5	Hungary	(1.44)	Spain	(3.00)
6	Not available		Canada	(2.77)

Source: Prepared from data in *Livestock, Dairy, and Poultry Situation and Outlook* (for the U.S.) and in *Noticias en los Mercados de la Carne, Lácteos y Lanas* (for Argentina).

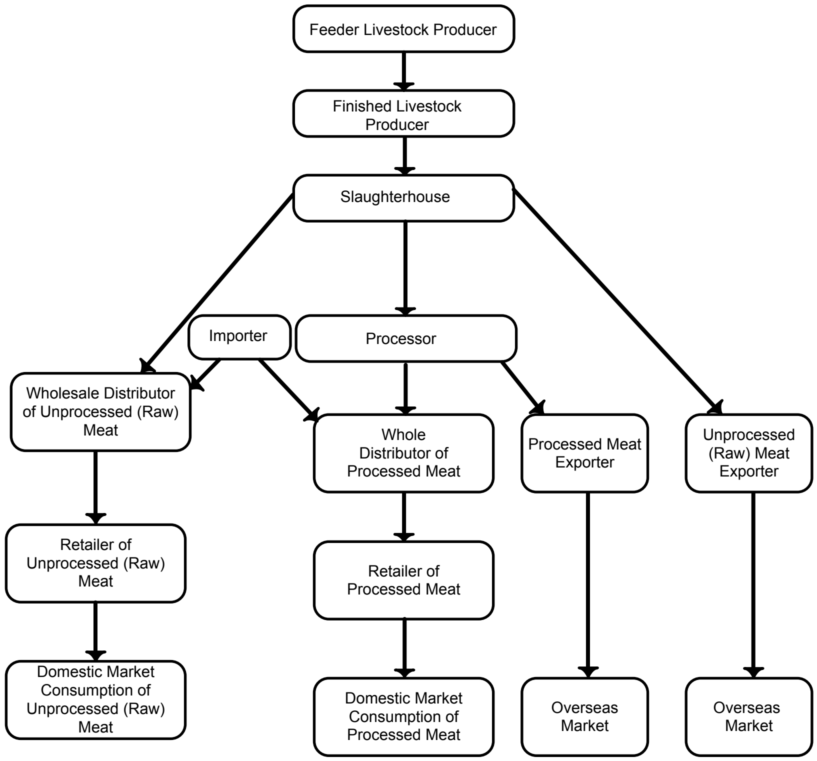

Figure C.1. Physical flows in the marketing channel for livestock

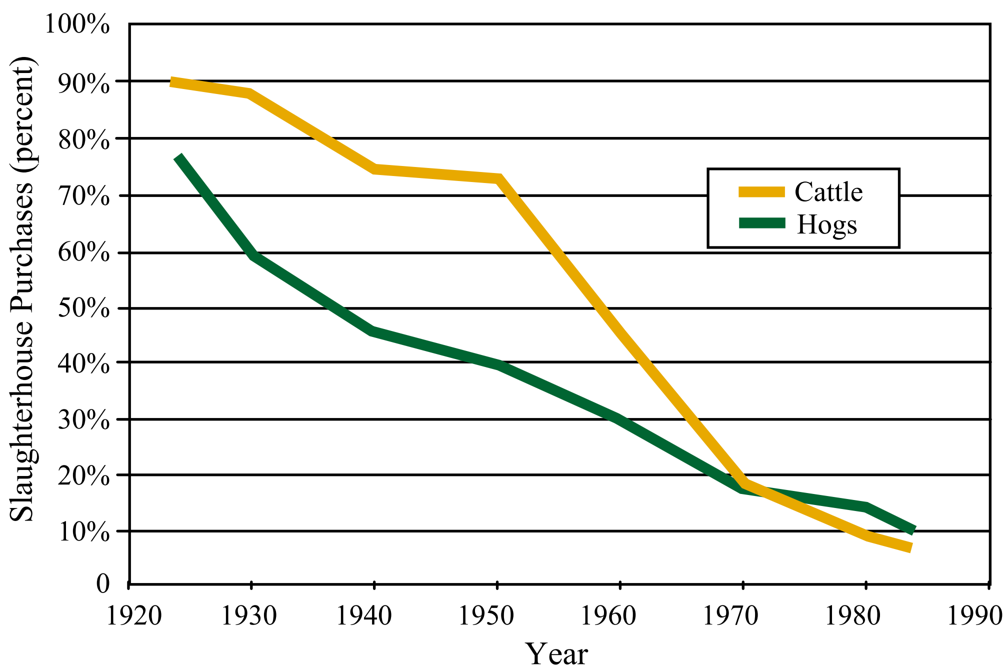

Figure C.2. Percentage of slaughterhouse livestock purchases from terminal markets in the U.S., 1923-84

Source: Prepared from data published in Kohls and Uhl.

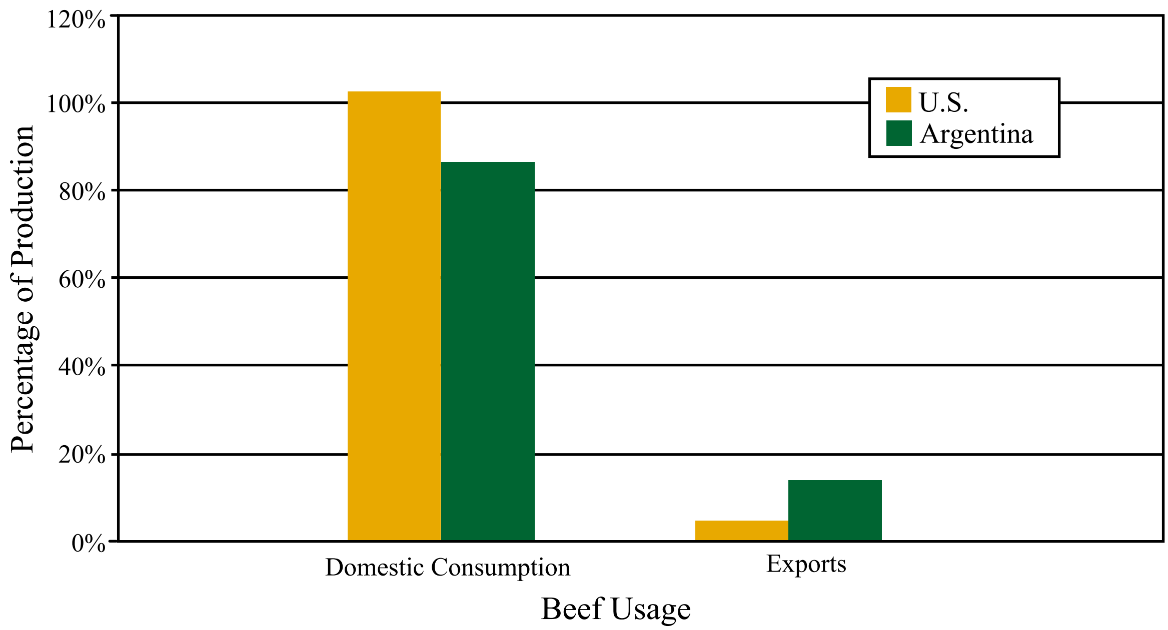

Figure C.3. Beef usage as percentage of production, average 1990-99
Source: Prepared from data in *Agricultural Statistics, Red Meat Yearbook, Livestock, Dairy and Poultry Situation and Outlook,* and *Panorama Ganadero.*

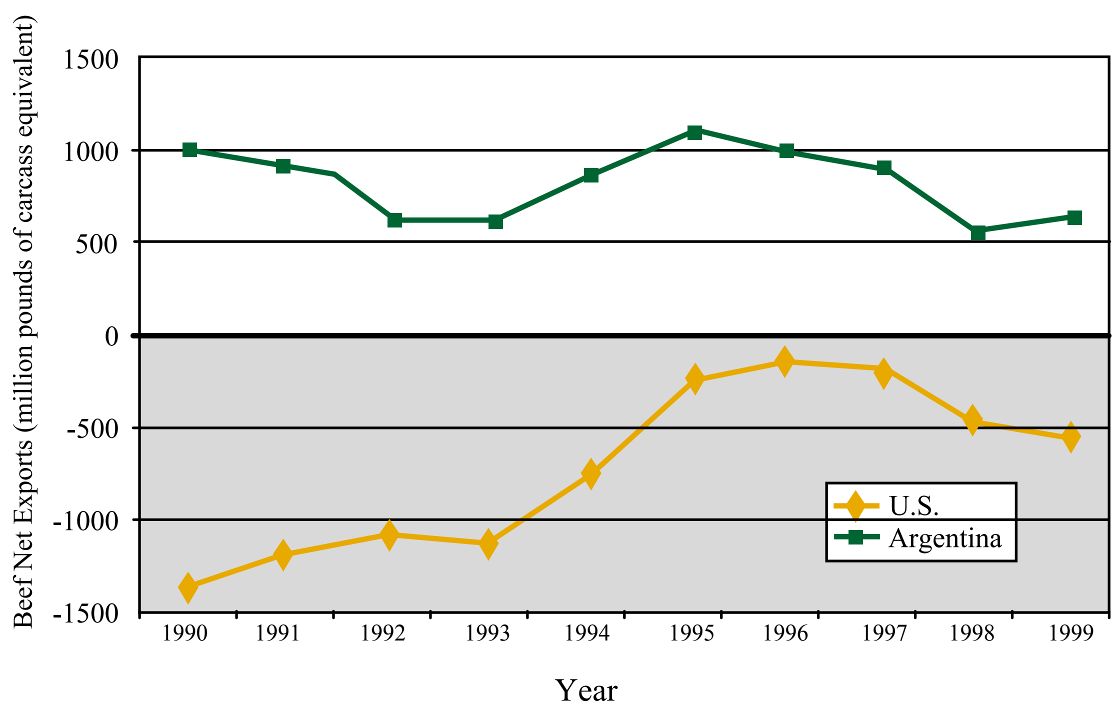

Figure C.4. Net exports of beef rom the U.S. and Argentina
Source: Prepared from data in *Agricultural Statistics, Red Meat Yearbook, Livestock, Dairy and Poultry Situation and Outlook,* and *Panorama Ganadero.*

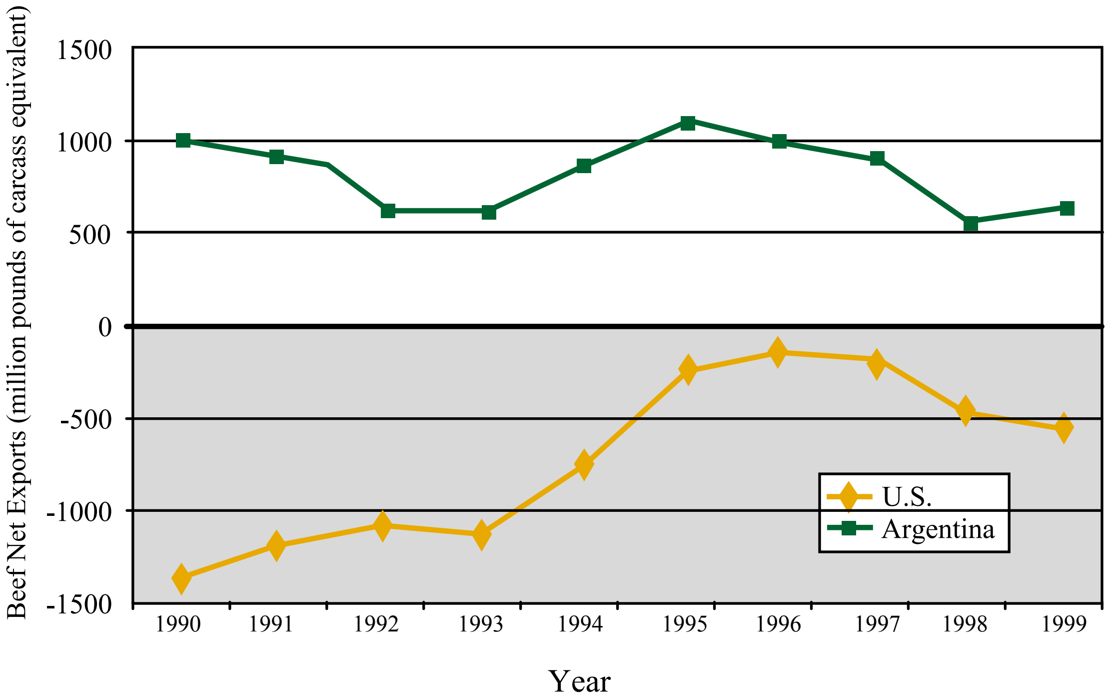

Figure C.5. Pork usage as percentage of production, average 1990-98
Source: Prepared from data in *FAOSTAT.*

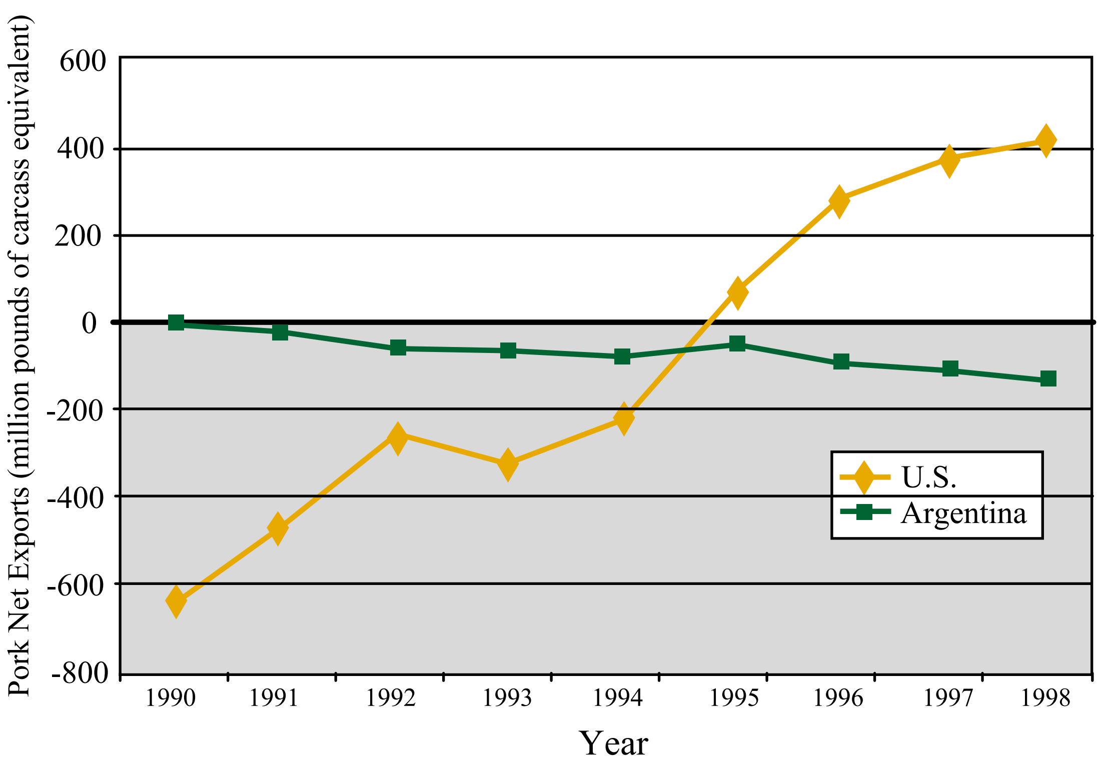

Figure C.6. Net exports of pork from the U.S. and Argentina
Source: Prepared from data in *FAOSTAT.*

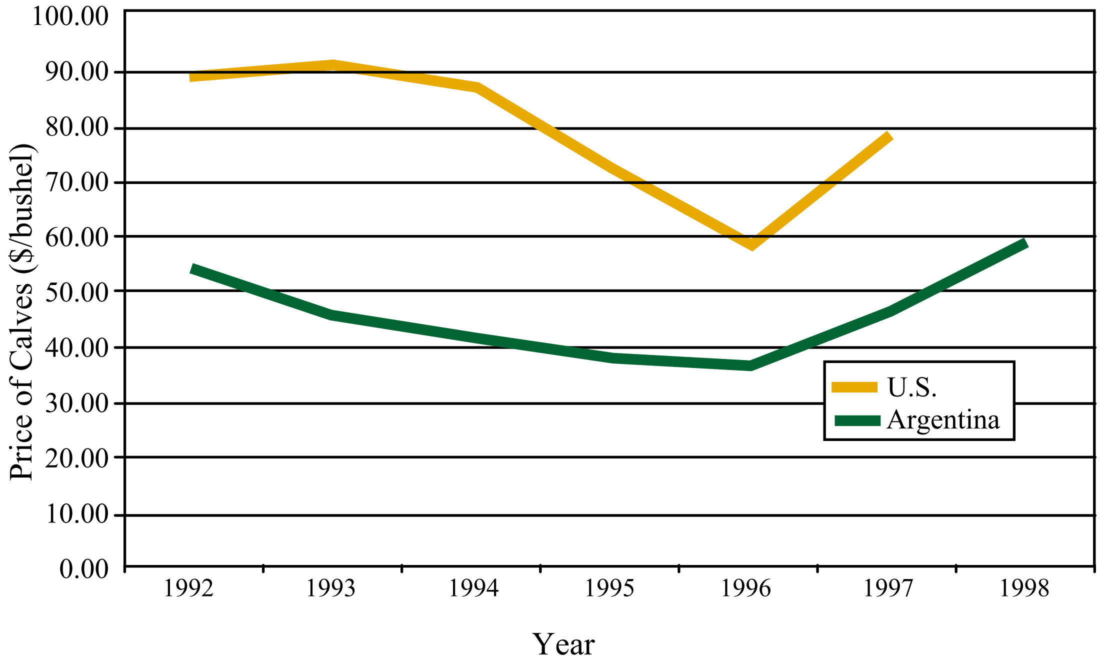

Figure C.7. Calf prices in the U.S. and Argentina
Source: Prepared from data reported in *Agricultural Statistics* (average calf prices received by farmers) and *Márgenes Agropecuarios* (average calf prices at auctions) for the U.S. and Argentina, respectively.

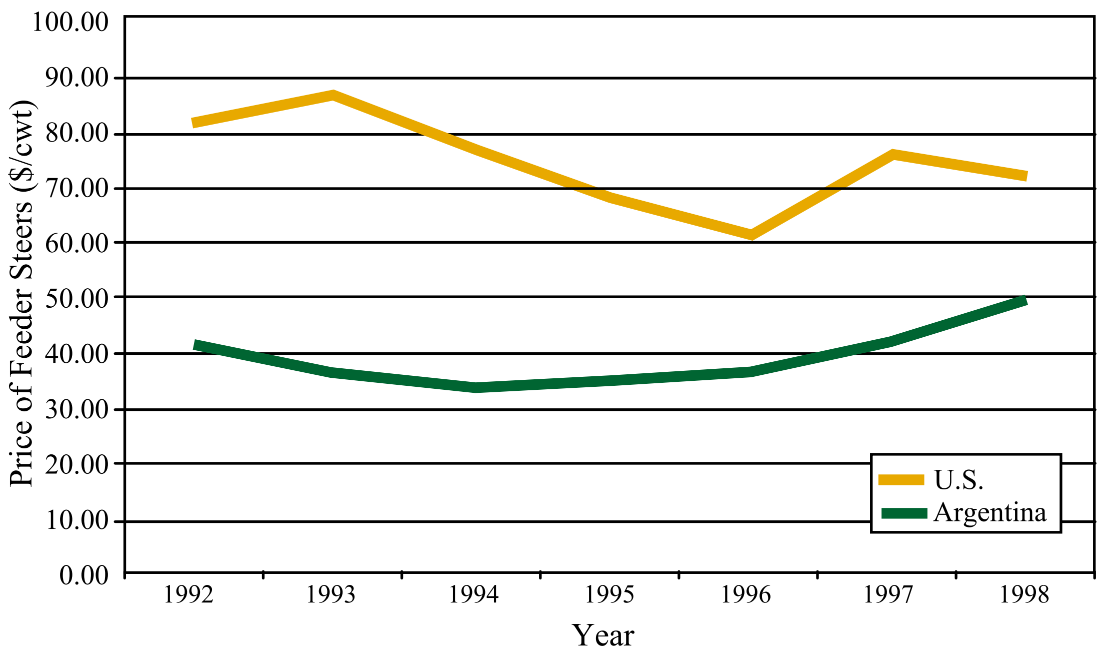

Figure C.8. Prices of feeder steers in the U.S. and Argentina
Source: Prepared from data reported in *Livestock, Dairy, and Poultry Situation and Outlook* (price of 750-800 lb feeder steers at Oklahoma City) and *Situación del Mercado de Carnes* (average price of 800 lb small steers at Liniers) for the U.S. and Argentina, respectively.

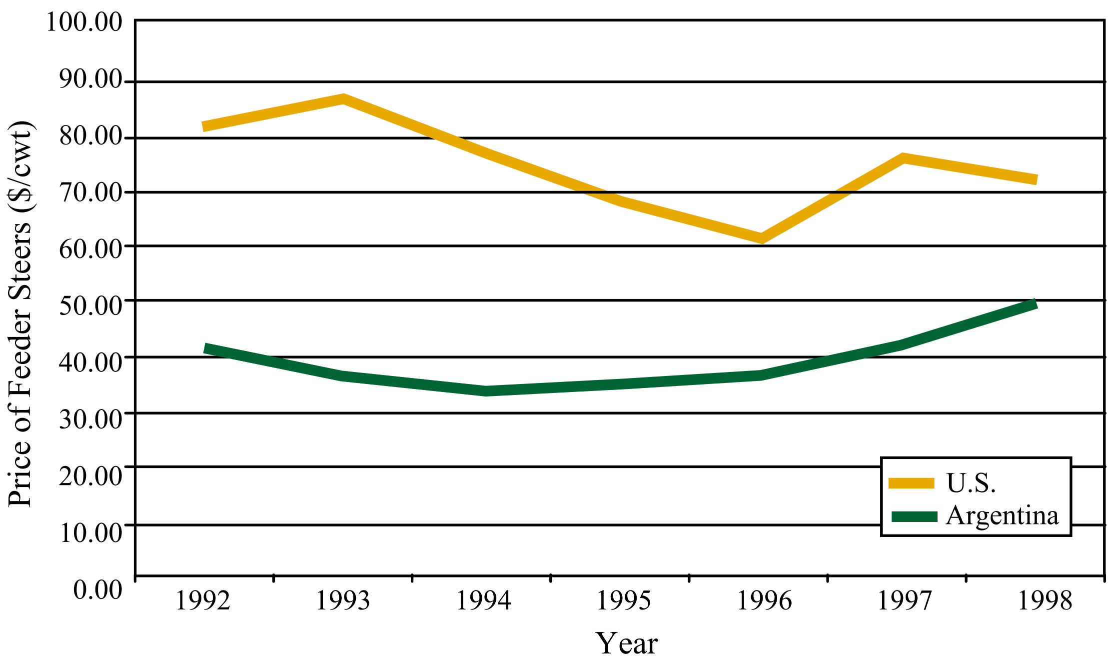

Figure C.9. Steer prices in the U.S. and Argentina
Source: Prepared from data reported in *Agricultural Statistics* (average price of 1,100-1,200 lb steers at Texas-Oklahoma, Kansas, Colorado, Nebraska, Iowa-Southern Minnesota feedlots) and *Situación del Mercado de Carnes* (average price of 1,000 lb steers at Liniers) for the U.S. and Argentina, respectively.

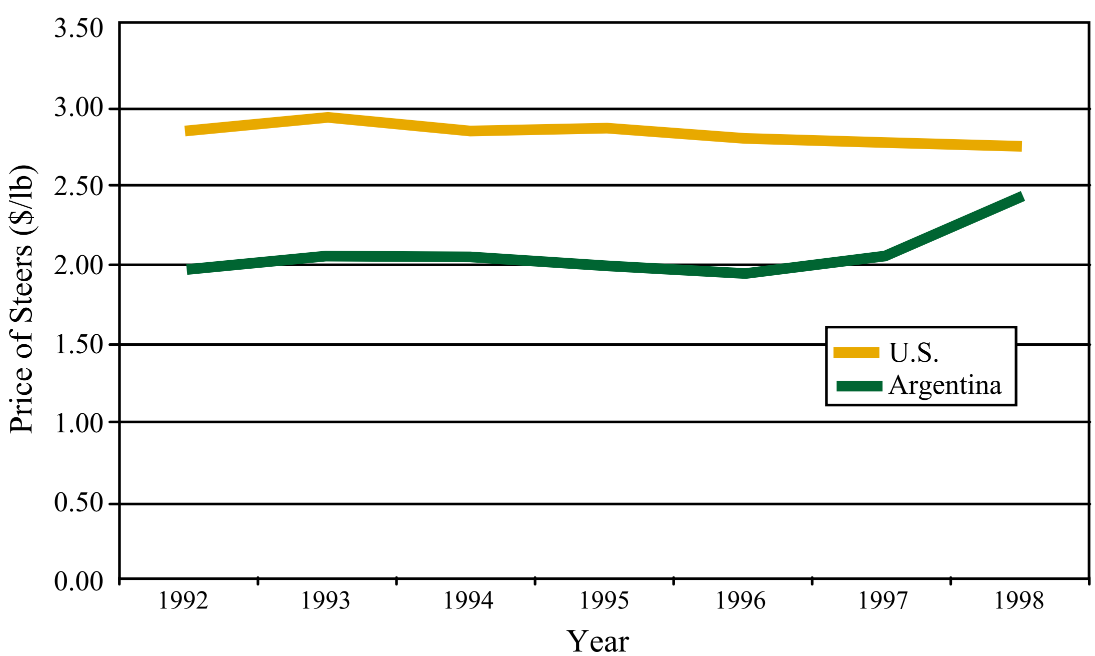

Figure C.10. Retail beef prices in the U.S. and Argentina
Source: Prepared from data reported in *Red Meat Yearbook* (retail price of beef, Choice Yield Grade 3) and *Evasión y Competitividad en el Mercado de la Carnes* (average price of beef) for the U.S. and Argentina, respectively.

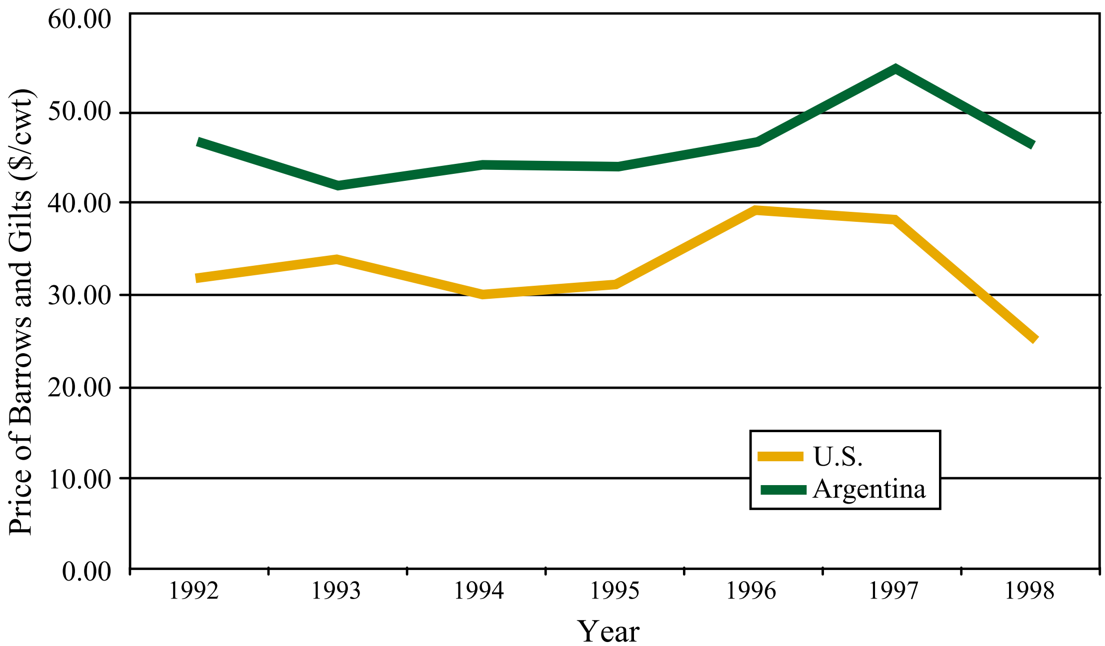

Figure C.11. Prices of barrows and gilts in the U.S. and Argentina

Source: Prepared from data reported in *Agricultural Statistics* (average price of barrows and gilts in Iowa-Southern Minnesota expressed on a live-weight basis, Live Price = 0.74 Lean Price) for the U.S., and in *Situación del Mercado de Carnes* (average price of barrows and gilts at Liniers up to June 1996) and *Agromercado* (average price of barrows and gilts sold directly to slaughterhouses since July 1996) for Argentina.

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