United States
Department of
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Economic
Research
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Economic
Research
Report
Number 21

June 2006

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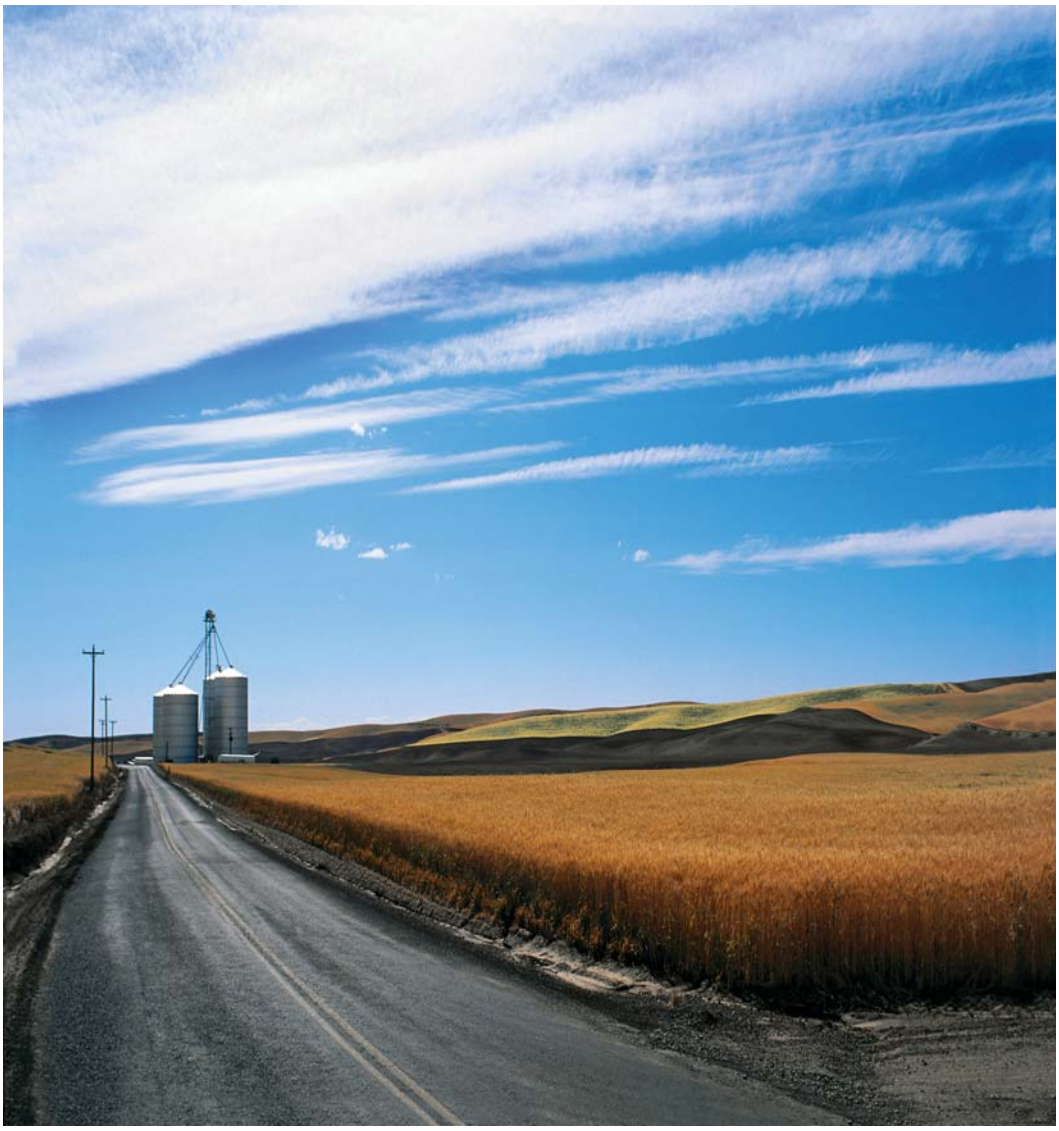
Robert A. Hoppe and Penni Korb



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National Agricultural Library Cataloging Record:

Hoppe, Robert A.
Understanding U.S. farm exits.
(Economic research report (United States. Dept. of Agriculture. Economic Research Service) ; no. 21)

1. Farms—Economic aspects—United States.
2. Farmers—United States—Economic conditions.
I. Korb, Penni.
II. United States. Dept. of Agriculture. Economic Research Service.
III. Title.

HD1769

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United States Department of Agriculture

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Electronic Report from the Economic Research Service

www.ers.usda.gov

Understanding U.S. Farm Exits

Robert A. Hoppe and Penni Korb

Abstract

The rate at which U.S. farms go out of business, or exit farming, is about 9 or 10 percent per year, comparable to exit rates for nonfarm small businesses in the United States. U.S. farms have not disappeared because the rate of entry into farming is nearly as high as the exit rate. The relatively stable farm count since the 1970s reflects exits and entries essentially in balance. The probability of exit is higher for recent entrants than for older, more established farms. Farms operated by Blacks are more likely to exit than those operated by Whites, but the gap between Black and White exit probabilities has declined substantially since the 1980s. Exit probabilities differ by specialization, with beef farms less likely to exit than cash grain or hog farms.

Keywords: 1997 Census of Agriculture Longitudinal File, farm exit, farm entry, farm structure, farm operator characteristics, farm operator life cycle

Acknowledgments

The authors thank Mary Bohman, Hisham El-Osta, Fred Gale, James MacDonald, and Keith Wiebe, Economic Research Service (ERS), USDA; Geoff Becker, Congressional Research Service; Jameson Burt, National Agricultural Statistics Service, USDA; and Dave Freshwater, University of Kentucky, for their reviews and helpful comments. We also received excellent editing and useful comments from Linda Hatcher and Adrie Custer, ERS. Finally, we thank Juanita Tibbs and Linda Hatcher, ERS, for the cover design and report layout.

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Contents

Summary

About 717,100 farms in the U.S. went out of business—or exited—between 1992 and 1997. But the total number of farms declined by just 13,400 because the number of entries (703,700 farms) nearly equaled exits. In fact, the farm count has remained relatively stable since the 1974 Census, reflecting exits and entries essentially in balance.

Understanding farm exits is important for three reasons. First, knowing which types of farms are most likely to exit might be useful to policy-makers interested in the effects of exits on exiting farmers, the remaining farms, and farm communities. Second, exits help reallocate resources between farming and other economic activities and within the farm sector itself. Third, farm exits—and farm entries—may play an important role in introducing technologies and productivity growth, as in other industries.

What Is the Issue?

U.S. farm numbers have been relatively stable between agricultural censuses in recent decades, but beneath the surface, farming is a much more dynamic industry than the farm count indicates. The relatively small net change in farm numbers masks substantial turnover in farms. Knowing the underlying socioeconomic components of this turnover provides a more thorough understanding of exits and gives other researchers a method of predicting exits.

What Did the Study Find?

U.S. farm exit rates are 9-10 percent per year, within 1 percentage point of those for all U.S. small nonfarm businesses with no employees. Small businesses have a high exit rate, and most U.S. farms are small businesses. U.S. farms and other small businesses have not disappeared completely because entry rates as well as exit rates are high.

We studied two fundamental drivers of farm exits, farm size and operator age. The life cycle of farm operators is important in understanding farm exits because most U.S. farms are fairly small family businesses and the life of the farm is correlated with the life of the farmer. The correlation is not 100 percent because the farm may continue as a business after an elderly operator leaves, if operation of the farm as a separate business continues under another operator, such as an adult child. The results show the following:

- Exit rates decline as farm size (measured by sales) increases.
- Nevertheless, exit rates are still 6-7 percent for large farms (sales of $250,000 or more).
- The exit rate initially declines with age until it reaches 8-9 percent for farmers between 45 and 54 years of age.
- The rate then increases and peaks at 12-13 percent for farmers who are at least 65 years old.

Because the operator's age and farm size are important determinants of farm exits, the report uses logistic regression models to estimate exit probabilities, which control for these factors. Two of the most striking findings from the study—the narrowing gap in the probability of exit between Black- and White-operated farms and the relationship between exit probability and the age of the farm business—emerged when we examined the effect of other farm and operator characteristics on exit probabilities:

- Exit probabilities between the 1992 and 1997 Censuses are 5-7 percentage points higher for Black-operated farms than for White-operated farms, depending on sales class and operator age. These Black/White differences represent a substantial decline from the 1982-87 intercensus period, when exit probabilities were 9-10 percentage points higher for Black-operated farms.
- Exit probability is inversely related to business age; it is substantially higher for recent entries than for older, more established farms.
- Exit probability is particularly low for large farms that are at least 14 years old and operated by farmers who are younger than 65. The lower exit probability for these large, well-established farms may help explain the growing concentration of production among fewer farms, particularly if the farms are passed on to other family members and continue in operation.

How Was the Study Conducted?

This study used data from the 1997 Census of Agriculture Longitudinal File to analyze the forces that drive farm exits. USDA's National Agricultural Statistics Service created the longitudinal file from five agricultural censuses to follow individual farms between 1978 and 1997. Data from the longitudinal file were used to calculate exit rates for farms in different sales classes and with operators in different age groups. These data were also used in logistic regression models to estimate exit probabilities, controlling for operator age and farm size. This study provides a straightforward procedure for estimating exit probabilities that can be applied to any group of farms.

Introduction

About 717,100 farms in the U.S. went out of business—or exited—between 1992 and 1997. But the total number of farms declined by just 13,400 because the number of entries (703,700 farms) nearly equaled exits. In fact, the farm count has remained relatively stable since the 1974 Census, reflecting exits and entries essentially in balance (fig. 1).[1]

This report assesses the forces driving farm exits since 1978, after the farm count stabilized, using the 1997 Census of Agriculture Longitudinal File. The USDA's National Agricultural Statistics Service (NASS) created the longitudinal file from five agricultural censuses to follow individual farms—rather than operators—from 1978 to 1997. A farm is considered to exit, or go out of business, when there is no response to the census questionnaire or the establishment is no longer operating as a farm. Note that farms can continue to exist even if the operator leaves the business. For example, if someone buys a farm or assumes its operation upon retirement of the current operator and continues its operation as a separate business entity, the farm would be classified as a survivor, not an exit.

Importance of Exits

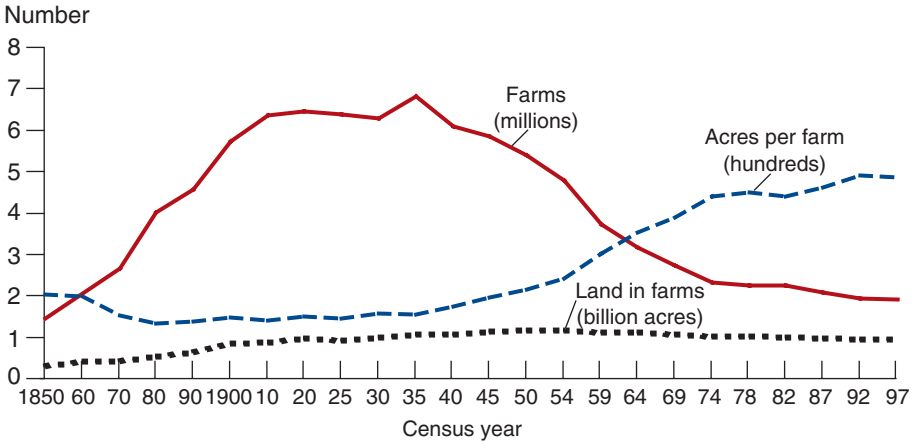
Understanding farm exits is important for three reasons. First, knowing which types of farms are most likely to exit might be useful to policymakers interested in the effects of exits on exiting farmers, the remaining farms, and farm communities.

Second, exits help reallocate resources between farming and other economic activities and within the farm sector itself. For example, exits were substantially larger than entries between 1935 and 1974 (Gale, 1992, p. 26), and farm numbers declined by 4.5 million. This large decline resulted in a massive reallocation of labor from farming to other endeavors (Hoppe, 1994, p. 1).

Figure 1

Farms, land in farms, and average acres per farm, 1850-1997

Most of the decline in farms occurred between 1935 and 1974



Source: Compiled by ERS from census of agriculture data.

[1]The stable farm count extends to the 2002 Census of Agriculture, which is not included in the 1997 Census of Agriculture Longitudinal File analyzed in this report. The 2002 farm count is not directly comparable to counts from earlier censuses because the National Agricultural Statistics Service—which administers the census—began adjusting census data to correct for undercoverage in the 2002 Census. Adjusting the census farm count back to 1978 is possible (Allen and Harris, 2004), however, and the adjusted count from 1978 to 2002 shows the same trend as in figure 1.

Third, farm exits—and farm entries—may play an important role in introducing technologies and productivity growth, as in other industries (see box "The Role of Exit and Entry"). Older, exiting farmers tend to downsize their operations and disinvest as they age. Farms absorbing their land, either recent entrants or surviving farms, are more likely to use newer technology and a more efficient mix of capital and labor.

The Role of Exit and Entry

Textbook analyses of nonfarm industries historically focused on how entry and exit are linked to industry growth (or contraction). Growing demand creates high profits, which attracts entrants, who expand industry production. Conversely, contracting demand creates losses, which induces exits and reductions in industry production. This framework led to a focus on barriers to entry and exit, factors leading to persistent profits or losses because the process of entry and exit is short circuited.

Economists have devoted greater attention to the study of entry and exit in recent years, and the studies have led to an altered focus (Bartelsman et al., 2004; Organisation for Economic Cooperation and Development, 2001). Today's studies seek to better understand the processes of entry and exit and to assess how entries and exits are linked to productivity growth and the spread of innovations. These analyses, covering many industries in different countries, have also found some striking patterns, consistent with what we find in this report. First, entry and exit occur simultaneously in most industries, regardless of industry profits. Second, those entry and exit rates are substantial and, over intermediate periods of 5 to 10 years, can account for large shares of industry production.

Because entering and exiting firms account for significant shares of industry production, the process of entry and exit may be an important driving force in industry productivity growth. Growth in productivity comes about through adoption of new technologies and new ways of doing business. Frequently, those technologies and methods are spread through the entry of new firms that use them, replacing older firms that have not adopted them.

But even among firms with similar technologies, there is often a wide range of performance as some firms prove to be better organized and more efficient than others. The process of competition forces inefficient firms to shrink and to exit over time, while allowing more efficient firms to enter and grow. Thus, an effective process of entry and exit would be expected to speed the adoption of improved technologies and methods and spur the expansion of more efficient firms at the expense of less efficient firms.

The process is complicated in agriculture because farm businesses are closely tied to individual families, which means that a family's life cycle has an important impact on entry and exit. We expect to see younger operators entering and older operators exiting or arranging for the business to be transferred to the next generation. As a result, the operator's age plays an important role in farm exit. Older farmers often downsize their operations and disinvest as they exit. Entering (and surviving) farmers may use newer equipment and techniques, use a more efficient mix of capital and labor, and devote more time to farming.

Topics Covered

We begin this report by examining earlier literature on farm exits and discussing the longitudinal file. We estimate rates of entry and exit in farming and compare those findings to estimates for other industries and other countries. We then focus on exits because our data allow for a more accurate and detailed analysis of exits.

We apply a logistic regression model to the longitudinal file to investigate factors that contribute to farm exits and estimate exit probabilities for farms with different characteristics. We first show how exit rates vary with two fundamental drivers, farm size and operator age. Then we explore how exit rates vary with several additional farm and operator characteristics, controlled for farm size and operator age.

Note that the exit probabilities estimated from a logistic regression are conceptually different from the simple exit rates calculated by dividing exits by the number of farms in the beginning year of a given period. Exit probabilities simultaneously control (or adjust) for the operator's age and the size of the farm, while exit rates do not. Thus, probabilities estimated from logistic regressions are called "adjusted exit probabilities," or more concisely, "exit probabilities" in this report. The term "exit rate" is reserved for simple exit rates.

Our contribution to the exit literature is to provide a straightforward procedure for estimating exit probabilities that can be applied to any group of farms. In addition, we track those exit probabilities through time because exit probabilities for specific groups do change, sometimes dramatically. The 1997 Census of Agriculture Longitudinal File allows us to perform a more detailed analysis of farm exit than was possible previously.

As one would expect, exit is more likely for farms with operators who are at least 65 years old than for farms with younger operators. Exit probabilities are generally higher for small farms than for large farms. Farms specializing in beef are less likely to exit than are those specializing in hogs or cash grains. Likelihood of exit is higher for recent entrants than for older, more established farms, and combining farming with off-farm work decreases the probability of exit. Farms with female or Black operators are more likely to exit than are those with male or White operators.

Background

Farm Exit Literature

U.S. and Canadian literature is emphasized here, for two reasons. First, both the United States and Canada produce longitudinal files that link agricultural censuses and follow individual farms from census to census. Second, the two countries are similar in basic farm structure (Hoppe et al., 2004, p. 92; Whitener and Bollman, 1995). A few other countries have also produced and analyzed longitudinal files, but comparing results from these countries with those from the United States and Canada is difficult because of institutional differences.

Gale (1990) used a predecessor of the 1997 longitudinal file to calculate entry, exit, and survival rates in the United States. He found, among other things, that turnover in small farms is substantial and that most exiting and entering farms are small, measured in terms of sales. Gale (1994) also used longitudinal data to examine farm size over the operator's life cycle for North Dakota wheat farms, Illinois corn/soybean farms, and Wisconsin dairy farms. He found that young farmers and entrants generally have smaller farms than do older farmers and are less likely to own farmland. The farm businesses of young farmers and entrants also grow faster. Exiting farmers are older than entering farmers, and exits are concentrated among older operators.

Statistics Canada's longitudinal file—the Census of Agriculture Match—extends forward from 1966, based on the Canadian census of agriculture, which is conducted every 5 years. Articles of a descriptive nature were published in the early 1980s, using an early version of the file (Bollman, 1983; Ehrensaft et al., 1984). These articles documented relatively high exit and entry rates. For example, the exit rate for all Canadian farms was at least 30 percent for each 5-year period and even higher for particular groups, such as small farms. As stated in one of the articles, "Life in the farm sector, when looking at the farm operator population as a whole, thus appears to be distinctly Hobbesian: nasty, brutish, and short" (Ehrensaft, 1984, p. 824). Farm turnover was much more than suggested by the rate of net change between censuses. Factors that were important in explaining exits from agriculture in this work were farm size (measured in acres or sales) and age of the operator.

Another study using the Canadian data was more analytical. Kimhi and Bollman (1999) used a probit regression model to explain farmers' tendency to exit farming. Two data sets were used: Canadian longitudinal data from the 1966 and 1971 Censuses—for farms in Prince Edward Island, Nova Scotia, and New Brunswick—and Israeli longitudinal data from the 1971 and 1981 Censuses. In both countries, exit probability decreased with off-farm work and was higher for older farmers but increased with age much faster in Canada. The major difference between the countries was that exit probability decreased with farm size (measured in terms of land area) in Canada but increased with farm size in Israel, which may reflect institutional constraints on Israeli land sales.

These longitudinal studies indicate that operator age is an important factor in understanding farm exits because family farms—defined broadly here to

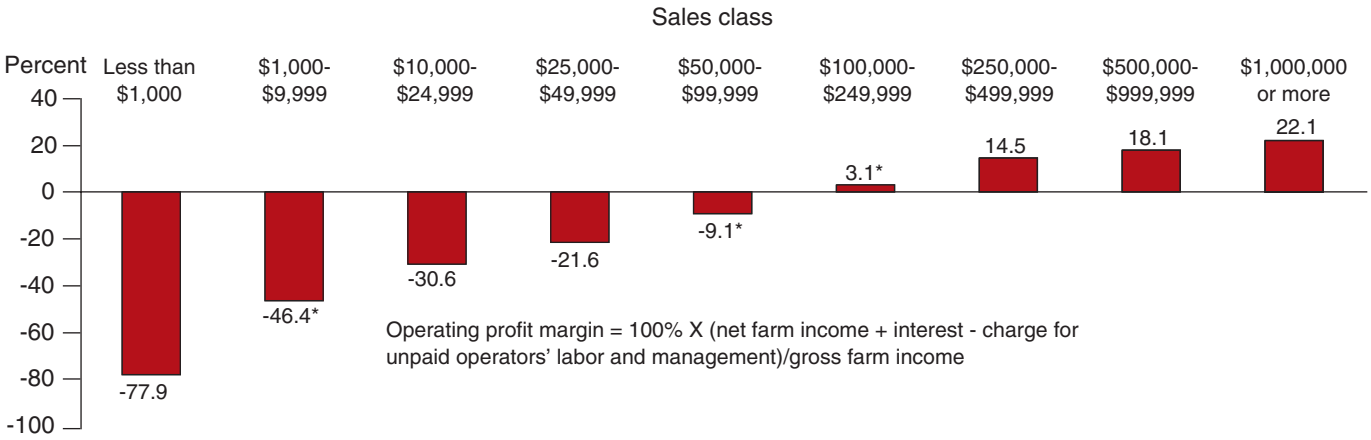
include sole proprietorships, partnerships, and family corporations—dominate U.S. agriculture (Hoppe, 1996, p. 2). Family farms accounted for 99 percent of all farms and more than 90 percent of farm sales during the 1978-99 period covered by the longitudinal file. Although larger family farms may be organized as family corporations or partnerships, the age of the farm tends to correlate with the age of the farmer.

Farm size, measured in land area or sales, is also important in understanding exits. Larger farms generally are less likely to exit, at least in the United States and Canada. One explanation may be that larger farms are more viable as commercial enterprises. For example, the operating profit margin increases with size and is positive only for farms with sales greater than $100,000 (fig. 2).

Figure 2

Operating profit margin by sales class, 1997

Operating profit margin increases with size



*The standard error exceeds 25 percent of the estimate but is no more than 50 percent of the estimate.

Source: Compiled by ERS from the 1997 Agricultural Resource Management Survey (ARMS).

Source of Data

The data in this report come from the 1997 Census of Agriculture Longitudinal File. NASS merged data for individual farms from five censuses (1978, 1982, 1987, 1992, and 1997), allowing analysts to follow individual farms over a 20-year period. The longitudinal file is described in detail in appendix I.

The longitudinal file follows individual farm businesses associated with farmland rather than operators (see box, "Glossary of Farm-Related Terms"). A farm is considered to go out of business (exit) when there is no response to the census questionnaire or the questionnaire is returned with a statement that the establishment is no longer operating as a farm. A farm that is not matched or linked to a previous longitudinal record would be considered a new business (an entry) and added to the longitudinal file as a new record. A farm existing at both the beginning and end of an intercensus period is considered to be a survivor.

A farm changing hands does not necessarily mean that the original farm exited and a new farm entered on the longitudinal file because the file follows farm businesses rather than operators. Farm businesses can continue, even if the operator leaves the business. For example, if an adult child assumes operation of a farm upon retirement of an operator, the farm would be classified as a survivor in the longitudinal file. Likewise, if the farm is sold to an unrelated operator, who continues the business as a separate entity, the farm also would be classified as a survivor. Cases like this—where the farm operator and farm do not exit together—complicate

Glossary of Farm-Related Terms

Farm. An establishment that has—or normally would have—agricultural sales of $1,000 in a given year. The farm definition has changed nine times since 1850, when "farm" was first defined for census purposes. The current definition was introduced in the 1974 Census of Agriculture (USDA, NASS, 1999, p. VII).

Farm Business. Each farm is also a farm business. Most farms are small businesses; more than 90 percent have sales less than $250,000, the threshold between small and large farms (USDA, National Commission on Small Farms, 1998). About half of all farms are very small, with sales less than $10,000. Operators of very small farms may have goals other than to generate income.

Farmland or Land in Farms. Acreage operated by farms. The land may be owned by the farm or rented from others. The amount of land in a given farm may vary from year to year as the amount of rented land changes. Note that farms are more than a tract of farmland. They include other resources and the people who run them.

Farm Operator or Farmer. The person making day-to-day decisions about the operation of a farm. The 1997 longitudinal file assumes one operator per farm. The operator on a particular farm may change over time as the original operator ages and leaves the business.

life-cycle analyses. Nevertheless, life-cycle changes can trigger exits. In a common pattern, farm operators become elderly, stop farming, and rent or sell their land to other farmers who incorporate it into their operations. The original farm businesses no longer exist.

Exit Rates Calculated From the Longitudinal File

Gross exit rates calculated from the 1997 longitudinal file are presented in table 1. Exits amount to about 9 or 10 percent of all farms annually, with no strong trends over time, and cover a substantial share of land and sales (7 or 8 percent). The fact that the sales exit rate is lower than the farm exit rate means that larger farms are less likely to exit.

Farm size matters, with the exit rate declining with sales. Nevertheless, even among the largest farms (sales of $250,000 or more), 6 or 7 percent of farms exit per year. The age of the operator also matters. Exits generally decline with age until farmers reach 45-54 years old. After that, exits rise and peak at 12-13 percent for farmers 65 years old or older.

Relatively high gross exit rates (table 1) but relatively low net exits since 1974 (fig. 1) imply substantially high farm entry rates at any given time.

Table 1
Exit rates by operator age and sales class, 1978-82, 1982-87, 1987-92, and 1992-97

Characteristic[1]	1978-82		1982-87		1987-92		1992-97	
	4-year period[2]	Annualized	5-year period[2]	Annualized	5-year period[2]	Annualized	5-year period[2]	Annualized
	Percent							
All farms	33.0	9.5	40.4	9.8	38.5	9.3	37.2	8.9
Land in farms	26.3	7.4	32.6	7.6	29.7	6.8	32.5	7.6
Sales	26.0	7.3	33.3	7.8	29.3	6.7	30.1	6.9
Farms by sales class:[3]								
Less than $1,000	32.3	9.3	53.7	14.3	53.0	14.0	48.8	12.5
$1,000-$9,999	39.2	11.7	44.5	11.1	42.9	10.6	40.6	9.9
$10,000-$49,999	32.5	9.4	37.8	9.0	36.7	8.7	35.7	8.5
$50,000-$99,999	27.6	7.7	34.8	8.2	31.7	7.3	33.0	7.7
$100,000-$249,999	22.5	6.2	30.5	7.0	27.5	6.2	30.1	6.9
$250,000 and over	24.0	6.6	30.3	7.0	25.8	5.8	26.5	6.0
Farms by operator age:								
Younger than 35	34.1	9.9	42.1	10.4	37.8	9.1	36.9	8.8
35-44	30.1	8.6	39.8	9.7	36.7	8.7	33.8	7.9
45-54	28.1	7.9	36.1	8.6	34.7	8.2	32.9	7.7
55-64	32.9	9.5	38.5	9.3	37.0	8.8	35.4	8.4
65 or younger	42.7	13.0	47.8	12.2	46.0	11.6	45.7	11.5

Note: Rates are based on data that are weighted by nonresponse weights from the beginning year of the period, except for the 1978-82 period. Nonresponse rates do not exist for the 1978 data, so exit rates between 1978 and 1982 are based on unweighted data. See appendix I for more information.

[1]Farms classified by characteristics at the beginning of each period.

[2]Calculated as the percentage of farms in the group at the beginning of the period that no longer exist at the end of the period.

[3]Sales class is expressed in constant 1997 dollars, using the Producer Price Index for Farm Products to adjust for price changes.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Entry and exit rates have been fairly close to each other during the past three intercensus periods (fig. 3). In fact, the stabilization in aggregate farm numbers between 1992 and 1997 resulted from an increase in entry.

Exit Rates in Perspective

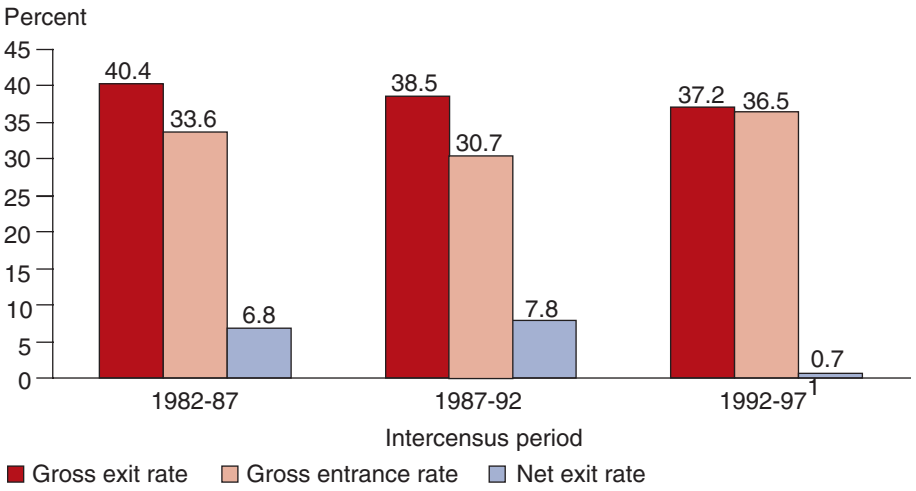
Although annualized exit rates of 9 or 10 percent may seem high, they are comparable to exit rates for Canadian farms, small U.S. nonfarm businesses, and businesses in other countries. Annualized Canadian exit rates range from 6 to 8 percent for each census period, or 2 to 3 percentage points lower than the U.S. rates, depending on the period (fig. 4).

Some of the difference between U.S. and Canadian exit rates, however, reflects differences in the size distribution of farms in the two countries. Nearly half of U.S farms have less than $10,000 in sales compared with about one-fourth of Canadian farms, measuring sales in U.S. dollars in both countries (Whitener and Bollman, 1995, p. 22). Exit rates are higher for these very small farms than for larger farms, and the higher share of U.S. farms with sales of less than $10,000 raises the overall U.S. exit rate. Rough calculations suggest that about half of the difference in the overall U.S. and Canadian exit rates is from differences in the two countries' farm size distribution.[2] Part of the remaining differences between the United States and Canada may be because of the higher nonresponse rate in the United States. Some farms classified as exits in the U.S. file may actually have been continuing operations that did not respond to the census questionnaire. (See appendix I for additional information.)

Figure 3

Five-year gross exit rate, gross entrance rate, and net exit rate by intercensus period

Net exits masks turnover in farms



Note: Entrants are calculated as a residual. The number of entrants in a period equals exits during the period plus the net change in farms during the period. The denominator for calculating exit and entrance rates is the number of farms at the beginning of the period.

[1]Part of the increase in the entrance rate between 1992 and 1997 occurred because of minor changes in the farm definition. After removing the effects of the definition changes, net change in farm numbers is 4.6 percent, which is still less than the earlier declines. For more information, see appendix I.

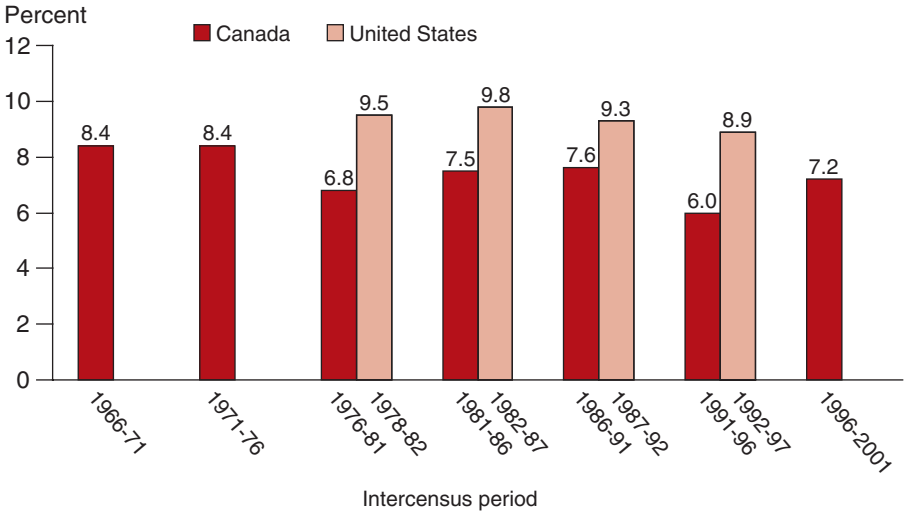
Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

[2]The overall U.S. exit rate between 1992 and 1997 was adjusted to reflect the size distribution of Canadian farms rather than U.S. farms. The U.S. rate was recalculated as the weighted average of the U.S. exit rate for each sales class, where the weights were the share of farms in each class in Canada. After this adjustment, the annualized 1992-97 exit rate for the United States declined by 1.4 percentage points from 8.9 percent to 7.5 percent, halving the difference between the U.S. and Canadian exit rates.

Figure 4

Annualized exit rates for Canadian and U.S. farms by intercensus period

U.S. exit rates are somewhat higher



Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File and from Statistics Canada, Census of Agriculture Match, 1966-2001.

Table 2

Annual entry and exit rates for the total business sector in 17 countries, various years

Country	Years	Entry rate	Exit rate
		Percent	
Argentina	1995-2002	10	8
Canada	1989-98	11	10
Denmark	1989-94	9	12
Estonia	1995-2001	11	6
Finland	1989-98	12	6
France	1989-97	11	7
Germany (East)	1989-99	12	9
Germany (West)	1989-99	7	7
Hungary	1992-2001	20	7
Italy	1989-94	9	8
Latvia	1996-2002	23	6
Mexico	1989-2001	16	11
Netherlands	1989-97	10	6
Portugal	1989-98	15	6
Romania	1992-2001	20	8
Slovenia	1992-2001	22	5
United States	1989-97	12	10

Note: The estimates are drawn from census, business register, industry survey, and social security records.

Source: Bartelsman et al., 2004.

U.S. farm exit rates are also close to exit rates for small nonfarm businesses with no employees, according to the Small Business Administration. The annualized exit rate for these small nonfarm businesses between 1982 and 1986 was 8 percent, about 1 percentage point less than the annualized exit rate for U.S. farms during the 1992-97 period (U.S. Small Business Administration, 1998, p. A-17). In addition, a recent report by the World Bank (Bartelsman et al., 2004) reported exit rates for all businesses of 5-12 percent per year in 17 countries, a level consistent with exit rates for U.S. farms (table 2).

Some studies have found farm exit rates much lower than those from the longitudinal file. For example, four State- or county-level longitudinal surveys conducted during the farm financial crisis—dated from 1982 to 1986—estimated exit rates in the 3- to 5-percent range (Bentley et al., 1989), substantially lower than the rates calculated from the longitudinal file. Two of the four studies, however, excluded farms with operators 65 years old or older, one excluded farms with retired operators and operators

with fewer than 20 acres, and all excluded exits through death. Including these operators would have raised the exit rates.

An Economic Research Service study that used data from an annual American Bankers Association (ABA) survey of agricultural banks also reported relatively low yearly exit rates—in the 2- to 6-percent range—for 1982-99 (Stam et al., 2000. p. 48). The ABA survey excluded exits through death, which would lower the estimates of exits. In addition, bankers are likely to focus on commercial farms that are actual or potential customers—preferably creditworthy—rather than smaller farms, which would also be expected to lower the estimates of exits.

Finally, farm entry and exit rates can be calculated from published tables of agricultural census data that show counts of operators by the number of years on their present farm (Gale, 2003, pp. 170-71). The tables are based on the census question: "In what year did the operator (senior partner or person in charge) begin to operate any part of this place?"

Mathematically producing these cross-section-based estimates is fairly straightforward. The first step is to select two consecutive censuses. Entrants are estimated as farms with operators who reported 5 or fewer "years on present farm" in the later census.[3] The census publications, however, aggregate the years on the farm responses into five categories: (1) less than 2 years, (2) 3 or 4 years, (3) 5 to 9 years, (4) 10 years or more, and (5) not reported. Entrants are initially estimated by summing the first two categories and one-fifth of the third category. The initial estimate is adjusted upwards by adding a prorated share of "not reported," calculated by multiplying nonrespondents by the ratio of the initial estimate of entrants to respondents.[4] Exits are calculated as entrants plus the count in the earlier census minus the count in the later census.

[3]When the period between censuses is only 4 years, use 4 or fewer years.

[4]The years-on-this-farm question has a fairly high nonresponse rate, approximately 16 percent in 1997 compared with 6 percent for the question on off-farm work.

This procedure results in exit rates in the 4- to 5-percent range for the 1987-92 and 1992-97 intercensus periods (Gale, 2003), about half the corresponding rates calculated from the longitudinal file. The cross-section estimates may underestimate entrants, however, which in turn would underestimate exits, given the way exits are calculated (Gale, 1990). For example, how would a farmer report the year he began to operate "any part of this place" if he grew up on the farm and gradually assumed operation from his father over the last 10 years? When responding to the 1997 census, he may have reported 1992 as his initial year. Or, he may have responded with 1980, the year he assumed responsibility for the family's chicken flock—used for home consumption—which would bias the estimates of entry and exit downward.

What can we conclude from the wide range in estimates of farm exit rates? No one can provide an *exact* exit rate for farms in the United States. Estimates differ based on the data source and assumptions used when making the estimates. The main conclusion to take away from the various exit estimates is that turnover among farms is far greater than is indicated by the small net change in farm numbers between censuses (Gale, 1990).

The Model

This report assesses how various operator and farm characteristics affect farm exit. Farm size and operator age, however, have important effects on exit, so controlling for these factors is necessary in order to isolate the separate impacts of other farm and operator characteristics. To do this, a logistic regression model is used to estimate exit probabilities for farms with different characteristics. This type of model is commonly used in cases in which the variable of interest is a binary index, coded 1 (for exit in this case) or 0 (for survival) rather than continuous. For a detailed description of the model, see appendix II.

This analysis uses a base model with two groups of independent variables that cover four age classes for the operator and six sales classes for the farm. The analysis then examines the effects of including additional independent variables—namely, farm specialization, business age, and operator race, gender, and off-farm work. We first explore a base model that uses only age and sales class for three reasons:

- First, knowledge of exit probabilities across various size and age categories is useful in itself.
- Second, the exact linkage going from age and size to exit may be complex. We did not want to complicate the model more by adding additional variables.
- Third, the base model estimates provide a useful point of comparison when we add additional variables.

Using a base model that includes only operator age and farm sales class does not imply that the decision to exit is simple. As pointed out by Kimhi and Bollman (1999, p. 70), the decision to exit can be fairly complex even if only age and profitability are considered:

> …Farmers choose to exit at or prior to retirement. In both cases, the alternative utility must be greater than the on-farm utility, by a factor large enough to cover the psychic cost of exit. Exit is almost inevitable in old age because of health problems and a decline in the ability to perform physical tasks, but it may also be a consequence of poor ability to run a farm, or simply bad luck. Hence, the decision to exit is in part planned ahead, and in part a consequence of revealed poor farm performance. In addition, exit can be gradual, implying that farmers may reduce farm activity, perhaps shift to part-time off-farm work, and eventually exit…

A variable that measures performance or profitability may be preferable to sales class, but such a measure is not available on the longitudinal file for each farm across time.[5] Sales class, however, could be considered a proxy for profitability, given the relationship between sales and operating profits (fig. 2).

[5]Adding total sales and government payments and subtracting production expenses creates a crude measure of net income on the longitudinal file. However, production expenses are sample items, with the sampling rate in a given county ranging from one in two farms to one in six farms. A farm sampled in 1 year may or may not be sampled in other years, which makes analysis of small groups particularly difficult. In addition, the expense and government payments data are available only for 1987, 1992, and 1997, which restricts any analysis to two intercensus periods.

Results From the Base Model

Adjusted exit probabilities from the base model are consistent with exit rates from table 1. Exit probabilities decrease as sales class increases, and within any given sales class, the adjusted exit probability first decreases with operator age and then increases for older operators (fig. 5).

Adjusted exit probabilities are best understood by examining a specific example. Consider a 45-year-old farmer operating a farm with sales of at least $250,000 in 1992. The farmer has an exit probability of 24 percent between 1992 and 1997, which may seem high for a middle-aged farmer with sales at that level. The 24-percent exit probability is for a 5-year period, however, and appears more reasonable when annualized to a 5-percent chance of exit per year. A 5-percent annual exit probability falls within the range of exit rates estimated by the American Bankers Association (Stam et al., 2000). A 5-percent exit probability also means that the annualized survival probability is 95 percent (100 percent minus the exit probability). A survival rate that high implies a 36-percent probability that the farm will still be in operation when the operator is 65 years old (95 percent raised to the 20th power).

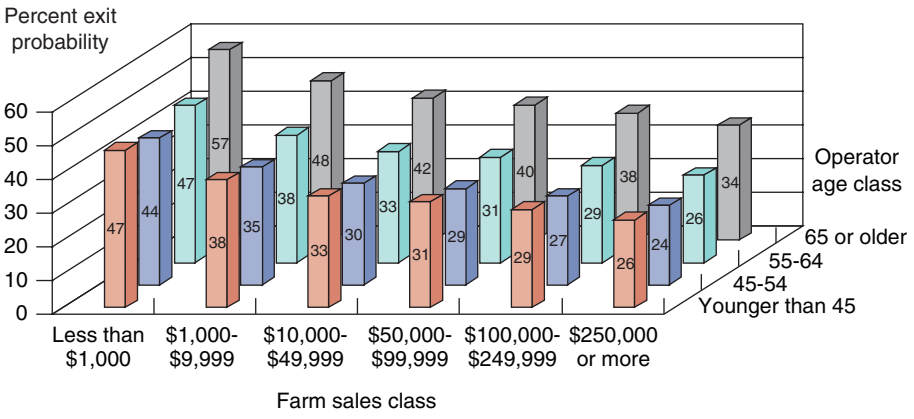
Figure 6 presents adjusted exit probabilities for each age class over time. We do not present exit probabilities for the 1978-82 period in figure 6 or in the rest of the report because the period—strictly speaking—is not comparable with the later periods. The 1978-82 period covers only 4 years instead of 5, and the 1978 Census incompletely covered low-sales farms. (See appendix III for more information about coverage in the 1978 Census.)

Within each age class, exit probabilities are fairly stable over time. Plots of exit probabilities by intercensus period generally fell within a fairly narrow band. Even the farm financial crisis of the 1980s had minimal effects on exit probabilities. The largely consistent exit probabilities over time also mean that the 1992-97 period can be emphasized in this report. Results for earlier periods are discussed later in the report only when exit probabilities shift over time.

Figure 5

Probability of exit between 1992 and 1997 by age and sales class in 1992

Probability of exit decreases with sales and is lower for middle-aged farmers



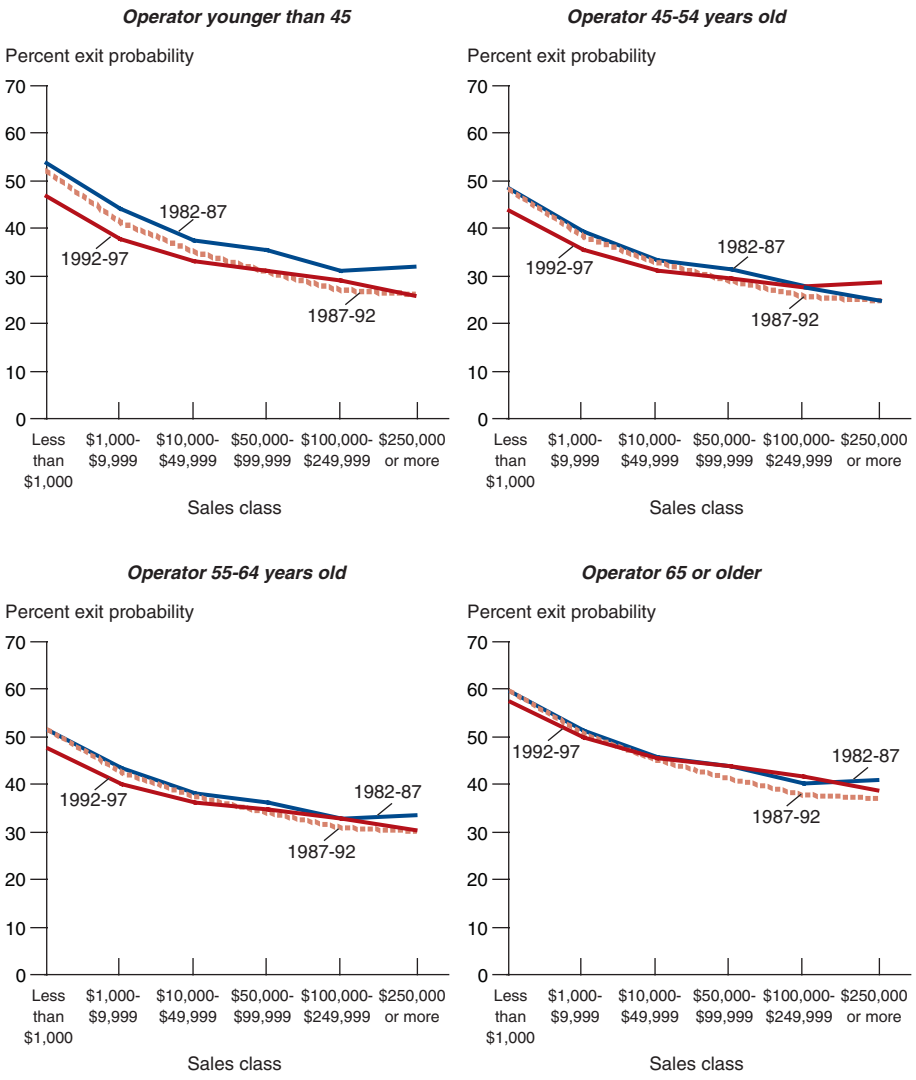
Note: Sales class is expressed in constant 1997 dollars, using the Producer Price Index for Farm Products to adjust for price changes.

Source: Compiled by ERS from the1997 Census of Agriculture Longitudinal File.

Figure 6

Probability of exit by age, sales class, and intercensus period

Exit probabilities are fairly consistent over time



Note: Sales class is expressed in constant 1997 dollars, using the Producer Price Index for Farm Products to adjust for price changes.

Source: Compiled by ERS from the1997 Census of Agriculture Longitudinal File.

Additional Independent Variables

Other independent variables are added to the model in order to measure how variation in that particular variable affects the probability of exit, after controlling for age and sales class. Including other variables allows us to compare adjusted exit probabilities for specific groups of farms. In particular, we compare exit probabilities for the following:

- Farms operated by Blacks and Whites.
- Farms operated by women and men.
- Farms with different specializations.
- Farms the operators of which report different levels of off-farm work.
- Farms of different ages.

Two findings from the general model also apply to each of the specific groups just listed. First, exit probabilities decline with farmers' age until farmers become 45-54 years old and then rise and peak for operators 65 year old or older. Second, within a given operator age group, exit probabilities fall as sales increase, although this situation is not always true for elderly operators, those at least 65 years old.

Minority Status and Gender

One might hypothesize that farms run by women and minority farmers are more likely to exit, given allegations of discrimination, including discrimination in the USDA program-delivery system (Effland et al., 1998, p. 16). Note, however, that there are many possible economic and institutional causes of exit for minority farmers. For example, the very small size of most Black-operated farms, the historic dependence of Black-operated farms on cotton sharecropping, and fragmented farmland ownership among Blacks played an important role in the long-term decline in their numbers (Beale, 1991; Kalbacher and Rhoades; 1993, Effland et al., 1998).

Comparing exit probabilities over time may help in understanding trends in the effects that minority status and gender have on survival in farming. Calculating exit probabilities controlled for age and sales class makes comparisons with farms run by White and male farmers easier because age and size distribution vary by race and gender among farmers.

Controlling for age and sales class is particularly important for farms operated by Blacks and women, given their older age distribution and smaller farms (USDA, NASS, 1999, pp. 25-6). About one-third of Black and female operators were at least 65 years old in 1997 compared with one-fourth of all operators (of whom 89 percent were White males). Average sales per farm in 1997 amounted to $103,000 for all U.S. farms but $41,500 for farms operated by women and $25,800 for farms operated by Blacks.

Black and White Farm Operators

Rather than presenting adjusted exit probabilities for farms operated by members of each minority group, we focus on exit probabilities for farms with Black operators, for the sake of brevity. Blacks make up the largest

group of minority farmers, and they are the only group of minority farmers that did not stabilize or increase in number in the 1980s and 1990s (Effland et al., 1998, p. 17).

Black and White exit probabilities are presented in table 3. For brevity, we present probabilities for two sales classes in this and subsequent tables: sales greater than $250,000 and sales from $1,000 to $9,999. These sales classes encompass the range in exit probabilities with only one-third of the estimates that would appear if all the sales classes were used.[6]

For each age and sales class category, the 1992-97 exit probability was 5-7 percentage points higher for farms with Black operators than for farms with White operators. Within a particular age group, the Black/White difference declined somewhat as sales increased. Nevertheless, even in the highest sales class, exit probabilities were still 5-6 percentage points higher for Black-operated farms than for White-operated farms. Even after controlling for age and sales, Black-operated farms are more likely to exit.

Although the Black/White differences in table 3 may appear large, they are smaller than in the recent past. Table 4 summarizes the Black/White differences in adjusted exit probabilities for the last three intercensus periods. Between 1982 and 1987, Black/White differences ranged from 9 to 10

[6]Farms with sales of less than $1,000 were not selected as the lower end of the sales spectrum because they are "point farms." If an establishment does not have the $1,000 in sales necessary to meet the farm definition, a "point system" assigns values for acreage of various crops and head of livestock to estimate a normal level of sales. Point farms have less than $1,000 in sales but points worth at least $1,000. See appendix I.

Table 3
Selected exit probabilities by race and gender, controlled for operator age and sales class, 1992-97

Race, gender, and sales class[1]	Operator age			
	Younger than 45	45-54	55-64	65 or older
	Percent			
Blacks and Whites:				
$1,000-$9,999—				
Black	44.1	41.1	44.2	54.0
White	37.7	34.8	37.8	47.4
Difference[2]	6.4	6.3	6.4	6.6
$250,000 or more—				
Black	31.3	28.6	31.3	40.3
White	25.8	23.5	25.9	34.1
Difference[2]	5.5	5.1	5.4	6.2
Females and males:				
$1,000-$9,999—				
Female	45.7	42.6	45.7	55.2
Male	37.1	34.2	37.1	46.4
Difference[3]	8.6	8.4	8.6	8.8
$250,000 or more—				
Female	33.0	30.3	33.0	42.0
Male	25.8	23.4	25.7	33.7
Difference[3]	7.2	6.9	7.3	8.3

[1]Sales class is expressed in constant 1997 dollars, using the Producer Price Index for Farm Products to adjust for price changes.
[2]Black exit probability minus White exit probability.
[3]Female exit probability minus male exit probability.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

percentage points (depending on sales and age of operator), which is substantially more than the range between 1992 and 1997. Even for small groups—such as Black-operated farms—changes in exit probabilities over time are statistically significant because of the large number of observations in the longitudinal file.

Male and Female Operators

Female/male differences in adjusted exit probabilities are larger than Black/White differences (table 3). The 1992-97 exit probabilities for female-operated farms are 7-9 percentage points higher than those for male-operated farms compared with Black/White differences of 5-7 percentage points.

Although exit probabilities for both Black- and female-operated farms declined, relative to their comparison groups, exit probabilities for Black-operated farms declined faster. The Black/White difference in exit probabilities declined by 3 or 4 percentage points for each age and sales category between 1982-87 and 1992-97 (table 4). In contrast, female/male differences narrowed by 1 or 2 percentage points.

Table 4
Selected Black/White and female/male differences in exit probabilities, controlled for operator age and sales class by intercensus period

Race, gender, sales class, and period[1]	Operator age: Younger than 45	45-54	55-64	65 or older
	Percentage points			
Black/White differences:[2]				
$1,000-$9,999—				
1982-87	10.1	10.0	10.1	10.1
1987-92	8.8	8.7	8.9	9.0
1992-97	6.4	6.3	6.4	6.6
$250,000 or more—				
1982-87	9.7	8.9	9.2	9.9
1987-92	7.4	7.0	7.4	8.2
1992-97	5.5	5.1	5.4	6.2
Female/male differences:[3]				
$1,000-$9,999—				
1982-87	10.1	9.8	10.0	10.0
1987-92	9.3	9.1	9.3	9.3
1992-97	8.6	8.4	8.6	8.8
$250,000 or more—				
1982-87	9.4	8.7	9.0	9.8
1987-92	7.8	7.4	7.7	8.6
1992-97	7.2	6.9	7.3	8.3

[1]Sales class is expressed in constant 1997 dollars, using the Producer Price Index for Farm Products to adjust for price changes.
[2]Black exit probability minus White exit probability.
[3]Female exit probability minus male exit probability.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Controlling for Age and Sales Matters

Black/White differences in adjusted exit probabilities, although substantial, are much lower than Black/White differences in the aggregate exit rate. The exit rate was 11 percentage points higher for Black-operated farms than for White-operated farms during the 1992-97 intercensus period and even higher in earlier periods (table 5). Regardless of the intercensus period, however, the gap between the difference in the exit rate and the highest difference in exit probabilities was 4-6 percentage points (fig. 7), which means that controlling for age and level of sales reduces Black/White differences. Female/male differences also declined, but the gap between the difference in the exit rate and the highest difference in exit probabilities was smaller, 3 or 4 percentage points (fig 8).

Table 5

Exit rate by operator race and gender, 1982-87, 1987-92, and 1992-97

Race and gender	1982-87	1987-92	1992-97
	Percent		
All farms	40.4	38.5	37.2
Farms by operator race:			
Black	55.4	53.0	48.0
White	40.1	38.2	37.1
Difference[1]	15.3	14.8	10.9
Farms by operator gender:			
Female	53.1	50.7	48.1
Male	39.7	37.7	36.4
Difference[2]	13.4	13.0	11.7

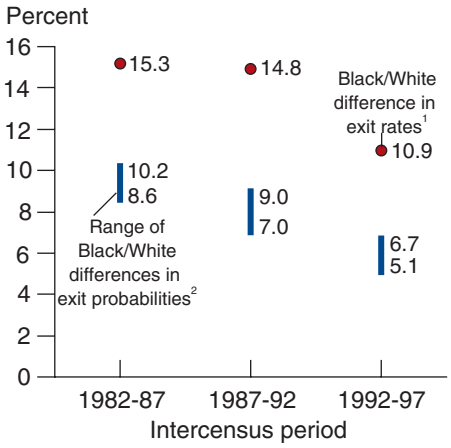
[1]Black exit rate minus White exit rate.
[2]Female exit rate minus male exit rate.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Figure 7

Black/White difference in exit rates and probabilities by intercensus period

Controlling for age and sales class makes a larger difference for Blacks and Whites...



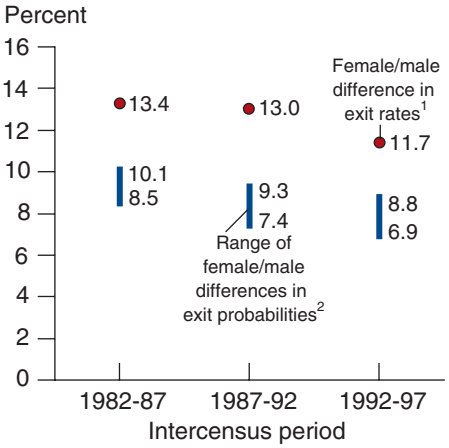
[1]From table 5.
[2]Each racial group has 24 probabilities (6 sales classes X 4 age groups) in each intercensus period, and thus, 24 Black/White differences, 1 for each sales-age combination.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Figure 8

Female/male difference in exit rates and probabilities by intercensus period

...than for females and males



[1]From table 5.
[2]Each gender has 24 probabilities (6 sales classes X 4 age groups) in each intercensus period, and thus, 24 female/male differences, 1 for each sales-age combination.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Selected Specializations

Rather than examining adjusted exit probabilities for a large array of farm specializations, we make two comparisons. The first comparison involves farms specializing in beef cattle (including feedlots) and farms specializing in cash grains. This comparison covers the majority of U.S. farms because beef and cash grain farms account more than half of U.S. farms—and more than two-fifths of sales of farm products—in all the census years examined.

Food and feed grains, the principal product of cash grain farms, are among the commodities traditionally covered by farm programs that make government payments to farmers. In contrast, no such programs exist for beef cattle. One might, therefore, expect cash grain farms to have lower exit probabilities because one of the goals of farm programs is to support farm income (Effland, 2000), which would be expected to help farms survive. Government programs, however, might speed the exit of smaller grain farms by providing funds for larger grain farms, which receive larger payments, to buy up smaller farms.

The second comparison involves farms specializing in beef cattle and farms specializing in hogs. Beef cattle farms account for a slowly increasing share of farms, while hog farms make up a decreasing share of farms. One might expect substantially higher exit probabilities for hog farms, given structural changes underway in the pork industry (McBride and Key, 2003).

Cash Grain Farm Exits Versus Beef Cattle Farm Exits

Cash grain farms had higher exit probabilities than beef cattle farms for the last intercensus period, regardless of sales class or operator age (table 6). The difference in exit probabilities declined somewhat with sales class for each age group but still amounted to 5 or 6 percentage points for most age groups among the largest farms.

Cash grain farms also have had higher exit probabilities than have beef farms since the 1982 Census of Agriculture (table 7). The differences in exit probabilities between the two types of farms did narrow between the 1982-87 and 1992-97 intercensus periods. The decline was modest, however, 1 or 2 percentage points for each age/sales combination.

Hog Farm Exits Versus Beef Cattle Farm Exits

Hog farms also had higher 1992-97 adjusted exit probabilities than did beef cattle farms (table 6). Unlike cash grain/beef differences in exit probabilities, however, hog/beef differences have increased since 1982 for each combination of operator and sales class, by 2-4 percentage points, with most of the increase between 1987-92 and 1992-97 (table 7). This increase does not appear to be directly related to cash receipts from hogs; hog cash receipts actually trended upward slightly between 1992 and 1997.

Rising adjusted exit probabilities for hog farms during the 1990s are consistent with trends in the industry. The 1992 and 1997 Censuses occurred during a period of rapid consolidation in hog production (McBride and Key, 2003, p. 5). Between 1994 and 1999, for example, the number of

farms producing hogs declined by more than 50 percent, but hog inventories remained relatively stable. As a result, the share of hogs and pigs on farms with at least 2,000 head increased from 37 percent to nearly 75 percent between 1994 and 2001.

Beef Cattle Farms' Low Exit Probabilities

This discussion shows that beef farms have lower adjusted exit probabilities than do cash grain or hog farms. In addition, the exit probabilities for beef cattle farms are lower than those from the base model for each size/age category for all intercensus periods examined. Two factors help explain the low exit probabilities for beef cattle farms. First, beef cattle are less labor-intensive than crops. Cattle can also be left alone with little direct supervision (unlike other livestock), except when calving. These attributes make it easier for operators to combine off-farm work with farming (Cash, 2002, p. 21), which may make farm survival easier (see next section, "Off-Farm Work).

Second, cattle operations can be low-cost enterprises, which limits their cash requirements and reduces their vulnerability if revenues from marketing fall. Variable costs for cattle production (other than feedlots) are typically lower than are variable costs for field crop enterprises. Cattle can eat grass and require little additional feed, except during the winter or adverse weather.

Table 6
Selected exit probabilities by farm specialization, controlled for operator age and sales class, 1992-97

Specialization and sales class[1]	Operator age			
	Younger than 45	45-54	55-64	65 or older
	Percent			
Grain and cattle:				
$1,000-$9,999—				
Grain	39.9	37.2	40.6	50.7
Cattle	33.8	31.3	34.4	44.2
Difference[2]	6.1	5.9	6.1	6.5
$250,000 or more—				
Grain	25.7	23.6	26.2	34.9
Cattle	21.0	19.2	21.5	29.2
Difference[2]	4.7	4.4	4.8	5.7
Hogs and cattle:				
$1,000-$9,999—				
Hogs	43.6	40.8	44.3	54.5
Cattle	33.8	31.3	34.4	44.2
Difference[3]	9.8	9.5	9.9	10.3
$250,000 or more—				
Hogs	28.7	26.5	29.3	38.4
Cattle	21.0	19.2	21.5	29.2
Difference[3]	7.7	7.3	7.8	9.2

[1]Sales class is expressed in constant 1997 dollars, using the Producer Price Index for Farm Products to adjust for price changes.
[2]Grain exit probability minus cattle exit probability.
[3]Hog exit probability minus cattle exit probability.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Fixed costs for land, water access, and fencing make up the largest costs of cattle enterprises. However, these costs represent long-lived assets that require only maintenance and repair to remain functional.

Off-Farm Work

Days of off-farm work by the operator are used here to examine the effects of working off the farm on exit probability.[7] For the off-farm model used here, we collapse the days of work into three categories:

- No days of off-farm work.
- 1-199 days of off-farm work.
- 200 days or more of off-farm work.

Off-farm work has become important to farm operators. About one-third of farmers have worked off the farm at least 200 days per year—essentially full-time—since 1978. Off-farm work could hypothetically affect exits in two ways. First, off-farm work may be the first step in an exit from farming, which would be reflected in higher exits for farms the operators of which work off-farm. Second, off-farm work might lower the probability of exit by providing farm operator households with another source of income.

[7]Another variable related to off farm work is also included in the longitudinal file: major occupation of the operator. This variable, however, forces operators into a farming/nonfarming dichotomy. The days-of-work variable is used here because it better accommodates farmers who combine farm and off-farm work.

Table 7
Selected differences in exit probabilities by specialization, controlled for operator age and sales class, by intercensus period

Sales class, specialization and period[1]	Operator age			
	Younger than 45	45-54	55-64	65 or older
	Percent			
Cash grain/beef cattle differences:[2]				
$1,000-$9,999—				
1982-87	7.8	7.5	7.7	7.9
1987-92	8.1	7.9	8.2	8.5
1992-97	6.1	5.9	6.1	6.5
$250,000 or more—				
1982-87	6.6	6.1	6.4	7.2
1987-92	6.0	5.6	6.1	7.1
1992-97	4.7	4.4	4.8	5.7
Hog/beef cattle differences:[3]				
$1,000-$9,999—				
1982-87	6.3	6.0	6.2	6.4
1987-92	7.2	7.0	7.2	7.5
1992-97	9.8	9.5	9.9	10.3
$250,000 or more—				
1982-87	5.3	4.8	5.1	5.8
1987-92	5.3	4.9	5.3	6.2
1992-97	7.7	7.3	7.8	9.2

[1]Sales class is expressed in constant 1997 dollars, using the Producer Price Index for Farm Products to adjust for price changes.
[2]Grain exit probability minus cattle exit probability.
[3]Hog exit probability minus cattle exit probability.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

The days-of-work model supports both hypotheses (table 8). On the one hand, working full-time off-farm is associated with a slightly higher exit probability than either of the alternatives (hypothesis 1). On the other hand, combining some off-farm work (1-199 days) with farm work leads to lower exits than working full-time on or off the farm (hypothesis 2).[8] Note, however, that the range in exit probabilities is fairly narrow, about 2 percentage points, for any sales-age category. The next section discusses a factor (business age) that contributes more to variation in exit probabilities.

[8]The same patterns held for the 1987-92 intercensus period (not shown). The longitudinal file includes days of off-farm work from 1987 forward, which means that the days-of-work model can be prepared for only the 1987-92 and 1992-97 periods.

Business Age

Studies of nonfarm industries find a strong, inverse relationship between age of business and the probability of exit (Davis et al., 1996; Dunne et al., 1989; and Evans, 1987). In other words, recent entrants are more likely to exit than older, more established firms for such reasons as undercapitalization and the management learning curve. We find a similar pattern among farm businesses. Results from the longitudinal file are presented in table 9, which is organized differently than previous tables. It shows the probability of exit during the 1992-97 period by age of farm business in 1992, for a given operator age and sales class.[9]

[9]In this case, we have included the 1978 Census because we are using it only to determine business age, not to analyze exits in the 1978-82 intercensus period.

For a given operator age and farm sales class, exit probabilities are lowest for the oldest farms and increase substantially as business age decreases. For example, the difference in exit probability between farms at least 14 years old and those less than 5 years old ranges from 13 to 17 percentage points, depending on the age of operator and sales class. The lowest exit probabilities are for farms 14 years old or more that are in the largest sales class and have operators younger than 65. If farms are large and have been in business for a while, their exit probabilities fall precipitously.

Table 8
Exit probabilities for farms by days of off-farm work and operator age and sales class, 1992-97

Sales class and days of off-farm work[1]	Operator age			
	Younger than 45	45-54	55-64	65 or older
	Percent			
$1,000-$9,999:				
No days	37.6	34.7	37.7	47.4
1-199 days	36.2	33.4	36.3	45.9
200 days or more	38.4	35.5	38.5	48.3
$250,000 or more:				
No days	25.9	23.6	26.0	34.4
1-199 days	24.8	22.5	24.9	33.1
200 days or more	26.6	24.2	26.7	35.2

[1]Sales class is expressed in constant 1997 dollars, using the Producer Price Index for Farm Products to adjust for price changes.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Table 9

Selected exit probabilities by business age, controlled for operator age and sales class, 1992-97

Sales class and age of business in 1992[1]	Census in which farm first appears	Operator age, 1992			
		Younger than 45	45-54	55-64	65 or older
			Percent		
$1,000-$9,999:					
14 years or more	1978[2]	27.6	27.3	31.2	41.8
10-13 years	1982[3]	30.5	30.3	34.3	45.3
5-9 years	1987[4]	35.2	34.9	39.3	50.6
Less than 5 years	1992[5]	43.1	42.9	47.5	58.9
$250,000 or more:					
14 years or more	1978[2]	19.1	18.9	21.9	30.8
10-13 years	1982[3]	21.4	21.2	24.5	33.9
5-9 years	1987[4]	25.2	25.0	28.6	38.9
Less than 5 years	1992[5]	32.0	31.8	35.9	47.0

[1]Sales class is expressed in constant 1997 dollars, using the Producer Price Index for Farm Products to adjust for price changes.

[2]Farms entering in 1978 would be 14 years old by 1992. Farms appearing in the 1978 Census, but established earlier, would be older.

[3]Farms entering between 1979 and 1982 would first appear in the 1982 Census. Their ages would range between 10 and 13 years by 1992.

[4]Farms entering between 1983 and 1987 would first appear in the 1987 Census. Their ages would range between 5 and 9 years by 1992.

[5]Farms entering between 1988 and 1992 would first appear in the 1992 Census. These farms would be less than 5 years by 1992.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Findings and Future Directions

This report provides some basic information useful in understanding farm exits and how they can restructure agricultural production. Simple exit rates vary by sales class of the farm and age of the operator. They decline as sales increase but are still 6 or 7 percent per year for large farms, those with sales of $250,000 or more. Exit rates also decline with age until farmers become 45 years old and then increase, peaking at 12 or 13 percent for farmers 65 years old or older. The same age- and sales-related patterns also apply to exit probabilities generated by the base model. At the national level, exit probabilities by age and sales class are fairly stable over time. Not even the farm financial crisis of the 1980s had much effect on exit probabilities.

The life cycle of farm operators is important in understanding farm exits because most U.S. farms are fairly small family businesses and the life of the farm is correlated with the life of the farmer. The correlation is not 100 percent because the farm may continue as a business after an elderly operator leaves, if operation of the farm as a separate business continues under another operator, such as an adult child.

As farm operators become elderly, however, they often stop farming and rent or sell their land to other farmers who incorporate it into their operations. In this case, life-cycle changes do result in farm exits. These farm exits may trigger productivity gains. The older, exiting farmers tend to downsize their operations and disinvest as they age. The farms that absorb their land—either recent entrants or surviving farms—are more likely to employ newer technology and a more efficient mix of capital and labor.

Farms at least 14 years old with operators currently less than 65 years old have particularly low exit probabilities. The lower exit probabilities for these large, well-established farms may help explain the growing concentration of production among fewer farms, particularly if these farms are passed on to other family members.

Additional operator and farm characteristics—such as race, gender, off-farm work, and farm specialization—also influence exit probabilities. Combining farming with some off-farm work slightly decreases the probability of exit, most likely by providing the operator household with another source of income. Farms with female or Black operators are more likely to exit than farms with male or White operators, although Black/White differences declined during the period examined here. Finally, farms specializing in beef are less likely to exit than are those specializing in hogs or cash grains, probably because cattle operations mesh well with off-farm work.

The list of farm and operator characteristics considered in this report is not exhaustive. We focused on basic farm and operator characteristics likely to affect exits. Other characteristics, including land tenure, receipt of government payments, and urban influence, may also affect exit probabilities and may warrant examination. Additional topics that could be examined include the dynamics of livestock subsectors. For example, the longitudinal file could be used to determine whether operators of small hog farms switch to other enterprises or exit farming entirely. The file could also be used to

examine land acquisition/disposal as operators age. For example, how much land do 35-year-old farmers add to their operations over a 5-year period, and how much land do 65-year-old farmers give up?

As this report was being written, the 2002 Census of Agriculture was released. NASS is creating the 2002 Census of Agriculture Longitudinal File by matching data from 2002 Census data to the existing 1997 file. Now is a logical time to consider future research directions using the 2002 longitudinal file. Despite the information presented here from the 1997 file, we still have much to learn about farm dynamics.

We plan to use the 2002 file to examine the exit and entry of farms with sales of $1 million or more. We will ask such questions as the following:

- What are the exit and entry rates for farms of this size?
- How many started as small farms?
- How many started as large commercial farms?
- How many entered with sales of $1 million or more?
- How long does it take smaller farms to grow to the $1 million level?

Focusing the analyses on "million-dollar" farms may seem restrictive because only 28,700 farms were that large in 2002, accounting for slightly more than 1 percent of all U.S. farms (USDA, NASS, 2004, p. 8). However these farms accounted for 48 percent of farm sales. Understanding the dynamics of very large farms is important because of their large share of production.

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Appendix I

1997 Census of Agriculture Longitudinal File

Most data used in this report are from the 1997 Census of Agriculture Longitudinal File. Data from five censuses (1978, 1982, 1987, 1992, and 1997) were merged for individual farms. As a result, individual farms can be followed over a 20-year period. The file contains 4.5 million observations—any farm in business during any of the five censuses.

Following Farm Businesses, Not Operators

The longitudinal file attempts to follow individual farm businesses associated with farmland rather than operators. The longitudinal file operationally follows "CFNs" or census file numbers. The CFN identifies a farm operation for a particular census and may follow a farm operation through subsequent censuses (up to five on the longitudinal file). If the farm continues from one census to the next and the farm operator responds to the census using the same CFN, the information reported by that farm for that census period is appended to the longitudinal file using the same CFN.

A farm is defined as going out of business when there is no response to the census questionnaire or the questionnaire is returned with a statement that the establishment is no longer operating as a farm. The disappearance of a farm in a given census year is indicated by zeros for all variables. A farm is considered to be out of business (an exit) when a zero appears in the CFN variable field for a given year, indicating that the farm has been discontinued. Likewise, a farm operation with a CFN that is not matched or linked to a previous longitudinal record would be considered a new business (an entry) and added to the longitudinal file as a new record. A farm with a CFN for both a beginning and an ending intercensus period in its record is considered to be a survivor.

Because the file follows farm businesses rather than operators, an operation that changes hands does not necessarily mean that the original farm went out of business and a new farm appeared on the longitudinal file. A change in operator among relatives due to life-cycle events—such as a widow or an adult child assuming operation of a farm upon the death of an operator—would not necessarily trigger a change in the CFN. Similarly, if the farm is sold to an unrelated operator, who continues the business as a separate entity, a new CFN might be issued. In this case, the data collection agency, currently the National Agricultural Statistics Service (NASS), links the old and new CFNs by matching farm operations. Linking allows data for the new CFN to be added to longitudinal data from the previous census under the old CFN, extending the longitudinal record of the farm.

Cases such as these make life-cycle analyses more difficult because they mean that an elderly farmer may quit farming but that the farm itself may continue. The operator and farm do not necessarily exit together. Nevertheless, life-cycle changes can trigger exits. In a common pattern, farm operators become elderly, stop farming, and rent or sell their land to other farmers who incorporate it into their operations. In other words, the original farm businesses no longer exist.

Other examples of events that could terminate a farm business on the file include the disappearance of the farm business through sale of the land for nonfarm purposes and the division of the farm into separate farming businesses. For a list of some possible transactions and whether they would trigger a change in CFN, see appendix table 1. The table gives examples of transactions, with their likely effects on the CFN. Terminating a CFN indicates a farm exit, and issuing a new CFN indicates a farm entry. This list does not cover all possible transactions.

The longitudinal file is not truly longitudinal, like the Census Bureau's Survey of Income and Program Participation (SIPP) or the University of Michigan's Panel Study of Income Dynamics (PSID), which were designed to follow households over time. Rather than identifying farms and following them as time progresses, the longitudinal file links data collected in the past for another purpose (the agricultural census). Thus, one cannot claim with

Appendix table 1

Likely effects of various transactions on Census File Numbers (CFNs)

Transaction	Likely effect on CFNs		
	No change in old CFN	Old CFN terminated	New CFN issued
Farm continues with original acreage owned by the operation:			
Under current operator	X		
Operator retires, farm continues under a junior operator	X		
Farm is sold to—			
Relative	X		
Someone else		X (Old and new CFNs are linked)	X
Entire farm is sold to another operation		X	(Purchasing farm has its own CFN)
Original farm is divided into two or more smaller farming operations:			
A portion of the original acreage continues under the original operator	X		X
All of the farms have new operators		X	X
Operator no longer farms but rents out farmland:			
Renter operates farm as a separate unit	X		
Renter operates the rented land as part of an an existing farm		X	(Renting farm has its own CFN)
Part of original farm is sold for nonfarm use; part continues as a farm	X		
Entire farm is sold for nonfarm use		X	

Note: Land rented by the original farm is not considered, to simplify the table. "Operator" means the the primary operator, in the case of legal or informal partnerships. This table is drawn up for family farms, which includes proprietorships, partnerships, and family corporations but a similar table could be created for nonfamily farms.

certainty that every instance of the transactions listed in appendix table 1 will affect CFNs as indicated, which explains the use of the phrase "likely effects on CFNs" as a column heading in the table.

Weighting

During each agricultural census, some operators do not respond, despite numerous attempts to contact them (USDA, NASS, 1999, pp. C-2 and C-3). This "whole farm nonresponse" ranges from 9 to 14 percent of all farms during the census years examined here. Census personnel use a weighting procedure to correct for whole farm nonresponse. Most census observations have a nonresponse weight of 1, meaning they represent only themselves. Some farms, however, have a nonresponse weight of 2 and represent themselves, plus another farm, the operator of which failed to provide a response. If the nonresponding farm is large or unique, census personnel conduct an intensive telephone or personal followup to obtain a response. If the followup fails, data are imputed for the farm. As a result, all the nonresponse weights are 1 for large farms. Weighted data are used in this report, when possible, to discuss characteristics of farming in a particular year and to calculate exit rates. Nonresponse weights for 1978, unfortunately, are not available on the longitudinal file or anywhere else.

Nonresponse can also cause problems when estimating exits and entries. Some farms classified as exits may actually have been continuing operations that failed to respond to the census questionnaire. Similarly, some farms classified as entries may be continuing operations that did not respond to the previous census.[10] The exit rates for farms calculated from the longitudinal file, however, are comparable to exit rates for Canadian farms, as discussed earlier, despite a Canadian nonresponse rate of less than 1 percent (Gale and Pursey, 1995, p. 68), suggesting that nonresponse may not be a large source of bias.

Farm Definition Change

The official census definition of a farm is "any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold during the census year" (USDA, NASS, 1999, p. VII). Although the basic definition has not changed since 1974, minor changes occur from time to time. Three new groups of farms were counted for the first time in the 1997 Census of Agriculture: farms with all their cropland in the Conservation Reserve or Wetlands Reserve Programs (CRP or WRP), Christmas tree farms, and operations specializing in forest products (Hoppe and Korb, 2002, p. 26).

Farms that became CRP/WRP farms or switched their production solely to forest products or Christmas trees between 1992 and 1997 would be classified as surviving farms during the 1992-97 intercensus period. In previous intercensus periods, such farms would have been classified as exits because they would not have met the farm definition existing at that time. Exit rates and exit probabilities, therefore, are understated somewhat—particularly for farms with sales of less than $10,000—between 1992 and 1997, relative to earlier periods. Similarly, entrance rates are overstated somewhat. Including these farms in the 1997 Census reduced the decline in the number of farms between the 1992 and 1997 Censuses from 4.6 percent to 0.7 percent.

[10]Peterson and Gale (1991) devised a procedure to correct for nonresponse that leads some continuing farms to be mistakenly classified as exits or entries. It is a fairly simple algorithm, applied in a spreadsheet that uses nonresponse rates to apportion nonrespondents across the survivor, exit, and entry categories. However, it is based on four major assumptions, three of which the authors state are not completely true. The Peterson-Gale adjustment procedure is not used in this report to adjust exit rates. Their procedure simply adjusts cells in a spreadsheet, not individual observations. Using unadjusted exit rates in this report maintains comparability between the exit rates and results from the model, which uses data from individual observations.

Note that some places qualify as farms, even if they have less than $1,000 in sales. If a place does not have $1,000 in sales, a "point system" assigns values for acres of various crops and head of various livestock species to estimate a normal level of sales. Point farms have less than $1,000 in sales but points worth at least $1,000. These point farms tend to be very small. Some, however, normally may have large sales but have low sales in a particular year due to bad weather, crop or livestock disease, or other factors.

Appendix II

The Logistic Regression Model

The report uses a logistic regression model to estimate the probability of farm exit (P) during each intercensus period, as in the following (Greene, 1993, p. 297):

$$\ln [P_{it}/(1-P_{it})] = Y = \beta' X_{it} + \varepsilon_{it} \quad (1)$$

where ln is the natural logarithm, X is a vector of exogenous variables, (for example, various farm and operator characteristics) for the i*th* farm in time period *t*, β is a vector of parameters to be estimated, and ε_{it} is a stochastic error term. Coefficients in logistic regressions (the β parameters) tell how much a change in an independent variable changes the log of the predicted odds ratio $[P_{it}/(1-P_{it})]$. Because we are interested in the effects on the predicted probability of exit (P_{it}), we must derive the predicted probability as:

$$P = e^{Y}/(1+e^{Y}) = e^{\beta' X}/(1+e^{\beta' X}), \quad (2)$$

where e is the base of natural logarithms, approximately equal to 2.718.

Linear regression models are inappropriate for our data because they may give nonsensical predicted probabilities for exit—exceeding 100 percent or less than zero. Logit or probit models are usually chosen for estimation in cases where the object is to analyze the choice between two alternatives, in this case, exit or continued operation. In cases like this one, where the explanatory variables are themselves dichotomous, the logit is likely to be preferred because the probit's assumption of normally distributed error terms may not be appropriate (Kennedy, 2003, p. 267).

Equation 2 indicates that the effect of changes in an explanatory variable on the probability of exit will be nonlinear and will vary with the values of other explanatory variables. For that reason, the report presents predicted exit probabilities, in tables 3, 4, and 6-9 and in figures 5-8, for different combinations of explanatory variables. To derive the predicted exit probabilities, we first estimated the logistic regressions to obtain the parameter estimates β. We then combined the parameter estimates with various representative values of the explanatory variables X to derive predicted values for Y, the log of the odds ration. For any given value of Y, the predicted exit probability P can be derived as $e^{Y}/(1+e^{Y})$.

The Base Model

Operator age and farm size are two fundamental determinants of exit. We first explored a base model that uses only those determinants. We used this base model for three reasons. First, knowledge of exit probabilities across various size and age categories is useful in itself. Second, the exact linkage between age and size to exit may be complex. Because we wanted to explore potential nonlinearities using categorical measures, we did not want to complicate the model more by adding additional variables. Third, the base model estimates provide a useful point of comparison when we add additional variables.

In the base model, we used dummy variables that depict four age classes and six size classes, with size measured in sales, adjusted for inflation with the Producer Price Index for Farm Products:

Age classes	***Sales classes***
Years	*1997 dollars*
Younger than 45	Less than 1,000
45-54	1,000-9,999
55-64	10,000-49,999
65 or older	50,000-99,999
	100,000-249,999
	250,000 or more

Tests of the Base Model Specification

The base model was selected from three potential logit models that were evaluated for significance in predicting a farm's exit. The two rejected alternatives were as follows:

- **Sales cubed, age squared.** We replaced the categorical sales categories with continuous measures, using sales, sales squared, and sales cubed as well as age and age squared (we also used continuous sales measures with age classes). This alternative provided a weaker fit to the data, however, compared with using sales and age classes.
- **Four age classes, six sales classes, and their interaction terms.** Including interaction terms in the third model helps determine whether there are combination effects among the variables. This combination results in a less significant log likelihood than the second model and produces several insignificant t-statistics. We found no evidence of improved fit from adding the interaction terms.

All the models tested produce highly significant t-statistics. Highly significant t-statistics are to be expected because the longitudinal data base is so large (4.5 million observations). The huge underlying data set used in this report—coupled with the long time span between census years (generally 5 years)—also should help alleviate the effects of possible econometric problems.

Additional Models

Once we accepted a base model, we constructed five other models by adding measures of race, gender, specialization, off-farm work, and business age. Our goal was to use the logit model to estimate exit probabilities, controlling for size and age. We felt that developing this approach was important because size and operator age varies sharply across the categories in the other explanatory variables.

The coefficients from each logistic regression are presented in appendix table 2. No coefficients are presented for the 1978-82 intercensus period. Unlike the other periods, it is only 4 years long (rather than 5), and coverage of very small farms is incomplete in the 1978 Census. (See appendix III for more information about coverage in the 1978 Census.)

Appendix table 2

Logistic regression coefficients by intercensus period[1]

Model and variables		1982-87	1987-92	1992-97
Base model				
	Intercept	-0.533	-0.750	-0.652
Sales:	Less than $1,000	.903	1.114	.916
	$1,000-$9,999	.515	.686	.553
	$10,000-$49,999	.243	.424	.342
	$50,000-$99,999	.148	.229	.261
	$100,000-$249,999	-.046	.047	.153
Operator age:	Younger than 45	-.220	-.290	-.398
	45-54	-.435	-.431	-.522
	55-64	-.314	-.307	-.395
Value of log likelihood function		*-1,336,652*	*-1,185,219*	*-1,064,789*
Race model (excluded category: White)				
	Intercept	-0.542	-0.759	-0.658
Sales:	Less than $1,000	.894	1.111	.914
	$1,000-$9,999	.509	.685	.552
	$10,000-$49,999	.243	.427	.343
	$50,000-$99,999	.150	.232	.263
	$100,000-$249,999	-.044	.051	.155
Operator age:	Younger than 45	-.214	-.287	-.396
	45-54	-.431	-.428	-.521
	55-64	-.312	-.305	-.394
Race:	Black	.409	.358	.266
	Native American	.187	.197	.095
	Asian	.314	.494	.383
	Other	.215	.298	.147
Value of log likelihood function		*-1,335,948*	*-1,184,684*	*-1,064,553*
Business age model (excluded category: 14 years or more)				
	Intercept	NA[2]	NA[2]	-0.809
Sales:	Less than $1,000	NA[2]	NA[2]	.771
	$1,000-$9,999	NA[2]	NA[2]	.477
	$10,000-$49,999	NA[2]	NA[2]	.323
	$50,000-$99,999	NA[2]	NA[2]	.278
	$100,000-$249,999	NA[2]	NA[2]	.187
Operator age:	Younger than 45	NA[2]	NA[2]	-.635
	45-54	NA[2]	NA[2]	-.646
	55-64	NA[2]	NA[2]	-.461
Business age:	Less than 5 years	NA[2]	NA[2]	.691
	5-9 years	NA[2]	NA[2]	.357
	10-13 years	NA[2]	NA[2]	.143
Value of log likelihood function		*NA[2]*	*NA[2]*	*-1,050,754*
Specialization model (Excluded category: Other livestock)				
	Intercept	-0.666	-0.816	-0.749
Sales:	Less than $1,000	1.031	1.181	1.002
	$1,000-$9,999	.607	.808	.651
	$10,000-$49,999	.272	.496	.399
	$50,000-$99,999	.161	.268	.286
	$100,000-$249,999	-.037	.074	.167
Operator age:	Younger than 45	-.255	-.338	-.438
	45-54	-.454	-.462	-.551
	55-64	-.327	-.325	-.411
Type:	Cash grains	.214	.124	.126
	Other field crops	.222	.170	.205
	Vegetables and melons	.477	.340	.387
	Fruits and tree nuts	.157	.147	.148
	Horticultural	.708	.576	.538
	General crops	-.035	-.064	-.096
	Beef cattle	-.103	-.215	-.137
	Hogs	.152	.085	.278
	Dairy	.082	.002*	.084
	Poultry and eggs	.239	.263	.136
	Animal specialties	.200	.292	.173
Value of log likelihood function		*-1,330,749*	*-1,178,111*	*-1,059,921*
Off-farm work model (Excluded category: 200+ days)				
	Intercept	—[3]	-0.700	-0.612
Sales:	Less than $1,000	—[3]	1.096	.904
	$1,000-$9,999	—[3]	.671	.542
	$10,000-$49,999	—[3]	.417	.337
	$50,000-$99,999	—[3]	.230	.262
	$100,000-$249,999	—[3]	.049	.155
Operator age:	Younger than 45	—[3]	-.301	-.403
	45-54	—[3]	-.443	-.529
	55-64	—[3]	-.313	-.398
Days:	No days of off-farm work	—[3]	-.042	-.034
	1-199 days of off-farm work	—[3]	-.087	-.093
Value of log likelihood function		*—[3]*	*-1,185,021*	*-1,064,602*
Gender model (Excluded category: Male)				
	Intercept	-0.557	-0.774	-0.676
Sales:	Less than $1,000	.879	1.088	.885
	$1,000-$9,999	.495	.669	.533
	$10,000-$49,999	.235	.417	.333
	$50,000-$99,999	.146	.228	.259
	$100,000-$249,999	-.047	.047	.153
Operator age:	Younger than 45	-.200	-.274	-.383
	45-54	-.417	-.415	-.510
	55-64	-.301	-.295	-.384
Gender:	Female	.404	.376	.353
Value of log likelihood function		*-1,334,639*	*-1,183,421*	*-1,063,123*

Note: All coefficients are significant at the 99-percent level, except dairy in 1987-92.

* = Not significant.

[1]Excluded categories for all models: sales—$250,000 or more; operator age—65 or older.

[2]NA = Not applicable. The analysis was performed for only the 1992-97 period. It examines exits between 1992 and 1997, by business age.

[3]— = Not available. The longitudinal file has days of off-farm work from 1987 forward.

Source: 1997 Census of Agriculture Longitudinal File.

Appendix III

Farms With Sales of Less than $2,500 in the 1978 Census of Agriculture

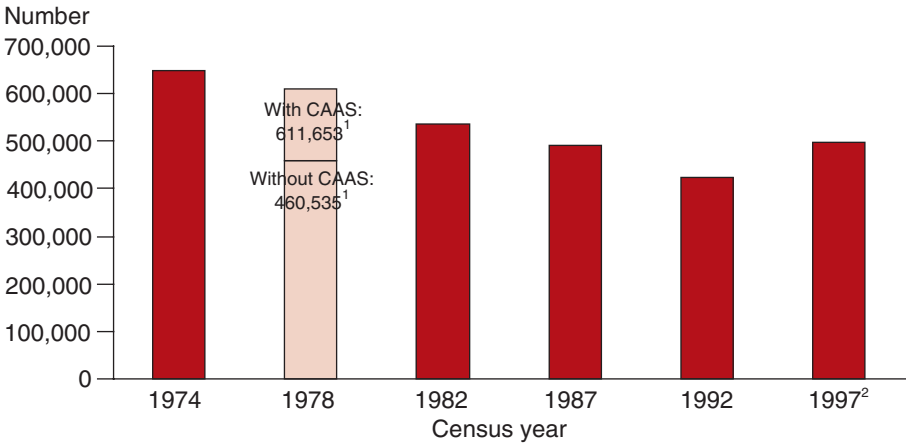
According to evaluation studies conducted after each census, the five censuses from 1978 through 1997 covered an average of 92 percent of all farms and 98 percent of production (USDA, NASS, 1999, p. C-5). However, farms with sales near the $1,000 cutoff in the U.S. farm definition were more likely to be undercounted. In the 1997 Census of Agriculture, for example, approximately 29 percent of farms with sales of less than $2,500 were not included in the count compared with 12 percent of farms with sales of $2,500-$9,999 and 4 percent of farms with sales greater than $10,000. The same pattern of undercounting the smallest farms also prevailed in earlier agricultural censuses.

The 1978 Census was an exception (U.S. Department of Commerce, U.S. Census Bureau, 1985, p. VI). After substantial undercounts of low-sales farms (sales of less than $2,500) in the 1969 and 1974 Censuses, the 1978 Census was augmented by the Census of Agriculture Area Sample (CAAS). Using the supplemental survey lowered the undercount of low-sales farms to about 7 percent. Combining the regular 1978 mailed census with the CAAS results in a count of 612,000 low-sales farms, which fits the 1974-92 trend in farms of that sales class (app. fig. 1).

Appendix figure 1

Farms with sales of less than $2,500, 1974-97

The number of farms in 1978 with sales of less than $2,500 is smaller without the supplemental Census of Agriculture Area Sample



Note: Sales are measured in current dollars, not constant, dollars.

[1]Census of Agriculture Area Sample (CAAS).

[2]The increase in farms with sales of less than $2,500 between 1992 and 1997 is largely due to a change in the classification of farms with all their cropland in the Conservation Reserve or Wetlands Reserve Programs (CRP or WRP). CRP/WRP farms were added to the farm count for the first time in 1997. For more information, see Hoppe and Korb, 2002.

Source: Compiled by ERS from census of agriculture data.

The CAAS sample was included in the 1978 Census publications, at least for U.S., State, and regional estimates. The sample was not large enough to provide estimates at the county level, however. In publications based on later censuses, the 1978 data included for comparisons were based on estimates made without the CAAS. Excluding the CAAS makes the 1978 estimates more comparable with estimates for later years, which have no supplemental survey (U.S. Department of Commerce, U.S. Census Bureau, 1984, pp. V and B1). The 1997 longitudinal file also excludes observations from the CAAS because it is a county-level file.

Although the CAAS-augmented 1978 Census provided an accurate estimate of the number of low-sales farms, the 1978 Census without the supplement did not, which is apparent when examining the number of low-sales farms over time. When we used the 1978 estimate without the CAAS, the count of low-sales farms fell by 189,000 between 1974 and 1978 and then rebounded by 76,000 between 1978 and 1982. This erratic change in farm numbers is difficult to accept as having actually happened. The unaugmented 1978 Census more likely undercounted farms with sales of less $2,500.

Missing a large share of low-sales farms in 1978 also appears to have greatly reduced the exit probability for farms with sales of less than $1,000 during the 1978-82 intercensus period. For a given age group, the exit probability for farms with sales of less than $1,000 is 15-20 percentage points lower in the 1978-82 period than in later periods. Farms with sales of less than $1,000 that the 1978 Census did locate may have been more established than the ones that were missed and thus more likely to survive until the 1982 Census. Unfortunately, the limited 1978 Census data now available—more than two decades after their release—prevent more definitive investigation.