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Succession in Family Farm Business: Empirical Evidence from the U.S. Farm Sector

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Abstract

Survival of many family farms is dependent on successful intergenerational transfer. Given the importance of succession in the farm sector, the purpose of this paper is to examine factors that are likely to influence succession decisions on U.S. farms. The paper uses 2001 ARMS data and a multinomial Logit (MNL) regression to estimate family succession, non-family succession, and farm exit decisions of farm households in the U.S. Model choice and specification issues are discussed. Results indicate that operator's education, household wealth, growth in farm size, and farm debt are important factors that determine succession decisions. Additionally, farm specialization is taken into consideration when farm operators make their succession plans.

Keywords: farm households, intergenerational transfer, micro-analysis, qualitative choice models, successions

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Most farm households control a substantial amount of wealth. In 2001, U.S. farm households had average net worth of $545,869, compared with $395,500 for non-farm households (Mishra et al.). Failure to plan carefully for retirement and transfer of the estate can result in serious problems such as financial insecurity, personal and family dissatisfaction, and unanticipated capital losses. Intergenerational transfers can be classified by their timing, into the forms of transfers and bequests (Altig and Davis, 1992). They can also be classified by type, into the forms of physical capital and human capital (Nervlove et al., 1984). Physical capital can be further classified into liquid and illiquid assets. This last classification is particularly interesting when the relatively illiquid assets are indivisible and when they constitute a large fraction of family wealth. Examples of this type of asset are the productive assets owned by self-employed individuals or family businesses. In family farms, the farm itself constitutes a physical asset that is highly illiquid, indivisible to a large extent, and in most cases constitutes a large fraction if not all of family wealth.

Many studies have shown that even when farming does not provide the family with an adequate standard of living, farmers refrain from selling farm assets and try to supplement their income from other sources, such as off-farm work (Mishra and Goodwin; Mishra and Sandretto; Mishra et al.) This tends to delay structural change within the sector (Kimhi and Nachlieli). The survival of many family farms is dependent on successful intergenerational transfer. Additionally, according to Pesquin et al. the family farm sector relies heavily on intergenerational succession. Gale (1993) points out that entry into farming by the ‘next generation’ holds a place of central

importance in the determination of industry structure and the total number of farmers and farm families.

The family farm is more than a profit maximizing enterprise. It is an asset whose productive life expectancy may extend well beyond that of its operator, and whose future value may depend on its continuous functioning; it is a place of residence for the farmer in old age; and it is attached to land, whose symbolic importance exceeds its economic value in many societies. Gasson and Errington (1993) looked at the development cycle of the farm family and the growth and decay cycle of the farm business, and concluded that "synchronizing these two cycles may itself be crucial for the continuance of the family business (p. 226)." Business succession is one important link between these two cycles. Succession has been defined as the process concerned with the transfer of management, or control of the business (Hastings). While succession differs from inheritance (transfer of ownership) and retirement (life after active work), the three are inter-linked (Hastings). The purpose of this paper is to examine factors that are likely to influence succession decisions on U.S. farms. Farm, operator, and successor characteristics that may contribute to a higher probability of succession will be identified. An understanding of the factors that influence succession is important as it allows insight into possible structural changes on the horizon for U.S. agriculture. Given that succession and retirement are inter-linked, examining succession planning activities of farm households may also provide a perspective about how households plan to use their business assets to generate income in later life.

Literature Review

Succession planning is a component of a household's risk management strategy for its farm business in as much as it is aimed at continuity of the businesses management team. Succession and estate planning have been described as being part of a complete business plan for agricultural producers (McCorkle and Bevers). A unique feature of the farm sector, in comparison to other sectors of the economy, is that a large share of farms, particularly large businesses, have traditionally passed within the family. The study of farm succession has a long tradition in the Rural Sociology literature (Gasson and Errington, 1993; Blanc and Perrier-Cornet, 1993; Carroll and Salamon, 1988; Coughenour and Kowlaski, 1977; Friedberger, 1983). However, agricultural economists have devoted little attention to this topic (Kimhi and Nachlieli, 2001; Weiss 1999). Most economics literature on the topic of farm succession is confined to a discussion of how succession is affected by tax considerations (Boehlje and Eisgruber, 1972; Harl, 1989; Harlin, 1992; Tauer, 1985). In the early 1990s economic historians examined farm succession practices while investigating Irish emigration (Guinnane, 1992; Kennedy, 1991).

The phenomenon of intrafamily succession is observed in many economies (Bryden et al. 1992). Kotlikoff and Spivak (1981) argue that intrafamily succession enables the extended family to enjoy the benefits of intergenerational risk-sharing when annuity markets are imperfect. Pesquin et al. (1999) mention additional advantages of intrafamily farm succession such as 'smooth' transition, reduction in transfer cost, and lower transfer taxes. Additionally, Tweeten and Zulauf (1994) point out that intra-family farm succession allows entering farmers to overcome borrowing constraints, at least in commercial farms. Using panel data of Austrian farms, Weiss (1999) found a strongly significant effect of intra-family succession on farm survival. Kimhi and

Nachlieli (2001) studied the likelihood of intra-family intergenerational succession on Israeli family farms. They found that age of the operator, level of schooling of the operator, and the age of the oldest child were significant factors in having an intra-family successor. Further, number of children and off-farm work did not have any impact on the probability of having an intra-family successor. The authors also found that Israeli farms with more land have lower probability of intra-family succession.

Some studies in the literature relate to farm succession and farm investment. For example, Potter and Lobley (1992) show that the investment behavior (on-farm investment) of farmers without successors was radically different from that of those where a successor has been identified. Perrier-Cornet et al. (1991) report that in France, the Netherlands, and Belgium, farm modernization is associated with intergenerational succession. However, farms located in the United Kingdom, Greece, and Italy did not show any significant relationship. Kimhi et al. (1995), using panel data of Israeli farms, found that during the 1970s succession contributed tremendously to farm expansion (both in terms of farm size and intensity of production). However, due to a widespread farm financial crisis in the 1980s, the expansionary phase did not continue. On the contrary, the farm financial crisis forced many successors to seek off-farm employment. Phimister (1994) argues that financial pressures arising from intergenerational farm asset transfers may have a negative impact on subsequent farm investment.

Theoretical Background

Early studies described two motivations for transfer of assets and wealth; altruism and exchange (Cox). In an altruism framework, a benevolent individual (say parent) cares about the well-being

of other individuals (the children). In an exchange model (Bernheim, Shleifer, and Summers) the parent makes a transfer to the children in return for services received from them. Bernheim, Shleifer, and Summers applied an exchange model to bequest behavior (transfer only takes place after the death of the donor). They found empirical support for the bequest-as-exchange model. However, a third strand of research (or third motive) in the 1980s treated family members as non altruistic; transfers represent payments made in exchange for services provided by family members. Non altruistic family behavior has been investigated in a variety of contexts, including annuity insurance (Kotlikoff and Spivak); household production (McElroy and Horney), insurance against shortfalls in income (Kaufman), and labor supply decisions (McElroy).

Transfers of wealth in the case of traditional farm households comes closer to fitting the first and third motive that covers annuity income, household production and labor supply. For example, the parents (former farmers) transfer the wealth (farm) to the child, who continues to farm, with the expectation that children will provide them with a place for retirement and support their living expenses. Further, the parents are involved in mentoring the child by providing farming experience and a helping hand if necessary. In return the child provides support for parents in old age.

Consider a representative farm household. Assume two individuals, the donor (say, the parent) and the recipient (the child)[1]. The parent's objective function is

(1) $$U_p = U\left(C_p, S_c\, V\left(C_k, S_c\right)\right)$$

where U_p = parent's well-being; V = child's well-being; $C_j = j = p = k$ denote parent and child consumption, and S_c denotes support and services the child provides to the parent(s). Equation (1) is a classical case of both altruism and exchange. In this case the parent cares about the well-being of the child, therefore $\frac{\partial U}{\partial V} > 0$ and in turn the child provides services, such as a place for retirement, share of farm income, savings, and investments related to the farm business. The partials of other arguments in equation (1) are all positive. Having a successor also raises potential farm income, saves on estate taxes and creates additional money that can be divided between the parents and child or between two generations. This type of succession is mutually agreeable to both parties because it is in the best interest of both parties[2]. The parent generation gets money from the farm business (assuming that the parent has a valid interest in the farm and makes it successful). Dealing with cross-sectional data, we assume that the parent has made a decision on whether to pass the farm to the next generation. The parent's utility level is conditional on having a successor. Equation 1 is maximized and depends on the conditioning variables: those affecting farm income, other production, and household variables.

Empirical Framework

A multinomial logit (MNL) regression model is used in this paper to examine the determinants of farm succession and farm exit among farm operator households. In the 2001 Agricultural Resource Management Survey (ARMS) producers were asked whether they had developed a succession plan along with selected other questions that focused on business management and

[1] We acknowledge that other forms of transfer, such brother to bother, bother to sister, may occur; we are primarily interested in the classical case (father-to-son) of intergenerational transfers.

planning to control costs. Specifically, farmers were asked if they had a succession plan for their operation, whether a specific person had been identified as the successor, and whether they planned to exit farming for any reason other than retirement within a five year time frame. Responses to these questions were used to develop four mutually exclusive alternatives (*M*) regarding succession. The first alternative (I_0) describes a strategy where no succession plan is formed by the farm household. The second (I_1) and third (I_2) alternatives describe strategies where succession plans are formed and they entail the designation of either a family member or a non-family member as the successor, respectively. The fourth alternative (I_3) describes a strategy by the farm household of farm exit. Let Y_j take the value 1 if the *j*th household chooses the *q*th succession plan; 0 otherwise. The relative odds (*P*) of farm succession choices are expressed using the following MNL model:

$$(2) \qquad log\left(\frac{P_{jq}}{P_{jM}}\right) = X_j'\beta_{qM} + \varepsilon_j, \qquad j=(1,\ldots,n),\ q=(1,\ldots,M\text{-}1),$$

where *log* is the natural logarithm, *X* is a vector of exogenous explanatory variables, β_{qM} is a vector of parameters to be estimated, and ε is a random disturbance term.

The conditional probability for the succession choice *q* is estimated as in the following:

$$(3) \qquad P_{jq} = \boldsymbol{Pr}\,ob(I_{jq}=1) = \frac{\boldsymbol{exp}(X_j'\beta_q)}{\sum_{q=1}^{M} \boldsymbol{exp}(X_j'\beta_q)}, \qquad q=(1,\ldots,M\text{-}1),$$

which, alternatively, can be written as:

[2] The alternative is the parent generations can sell the farm and find a place for retirement and the child or children find alternative source of income.

$$P_{jq} = \frac{exp(X_j' \beta_q)}{1 + \sum_{q=1}^{M-1} exp(X_j' \beta_q)}, \qquad q = (1, \ldots, M\text{-}1),$$

(4)

$$P_{jM} = \frac{1}{1 + \sum_{q=1}^{M-1} exp(X_j' \beta_q)}.$$

In the context of this paper, β_{qM} in equation (2) measures the marginal effects of the explanatory variables on the logarithm of the odds of a farm household choosing succession strategy I_1 relative to I_0, choosing I_2 relative to I_0, and choosing I_3 relative to I_0. The interpretation of β_{qM} is simplified even further by computing the marginal effects of X_j on the probabilities of being in I_1, I_2, or I_3 as in [for more detail, see Greene (1997)]:

$$\delta_q = \frac{\partial P_q}{\partial X_q} = P_q \left[\beta_q - \sum_{q=1}^{M-1} P_q \beta_q \right]$$

(5)

$$= P_q (\beta_q - \bar{\beta}),$$

where $\bar{\beta}$ is a vector whose elements are the averages of all estimated β_q $(q = 1,2,3)$. The signs of any particular β_q and δ_q need not be the same. Although by definition $\beta_0 = 0$, which is done for the purpose of facilitating the computation, the marginal effects of the attributes on the probability of a farm household choosing succession strategy I_0 are themselves not zero, and in fact they are computed as $\beta_0 = -P_0 \bar{\beta}$.

Data

Data for the analysis are from the 2001 Agricultural Resource Management Survey (ARMS). ARMS is conducted annually by the Economic Research Service and the National Agricultural Statistics Service. The survey collects data to measure the financial condition (farm income,

expenses, assets, and debts) and operating characteristics of farm businesses, the cost of producing agricultural commodities, and the well-being of farm operator households.

The 2001 ARMS collected information on farm households in addition to farm economic data collected through the regular survey. It also collected detailed information on off-farm hours worked by spouses and farm operators, the amount of income received from off-farm work, net cash income from operating another farm/ranch, net cash income from operating another business, and net income from share renting. Furthermore, income received from other sources, such as disability, social security, and unemployment payments, and gross income from interest and dividends was also counted. Specifically, our analysis will focus on married farm couples. The issue of retirement and succession is central to the family decision-making process and the literature points to the fact that a large share of farms are passed on directly to children of farm operators and owners. Secondly, the altruistic motive of the parent (farm family in this case) forms a basis for the theory of intergenerational transfers.

In the 2001 ARMS, farmers were asked using a sequential type of questioning about whether they had developed a succession plan for their farming operation. The issue of retirement and succession is especially pertinent for farmers who have a short-term planning horizon, for example those who plan to retire in the next five years. Using the 2001 ARMS we classified farm operators, based on succession plans, into four alternatives: no succession plan (base group), family succession, non-family succession, and farm exit.

Nationally, a small percentage, 27 percent, of farm operators indicated that they had a succession plan (Figure 1). Of those, 87 percent reported that they had identified a successor, and in most cases the successor was a family member. When asked if the successor worked or participated in the farm business, 52 percent indicated that that was the case. Further, 38 percent of designated successors were participating in management activities and decisions for the farm (Figure 2).

About 34 percent of farm operators who indicated that they would retire in the next 5 years had a succession plan and about 80 percent of these households had a family member taking over the farm. Thirty-six percent of operators who planned to exit farming to pursue off-farm work or business opportunities had a succession plan and almost in all cases (93 percent) the successor was a member of the family. Identified successors for this group of operators were also more likely to be working in the business and making management decisions for the farm (73 percent). Farm operators who were above 65 years of age and had no retirement plans appeared to be more organized in terms of having a succession plan than other groups of households, with about 40 percent of these households having succession plans. As with other groups, most of the successors were family members. But, while a large share of these farms reported a succession plan, a smaller share of these actually involved their successor in operation of the business than did farmers in general (Figure 2). All of the variables used and summary statistics are presented in Table 1.

Results

The results of the multinomial logit model are presented in Table 2, and the corresponding marginal effects are presented in Table 3. Table 2 provides information on the overall fit of the

model. Since an R^2 does not accurately measure the fit of a multinomial logit model, a pseudo-R^2, the likelihood ratio, is calculated. The likelihood ratio is 940 representing a relatively good fit for a multinomial logit model (Hensher and Johnson). In our model the base group is farmers with no succession plan. It is our interest to investigate the factors that affect succession, both family and non-family, and farm exits compared to farms with no succession plan. Therefore, as in any case of multinomial logit models, the number of significant variables and the level of significance can be influenced by the base group. The interpretation of the estimated coefficients is awkward because they describe the marginal effect of the explanatory variables on the logarithm of the odds of being in one of the succession groups (family and non-family) or the exit group relative to no succession group.

Results show that the set of significant explanatory variables varies across succession models. The probability of having a succession plan is significantly influenced by operator's education, household net worth, long term farm debt, and farm type. Literature (Tweeten; Goddard et al.) provides evidence that operator's education level is an important factor that determines structural change in the farm sector. The probability of having a succession plan that includes a family member increases with the educational level of the farm operator. The coefficient of OPEDUC (operator's level of education) is positive and statistically significant at the 10% level of significance (Table 2). The findings may reflect the notion that parents with a higher level of educational attainment may focus more intensely on the organizational and business plans for their business, including developing a plan for succession. Also, education levels tend to be positively correlated with lifetime accumulation of wealth. The correlation between educational level of farm operators and their spouses and off-farm work has been reported by various studies

in the literature. Results in Table 3 suggest that an additional year of schooling increases the probability of family succession by 0.012. Figure 3 reports the probabilities of farm successions and exits for a hypothetical farm household depending on the educational level of the farm operator[3]. Our results are consistent with the findings of Kimhi and Nachlieli and Stiglbauer and Weiss. Age is another factor that is closely related to succession. Older farm operators are more aware of the need for smooth transfer of the farm. Figure 4 reports the probabilities of farm succession (family and non-family) and farm exits for a hypothetical farm household. According to figure 4, family succession increases with the operator's age. The coefficient on OPAGE (operator's age) is positive for family succession and negative for non-family succession. However, the coefficients are not significant.

Farm households are unique in the ways they accumulate wealth (Mishra et al.). Farm households have land, buildings and other facilities, machinery, and other equipment that are part of farm net worth. On the other hand, farm households accumulate nonfarm wealth (such as savings, investments, and real estate property) that adds to the net worth of the household (Mishra et al.) . As described earlier in the paper intergenerational transfer of wealth has been an important aspect of farm succession. Mishra et al. indicate that at least 70 percent of farm household wealth comes from the farm and is directly related to farm size. In this study household net worth is a measure of size (farm) and the financial well-being of the farm family. The coefficient of HHNW (household net worth) is positive and statistically different from zero in family and non-family succession models. The notion is further reinforced by using a dummy variable, (SIZE_250), as an indicator of farm size. However, this variable was only significant in

[3] Actual percentages for no succession, family succession, non-family succession, and farm exits are not reported because of space, but are available from the authors.

the non-family succession model. Results show that farms with sales of more than $250,000 were more likely to have a non-family successor when compared to farms with no succession plans. The probability of non-family succession increases by 0.03 when farm sales are greater than $250,000.

There is no standard model of how farm households earn a livelihood. Instead, farm households use a wide variety of livelihood decisions to generate income to support choices with regard to consumption, saving, and investment. The Census of Agriculture has, for several decades, documented the trend toward off-farm work by farm operators, showing that three of ten operators worked off farm by the 1930's and that over half of operators had moved into non-farm labor markets by the 1960's. Not only has the share of operators working off farm grown but the amount of time, as measured in days worked off farm, has increased as well. Operators and spouses make decisions about whether one, both or neither work off-farm, and whether to hire someone to work or manage the farm operation. If the marginal value of time from off-farm work exceeds the marginal value of time from on-farm work or leisure, farm operators and spouses may find off-farm jobs more rewarding. These households may choose to live in rural areas and operate a business that qualifies as a farm. Many may have come into farming after beginning their off-farm job. Others may have moved from farming to off-farm work. These households might be expected to have a weaker tie to their farm than households who are engaged in farming as their primary source of income. A dummy variable that indicates off-farm work status of the farm family was included in the regression. The coefficient of OPSPOFF (both operator and spouses working off the farm) is positive and statistically significant at a 10 percent

level of significance (table 2). Results indicate that the probability of non-family succession increases by 0.035 if both farm operator and spouse reported working off the farm (Table 3).

While studying the effect of growth rates and firm exit rates Griliches and Regev found that a "doomed firm" will have lower growth rates several years earlier. Grichiles and Regev call this the "shadow of death effect". Kimhi et al. used a similar argument to point out that a farmer might be motivated to invest and raise current farm size if farm succession is known. In our study we used (ACRES_01) as a dummy variable that captures farm growth between 1996 and 2001[4]. Specifically, farmers were asked if they operated more, the same, or less acreage in 2001 than they did in 1996. ACRES_01 takes a value 1 if the farm operated more acres in 2001 than in 1996. Contrary to the "shadow of death effect" this study finds a negative relationship between farm growth rate and succession. The coefficient of ACRES_01 is negative and statistically significant at 10 percent only in the case of farm exits (Table 2). Results indicate that an increase in farm size reduces the probability of farm exits. This is consistent with the fact that once the operator has decided to increase the size of operation it is very unlikely he will exit farming or plan for a successor in the immediate future. These farm operators could be efficient farmers, with many years of farming experience, and may be earning higher returns from farming. They could also be farmers in the establishment and growth phases of the business and family life cycles. Farm debt could also have potential impact on succession decisions. The 2001 ARMS survey asked farm operators about their farm debt. In particular, they were asked if farm debt in 2001 was greater, less, or same as in 1996. A dummy variable, FDEBT_01, was created and coded as 1 if debt levels were greater in 2001 than in 1996. The coefficient of FDEBT_01 was

[4] The 2001 ARMS survey asked farmers to indicate whether their operated acres in 2001 were more, less, or the same as in 1996.

positive and significant for the family succession model (Table 2). Results indicate that the probability of succession (family) increases, by 0.045, with size of farm debt. A possible explanation is that larger farms generally have higher amounts of farm debt and these are the farms that are more likely to have a successor. Further, higher farm debt loads between 1996 and 2001 could be an indicator that farmers were willing to take more risk and finance investments on the farm. Taking on debt may also be an indication that upkeep, maintenance, expansion, or retooling of the farm's capital structure is likely needed to keep the business a competitive enterprise for future generations.

Farm attributes affect the succession process to the extent that both the retiree and successor might share farm income and labor. One of the farm attributes that is of interest in this study is whether succession may differ among types of farm businesses. Pesquin et al. point out that a successor is more common on dairy farms since work can be divided easily between two people. Additionally, dairy farms (and others such as nursery, green house, etc.) may have more stable and reliable sources of income. Further, the successor and the operator may specialize in different operations of the farm. For example, recent data show that many farms, particularly larger operations, may have two or three people who participate in machinery work, production, accounting and budget, and management of the farm. Hence, we included dummy variables for farms that are engaged in cash grains (CASHGRAIN), other crops (such as cotton, tobacco, and field crops), (OTHERGCROPS), dairy (DAIRY), and beef and hogs operations (BEEF_HOGS). Results show the probability of family succession increases if farms are specialized in the production of other crops, dairy, and beef and hogs. One thing that stands out here is that each of these commodities (crops, dairy, and hog) are farm specializations that produce high value

outputs and require large capital investments. The probability of having developed a succession plan is highest for dairy farms (0.133), followed by other crops farms (0.072), and beef and hog farms (0.071).

Summary and Conclusions

Succession planning is a part of the development of a complete business plan for a farm operation. Succession plans specify when, how, and under what circumstances management of the business will pass from the current operator to another individual. In one sense, succession plans are a road map for use in deciding how to handle management of the business as households enter the retirement or transfer stage of family life or incur an unexpected circumstance such as the incapacitation or death of the operator. Succession and retirement are inter-linked and are reflective of the life cycles of the farm household and the farm business. Growth, consolidation, and exit phases of a business may overlap with the retirement and transfer phases of a household. Despite the important role that succession (family and non-family) may play in the continuity of farm businesses, little theoretical or empirical work has been devoted to this issue. In this paper we examine farm and family characteristics that affect the likelihood of a household having developed a succession plan for its farm business. Two types of succession are considered: (1) "family succession" and (2) "non-family succession" (where the farm moves outside the household). In addition, farm exits are also considered as an additional category. A multinomial logit model, along with 2001 ARMS farm level data, is used to identify factors that are important in succession decisions of farm operator households.

Nationally, just over one-fourth of farmers have developed a plan for succession or the future management of their business. Nearly nine out of ten farmers with a succession plan have a known successor identified. For this group of operators that planned goal for the business is to keep it in operation under known management. Since the business will continue in operation with management turned over to new managers, who are most often identified as family members, some consideration has likely been given to the ability of the farm to generate enough income to support the later life income needs of the operator's household along with needs of the household(s) of the new management team.

Factors found to significantly influence having a known successor who is a member of the operator's family included education, household net worth, taking on higher debt loads in the past five years, and being engaged in farm businesses like dairying that require relatively large amounts of capital expenditures and managerial oversight. The likelihood of having a succession plan rises with household net worth, indicating that larger businesses may be better positioned to support multiple households. Operators with smaller businesses and household net worth may depend on their farm assets to support income needs in later life. This could likely mean leasing, selling, or making other use of farmland or other business assets.

Having a non-family successor was also found to be significantly affected by household net worth and by two other factors that differed from family succession planning. These were operator and spouse off-farm work and operation of a farm with over $250,000 in sales. These operators may have come to operate a farm from an off-farm occupation or found their off-farm employment to provide greater return. The likelihood of these households having a non-family

successor may result from family members not being interested in the farm or from the operator treating the farm as a part of a larger investment portfolio.

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Table 1—Definition and weighted means of variables used in the succession and exit plans model, 2001

Variable definition and symbol	Weighted means[1]				
	No succession	Family succession	Non-family succession	Farm exit	All ARMS sample
Age of operator (*OPAGE*)	53	58*	55*	60*	54
Gender of operator, dummy variable (=1 if male; 0 else) (*OPGENDER*)	0.93	0.93	0.98	0.96	0.94
Education of operator, years (*OPEDUC*)	13.16	13.45	13.40	12.89	13.22
Presence of young persons, dummy variables:					
(=1 if person's age was under 6; 0 else) (*CHILD6*)	0.12	0.06	0.13	0.11	0.10
(=1 if person's was between 13 and 18; 0 else) (*CHILD13_18*)	0.24	0.21	0.27	0.11	0.23
Off-farm labor participation, dummy variables:					
(=1 if only the operator worked off-farm; 0 else) *(OPOFFONLY*)	0.16	0.19	0.12	0.13	0.16
(=1 if only the spouse worked off-farm; 0 else) *(SPOFFONLY*)	0.17	0.14	0.16	0.12	0.16
(=1 if both operator and spouse worked off-farm; 0 else) *OPSPOFF*)	0.43	0.33	0.45	0.30	0.40
Household net worth ($10,000) (*HHNW*)	49.65	78.07*	69.51*	53.19	56.68
Farm organization, dummy variable:					
(=1 if sole proprietorship; 0 else) (*SOLE*)	0.93	0.90	0.89	0.91	0.92
Farm size, dummy variables:					
(=1 if sales were between $100,000 and $249,999; 0 else) (*SIZE100_250*)	0.09	0.09	0.13	0.09	0.09
(=1 if sales were $250,000 or more; 0 else) (*SIZE_250*)	0.07	0.09	0.14	0.04	0.08
Productivity index (0=least productive, 100=most productive) (*PRODINDEX*)	72.69	71.64	74.72*	73.77	72.60
Farm tenure, dummy variable (=1 if farm was fully owned; 0 else) (*FULLOWN*)	0.58	0.56	0.47	0.59	0.57
Past indebtedness dummy variable:					
(=1 if farm debt in 2001 was more than in 1996; 0 else) (*FDEBT_01*)	0.17	0.19	0.25	0.11	0.18
Income stream, dummy variable:					
(=1 if household income in 2001 was below 1996's income (*INCOME_01*)	0.19	0.17	0.19	0.29	0.19
Farm growth, dummy variable:					
(=1 if household operated more acres in 2001 than in 1996; 0 else) (*ACRES_01*)	0.18	0.23	0.23	0.08	0.19
Expected government support, dummy variable:					
(=1 if support was expected regardless of prices over next 4 years; 0 else) (*GOVP*)	0.27	0.28	0.42	0.30	0.28
Type of farm specialization, dummy variables:					
(1= if farm specialized in cash grain production; 0 else) (*CASHGRAIN*)	0.10	0.11	0.21	0.15	0.11
(1= if farm specialized in production of other crops; 0 else) (*OTHERCROPS*)	0.33	0.34	0.26	0.41	0.33
(1= if farm specialized in dairy production; 0 else) (*DAIRY*)	0.04	0.05	0.04	0.02	0.04
(1= if farm specialized in production of beef, cattle, or hogs; 0 else) (*BEEF_HOGS*)	0.35	0.38	0.35	0.29	0.35
Regional dummy variables:					
(=1, if location = non-metro farming county; 0 else) (*NONMETROF*)	0.14	0.14	0.13	0.12	0.14
(=1, if location = metro county; 0 else) (*METRO*)	0.32	0.34	0.28	0.42	0.33

[1] The coefficients of variation (CVs) of all non-binary estimates are below 15 percent. Differences in the means of non-binary estimates in the second (2^{nd}), third (3^{rd}), and fourth (4^{th}) succession categories and those in the first (1^{st}) category (i.e., 'No succession' are examined with * indicating that the respective means (in 2^{nd}, 3^{rd}, and 4^{th}) within each row are statistically different (at 10% level or better) from the means in the 1^{st} category.

Table 2--Multinomial logit estimates of factors affecting succession and exit plans by farm households, 2001

Variables	Succession and farm exit plans[1]		
	(1) Family succession: $log\ (P_1 / P_0)$	(2) Non-family succession: $log\ (P_2 / P_0)$	(3) Farm exit: $log\ (P_3 / P_0)$
INTERCEPT	-3.2935**	-5.2932***	-7.4143*
OPAGE	0.0184	-0.0374	0.1206
$OPAGE^2/100$	0.0188	0.0728	-0.0634
OPGENDER	-0.1999	0.9453	0.5257
OPEDUC	0.0698*	0.0446	-0.0169
CHILD6	-0.2902	0.5403	1.1029
CHILD13_18	0.1421	0.3813	-0.2866
OPOFFONLY	0.3560	0.3009	-0.4508
SPOFFONLY	-0.1261	0.2289	-0.4755
OPSPOFF	0.0474	0.7521*	-0.3277
HHNW	0.0017**	0.0013*	-0.0005
SOLE	-0.2965	-0.2996	-0.4090
SIZE100_250	-0.1093	0.3097	-0.1508
SIZE_250	-0.0545	0.5639*	-0.7119
PRODINDEX	-0.0072	0.0036	0.0061
FULLOWN	-0.1423	-0.1898	-0.2861
FDEBT_01	0.2840*	0.3682	-0.1398
INCOME_01	-0.1023	-0.0865	0.6057
ACRES_01	0.3101	-0.0147	-0.7110*
GOVP	-0.1092	0.3942	-0.1822
CASHGRAIN	0.5299	0.2873	0.5521
OTHERCROPS	0.4229*	-0.2297	0.2630
DAIRY	0.7334**	-0.2038	-0.5377
BEEF_HOGS	0.3960**	-0.0429	-0.2502
NONMETROF	0.0567	-0.4620	0.0118
METRO	0.0204	-0.1586	0.3343
Number of observation: Sample: 4,608 Population: 1,693,159			
Log Likelihood: -1,362,002 Restricted Log Likelihood: -1,453,337			

Note: Regression parameters are estimated using the Jackknife variance estimation method. * Significant at 10%. ** Significant at 5%. *** Significant at 1%.

[1] P_0, P_1, P_2, and P_3 are the probabilities of the household having no succession plan, of having family succession plan, of having non-family succession plan, and of having a plan of farm exit, respectively (see equations (x) and (x)).

Table3--Predicted marginal effects (averaged over individuals) of factors affecting the probabilities of farm succession and farm exit, 2001[1]

	Succession and Farm Exit Plans			
Variables	(1) No succession	(2) Family succession	(3) Non-family succession	(4) Farm exit
INTERCEPT	0.8512	-0.4196	-0.1880	-0.2436
OPAGE	-0.0048	0.0024	-0.0022	0.0046
OPAGE^2/100	-0.0034	0.0029	0.0033	-0.0028
OPGENDER	-0.0143	-0.0515	0.0453	0.0205
OPEDUC	-0.0113	0.0115	0.0012	-0.0014
CHILD6	-0.0037	-0.0674	0.0266	0.0445
CHILD13_18	-0.0253	0.0222	0.0164	-0.0132
OPOFFONLY	-0.0500	0.0613	0.0102	-0.0216
SPOFFONLY	0.0242	-0.0197	0.0131	-0.0176
OPSPOFF	-0.0219	0.0017	0.0348	-0.0146
HHNW	-0.0003	0.0003	0.0000	0.0000
SOLE	0.0641	-0.0426	-0.0093	-0.0123
SIZE100_250	0.0104	-0.0211	0.0160	-0.0054
SIZE_250	0.0094	-0.0094	0.0282	-0.0281
PRODINDEX	0.0008	-0.0013	0.0002	0.0003
FULLOWN	0.0346	-0.0190	-0.0064	-0.0093
FDEBT_01	-0.0498	0.0451	0.0137	-0.0090
INCOME_01	0.0016	-0.0224	-0.0039	0.0246
ACRES_01	-0.0263	0.0601	-0.0033	-0.0306
GOVP	0.0086	-0.0219	0.0200	-0.0067
CASHGRAIN	-0.1021	0.0811	0.0054	0.0155
OTHERCROPS	-0.0623	0.0724	-0.0166	0.0064
DAIRY	-0.0875	0.1330	-0.0178	-0.0277
BEEF_HOGS	-0.0504	0.0705	-0.0066	-0.0135
NONMETROF	0.0058	0.0155	-0.0221	0.0008
METRO	-0.0070	0.0022	-0.0083	0.0130

[1] The computation of the marginal effects is done based on equation (x).

Figure 1: Succession planning and successors of farm households, 2001

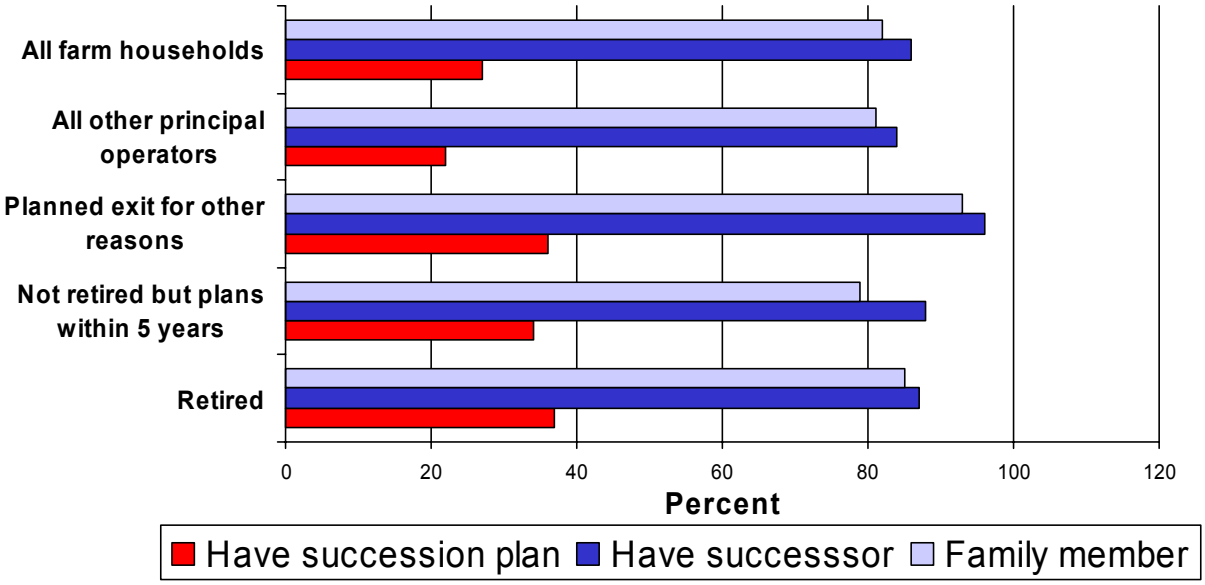

Figure 2: Participation of successor in farm work, management activities, and other decisions for the farm, 2001

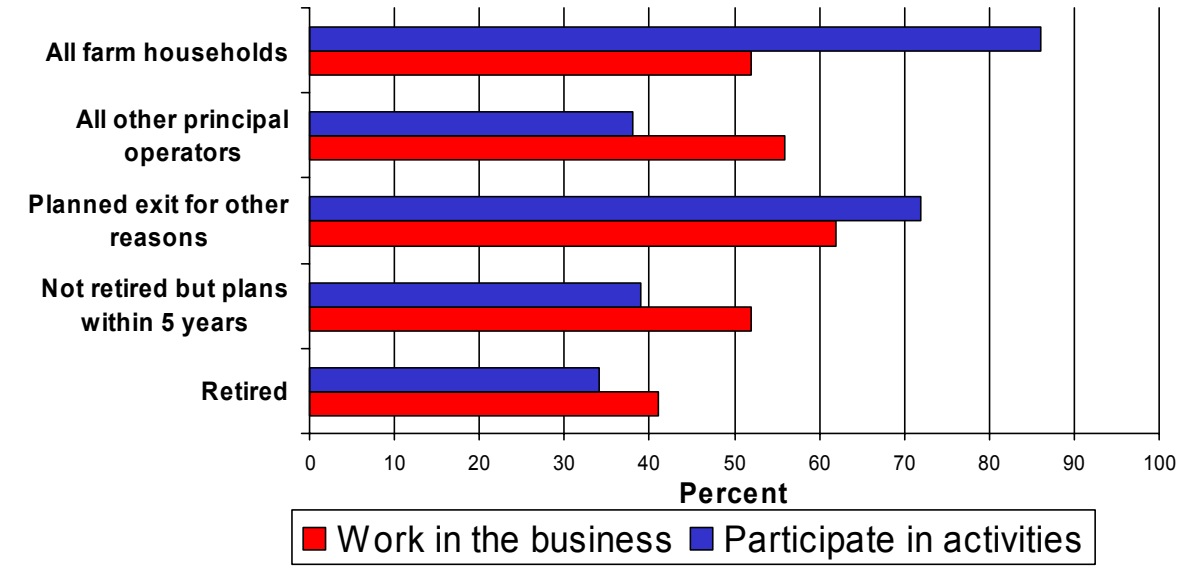

Figure 3—Farm operator's education and the expected probabilities of farm succession and farm exit, 2001

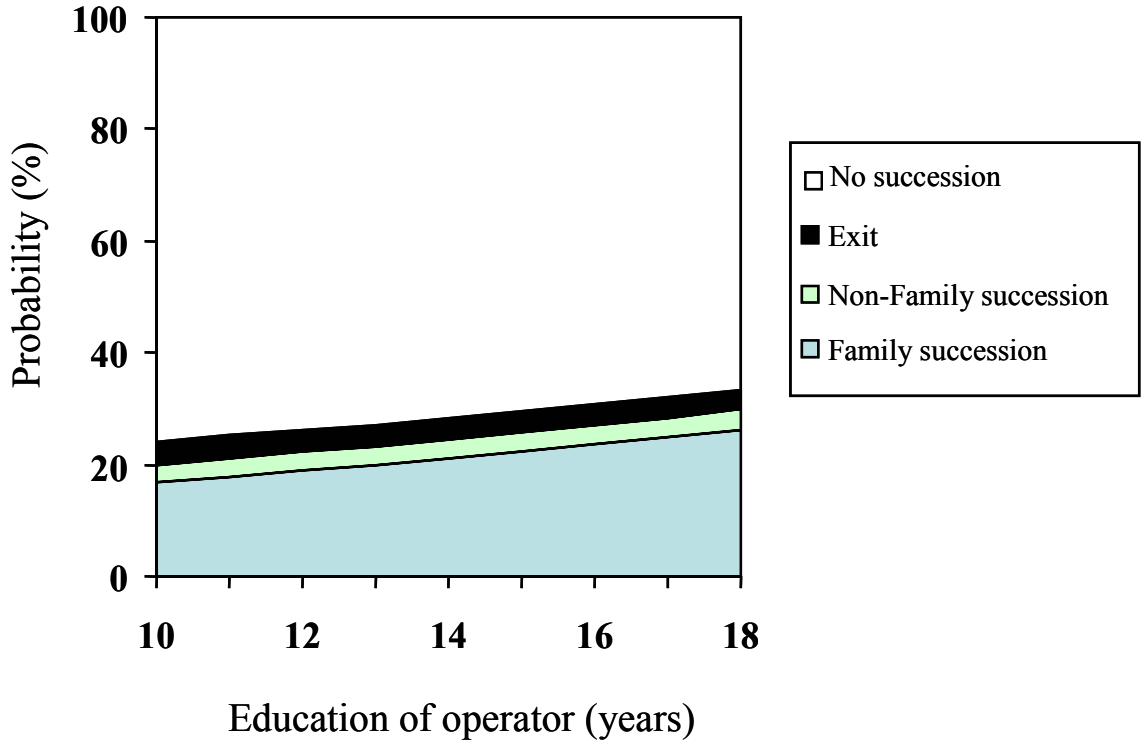

Figure 4—Farm operator's age and the expected probabilities of farm succession and farm exit, 2001