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ABSTRACT

We link census records for millions of farm children to identify owner-operators of the family farm in adulthood, providing the first population-level evidence on intergenerational farm transfers. Using our panel of U.S. census data from 1900 to 1940, our analysis supports the primogeniture hypothesis that oldest sons are more likely to inherit the family farm. Daughters are rarely observed as successors. We find that the birth order relationship among sons is relatively small and is only present for the subset of families with parents who are working age when they first have a successor, indicating that they had a succession plan. In families without an early successor, adult children who are tenant farmers or are not in an urban area are more likely to later inherit their family's farm. Tenancy and rural residence are much more predictive of succession than is birth order. Thus, unplanned succession may primarily benefit underresourced farmers. With fewer than one-fifth of farm families having a child successor, the slow growth in succession as parents reach retirement age and life expectancy suggests the importance of identifying a successor early.

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Introduction

"*Ask baby boomer farmers here how they are planning for retirement and the likely answer is: They are not.*" – Christina Cappecchi (2017), *New York Times.*

The USDA projected that 10% of U.S. farmland would change hands between 2015 and 2019, with most transfers expected as gifts, trusts, or wills (Bigelow et al., 2016; see also Roberts, 2021). Yet it remains uncertain whether these transfers were carried out as planned. Further, with over one-third of U.S. farmers above retirement age (U.S. Department of Agriculture, 2017) and many farmers planning to never retire (Kirkpatrick, 2013), the status of farms without a planned successor is precarious in the event of unexpected death or disability. Unresolved succession issues threaten existing farmland and the continuation of family farms.

Recognizing the problems for farms without a planned successor, the 2018 Farm Bill authorized the Heirs' Property Relending Program to provide loans for successors to resolve land ownership issues. Agricultural economists also recognize the importance of succession planning and have provided resources for succession planning through cooperative extension services in nearly all states.[1] Despite wide attention, there is a striking lack of data on the actual transfers of family farms. Little is known about the frequency of intergenerational succession, the beneficiaries of succession, or the prevalence and features of unplanned succession. Answers to these questions can improve how policies target succession issues.

In this paper, we use linked population-level data to answer the following research questions: (1) Is a child's birth order and gender predictive of farm succession? (2) Are tenant-farming children more likely to become successors when a succession plan is not present? (3) How frequent is unplanned succession? Our investigation is motivated by theoretical hypotheses and the existing literature on succession planning.

[1] We find online articles or workshops provided by extension services in 45 states.

With its prolonged prominence in agricultural policy debates and extension curricula, one would expect significant space to be devoted to farm succession among the top agricultural economics journals. Surprisingly, only one article in the *American Journal of Agricultural Economics* (and its predecessor the *Journal of Farm Economics*) addresses farm succession (Chang, 2013).[2] The relative absence of research on farm succession is a rather jarring result for a key and abiding issue in agricultural economics, and it appears to be driven by a paucity of appropriate data for economic analysis. Because succession happens at a generational pace, data on the execution of succession plans would need to observe families over decades. Retrospectively collecting data only from the heirs would likely lead to substantial bias due to selection effects. To date, there are no general panel surveys of farm families as there are for health and disease (e.g., the Framingham study (Andersson et al., 2019)) or labor (e.g., National Longitudinal Survey of Youth (Chase-Lansdale et al., 1991)). Without empirical data, it is impossible to evaluate theories of succession or the outcomes of succession planning.

To address this substantial gap in the literature, we have constructed an individual-level longitudinal dataset that links the children of 1.2 million observations of farm owners in the full-count 1900 and 1910 U.S. Census records to their realized succession outcomes in the 1920, 1930, and 1940 censuses.[3] By focusing on these years, we benefit from recent population-level linkages over periods of up to 40 years as well as a unique set of questions in the 1900 and 1910 U.S. Census that allow us to identify family structure with greater confidence. Although later census records are not yet available to the public, the 1940 census contains a rich set of variables that allow us to deepen our understanding of farm succession.[4]

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[2] Search for the term "succession" conducted on jstor.org, April 6, 2023. We also find no discussion of farm succession in the *Handbook of Agricultural Economics*. However, a search of the Core Historical Literature of Agriculture produces many works in sociology journals and less prominent agricultural economics journals that touch on farm succession.

[3] As shown in Table 2, our sample includes 548,348 families in 1900 and 655,046 in 1910 which results in 1,203,394 families. However, some families are likely included in both census years.

[4] Images of the 1950 U.S. Census are now available, following the U.S. Census Bureau's 72-year privacy rule. However, data from these images are not yet available to researchers.

While the current economic, legal, and demographic context is distinct from that of 80 years ago, our study focuses on fundamental and enduring aspects of succession decisions between farmers and their children. These aspects include the farmer's aging and retirement and the child's choice of occupation during young adulthood. Studying historical farm succession patterns can also help explain path dependence in the number of family-owned farms and the potential role of succession planning on structural change in agriculture.

Our analysis of farm succession across generations allows us to validate and provide context to the existing studies on farmers' succession plans (e.g. Liu et al., 2023; Chang, 2013; Mishra and El-Osta, 2010; Mishra and El-Osta, 2007). These prospective, survey-based, studies highlight numerous economic, social, and cultural concerns that influence farmers and their potential heirs during farm planning. We also add to a rich literature in economic history which highlights the role of succession practices in inequality and labor shortages (Wright, 1978), migration (Abramitzky et al., 2013; Ferrie, 2005), and declines in numbers of U.S. farms (Easterlin, 1976; Fennell, 1981).

With a large panel dataset and new methods to quantify intergenerational farm transfers, we contribute to the research literature in three primary ways. First, we analyze associations of child characteristics with actual farm transfers, not just the identification of a planned successor. We find that, within the same family, sons are much more likely than daughters to become successors and oldest sons are more likely than younger sons to become successors. Second, we study farm transfers which appear to be unplanned by identifying transfers which occur later in the parent's life. Unlike earlier (planned) succession, birth order is not predictive of later (unplanned) succession. However, a child's geography and occupation as an adult are strong predictors of later succession, with rural residents and tenant farmers being more likely successors. Third, we identify the frequency of farm transfers over a parent's life, showing that the majority of farm transfers occur within 20 years of the childhood census. This suggests that succession planning increases the likelihood of an intergenerational farm transfer taking place, which is in accordance with prior observational evidence.

Background

Family farms were once considered the backbone of the U.S., with farmers using the agricultural setting to provide children vocational training from an early age. As farmland and assets comprised most of a family's wealth (Nickerson et al. 2012), the parents' decisions regarding which child, if any, inherits the farm would thus imply vastly different outcomes among family members. The potential for succession decisions to create inequality among children has made its way into many popular stories and family histories.

Stories of children who resisted or refused the family farm are also prevalent in popular culture. Inheriting the farm requires a substantial commitment of a child's occupation and place of residence. Children who expect to wait decades to obtain full ownership and management of the farm may be drawn to off-farm employment. On the other hand, children may be willing to wait to inherit a larger or more profitable farm.

A family's succession decisions arise from both economic and social motivations that are highly individual, making them a noisy target of economic analysis. Succession decisions require both a parent and a child to agree on future plans (Aldanondo Ochoa et al., 2007; Mann, 2007), and personal disagreements between a parent and child can result in the failure of a succession plan (Mann, 2007). Yet systematic patterns may exist in how and when incentives are aligned across generations.

From the child's point of view, inheritance promises a source of wealth and income throughout their life and can substantially reduce the financial burden of farming. However, succession may require the sacrifice of off-farm labor opportunities, including prior to inheritance. Many heirs may remain working on the farm until succession, but with only minor input in management (Calus et al., 2008).

From the farmer's perspective, succession can involve a host of financial and socio-emotional issues. Often a successor is named with the understanding that the retired farmer will be supported in some way (Kimhi, 1997; Pitts, et al., 2009). A key alternative to succession is the private sale of the farm. Compared to an outside buyer, however, a child successor may earn more farm profit as a result of land- and asset-specific human capital (Stiglbauer and Weiss, 2000), thus affecting a parent's future financial support. Leasing out land is another substitute for succession (Glauben et al., 2004).

Parents may find sentimental value in helping their child continue the family legacy (Robison et al., 2002). Yet passing the farm to one of many siblings can create substantial conflict in the family and induce perceptions of favoritism or unfairness (Pitts et al., 2009). Cultural norms can also influence the selection of a successor. Using the 2019 Iowa Farm Transfer Survey, Liu et al. (2023) document that farmers are seven times more likely to choose a son than a daughter as the primary successor and that this is likely due to gender stereotypes.

Several factors may contribute to the timing and probability of succession. Farming is a risky venture, which can lead risk-averse children to balk at taking over the farm (Fennell, 1981). Attractive off-farm opportunities may delay succession (Glauben et al., 2009), but the evidence of their impact on the probability of succession is mixed (see Glauben et al. (2004)). Profit variability can delay succession similar to the impact of the stock market on retirement. Urbanization can raise the value of land, thereby inducing farmers to sell the farm (Inwood & Sharp, 2012). Larger farms are more likely to have a successor (Calus et al., 2008; Glauben et al., 2004). Children's education and the number of children are also related to the likelihood of succession (Aldanondo Ochoa, et al., 2007; Bertoni & Cavicchioli, 2016).

These general results are derived from a variety of studies conducted across many countries, with most conducted using prospective surveys. These surveys have been used in Spain (n=76) (Aldanondo Ochoa et al., 2007); Italy (n=362) (Bertoni & Cavicchioli, 2016);

Scotland (n=22) (Fischer & Burton, 2014); Germany (n=233) (Glauben et al., 2009); Austria (n=1,650) (Glauben et al., 2004); England (n=221) and Canada (n=408) (Errington, 2002); United States (n=4338), Australia, (n=790), England, (n=491), and Canada (n=1,277) (Lobley et al., 2010); United States (n=4,608) (Mishra & El-Osta, 2007; Mishra et al., 2010); and Australia (n=3,252) (Wheeler et al., 2012). Many of these studies relate farmer characteristics with the existence of a named successor, a succession plan, or a plan to sell the farm. These ex ante analyses find important relationships but cannot explore actual succession, the impacts of succession on the child, or what happens to farms without a succession plan. Prospective analysis thus omits unplanned succession. An exception is Calus, et al. (2008) who follow 767 Belgian farms over 15 years to track investment decisions conditional on succession plans. Economic historical studies have also used smaller samples of transaction records in 18th and 19th century Sweden (Dribe and Lundh 2005a, 2005b) and 19th century Ireland (Guinnane 1992).

Among these prospective studies, U.S.-focused work by Mishra and El-Osta (2007) and Mishra et al. (2010) provide a useful backdrop for our study. Using the 2001 Agricultural Resource Management Survey (ARMS), the authors find that off-farm work decreases the likelihood of having a succession plan but that more off-farm income actually increases the likelihood of succession. Planning for succession is closely related to having a retirement plan. Farmers with more education are more likely to have a successor. The authors also find evidence for regional differences and effects from government policies.

A very limited number of studies are based upon census data that cover all farms. Chang (2013) uses a cross-sectional dataset of 160,380 farm households in Taiwan to examine how retirement programs affected post-retirement farming decisions. In the closest work to our study, Stiglbauer and Weiss (2000) use a linked panel dataset of 50,000 Austrian farms in 1980, 1985 and 1990 to examine exit and succession decisions. The authors find that larger farms are more likely to be passed down, as are women-led farms. In addition, they find a dynamic relationship between a farmer's age and their likelihood of passing the farm down to a successor.

Notably, no available studies (to our knowledge) follow a large cohort of farmers over periods long enough to observe succession decisions over a farmer's lifespan and with respect to child characteristics. Our construction of linked U.S. Census data allows us to examine these decisions over periods spanning up to 40 years. This expanded dataset allows us to study a rich set of questions about the selection of a successor, the prevalence and timing of succession, and possible differences between planned and unplanned succession.

Hypotheses

Prior efforts at modeling farm succession were primarily designed to consider timing of decisions. Kimhi (1997) models the decision as a family maximizing the discounted present value of unitary utility of consumption, suggesting that generations cooperate in maximizing productivity across the transfer. This model can be used to understand how borrowing constraints may impact decision timing. Pesquin, et al. (1999) and Kimhi and Nachlieli (2001) model farm succession decisions as a Nash bargaining solution, leading to maximization of a household utility function embodying discounted present value. These latter models examine the functioning of income and risk sharing between generations as a substitute for retirement programs or annuities. Additionally, Calus et al. (2008) employ the framework of Chambers and Vasavada (1983) examining the potential role of asset fixity in succession decisions.

In the Online Appendix we present a stylized model of farm succession decisions focused on the motivations of the parent and the child. From this model and the stylized facts from the literature on succession planning, we present a series of hypotheses regarding the profile of successors and non-successor siblings. Our hypotheses are observational and not intended to represent causal effects, which would be difficult to assess using the current approach.

Hypothesis 1: Earlier birth order children are more likely to succeed their parent.

The first-generation farmer transfers the farm to children who are older because they are better able to pay for some portion of the assets transferred and have greater experience farming. This may be a rather weak relationship because of heterogeneous ability and wealth accumulation, especially if children are closely grouped in age.

Hypothesis 2: Sons are more likely than daughters to succeed their parent.

A parent may prefer passing the farm to a son in the presence of unequal credit access for women (Bittmann, 2018; Dymski et al., 2013). Additionally, strong cultural gender roles may prevent daughters from receiving vocational training appropriate for farming. While some married daughters may have been able to overcome both of these barriers to take over the farm, we expect the disparity in succession between sons and daughters to be rather large.

The timing of succession could play a key role in succession outcomes, either by influencing children's occupational choices or, in the event of unplanned retirement, influencing the farmer's ability to select a successor in advance. If a plan is in place, a child may be more likely to stay on the farm and take over operations earlier in their lifecycle (Calus et al., 2008).

When the family farm unexpectedly becomes available for inheritance, the children are likely to have already chosen their occupation and residence. The prospective inheritors, then, will be more likely to return to the family farm if their opportunity cost of moving is lower than their gains from inheritance. Because the net gains from inheritance are higher for children trained in farming and for children who do not own a home, we expect tenant farmers to become successors at a higher rate. Additionally, children living in a city may be less likely to be successors due to higher opportunity costs.

Hypothesis 3: In families without an early successor, tenant farmers are more likely to become successors and children living in cities are less likely to become successors.

Because later succession induces this type of selection based on children's location and occupation, birth order is less likely to play a role.

Hypothesis 4: Earlier birth order children in families without an early successor are less likely to become successors than children in other families with similar birth order.

These stylized hypotheses drive our data analysis.

Data

Our study uses individual-level data from the U.S. Census of Population in 1900, 1910, 1920, 1930, and 1940. We focus on children of farm owners living with their parents in 1900 or 1910 and we use a rich set of census variables to observe evidence of inheriting the farm 20 or more years after childhood[5]. Children in our sample are 0 to 18 years old, so we infer farm succession at ages 20 to 58.

Because we need to accurately measure birth order, we restrict the sample to increase the likelihood that oldest children are living with their parents. First, we only include nuclear families[6] with parents who have been married no more than 18 years[7]. Next, we require that the number of the mother's living children equal the number of children in the household, using a question that is uniquely available from the 1900 and 1910 censuses. We only include families with no stepchildren to limit the possibility of having children older than the duration of the marriage[8]. Although the census does not require fathers to report their total number of children, our empirical results are not sensitive to removing fathers who were over 25 when married to their current spouse (see the Online Appendix). Finally, we remove families with twins to more accurately measure birth order.

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[5] The 1900 and 1910 censuses include the variables needed for observing birth order. Our sample does not include families living in U.S. territories because these county boundaries are more likely to change over time, adding difficulty to geographic linking.

[6] We focus on nuclear families with a mother and a father because it would otherwise be difficult to confidently observe the oldest child. Using the 1900 Census, we find that 123,247 men and 140,298 women were farm owner-operators living with children without a spouse present. Analyzing succession among these subsets of the population may prove valuable for future research.

[7] We additionally choose an age window between 15 and 60 when mothers and fathers could reasonably have an oldest child still living at home.

[8] Stepchildren of the household head are reported directly, and we infer stepchildren of the mother if any children in the household are older than the duration of the marriage.

We define a family as "farm owning" if the family owns their home[9], lives on a farm, and has a household head who is a farmer by occupation.[10] Because these families live on a farm, we could refer to the farmers as owner-operators. We intentionally exclude tenant farmers, who lack land to pass to the next generation. Using the same definitions, we infer farm inheritance in later censuses for farm-owning children who are living in the same place as their childhood home and are listed as heads of household[11]. Our classification scheme allows for multiple successors in one family (presumably either through sub-division or through joint ownership). While we do not observe succession directly, we pursue a variety of tests for our outcome specification that support our main findings. For a more straightforward discussion we will henceforth refer to succession outcomes as observed, although these are inferred using the above definitions.

We construct a new longitudinal dataset that links over 4 million observations of farm children to their place of residence, occupation, and home ownership at least 20 years after childhood. Similar to Price et al. (2021), we create census links using rules-based and machine learning algorithms (Abramitzky et al. 2021; Helgertz et al. 2022; Price et al. 2021) as well as those created by contributors to the public wiki-style family tree at FamilySearch.org (Price et al. 2021). The accuracy of these combined links is expected to be higher than individual methods alone, as we apply a technique to remove inaccurate links by using information about a person's household members and neighbors (see discussion on "sheet checking" in Price et al., 2021).

Table 1 includes information on census linkage rates for each of the census years included in our study. Between 71 and 72 percent of sons in 1900 and 1910 are linked to a census record 20 years after living with their parents. By comparison, 56 to 62 percent of

[9] We follow Collins and Wanamaker (2022) by using home ownership as a proxy for farm ownership, since data from the U.S. Census of Agriculture are not available for this period.

[10] Because married women living with their husbands are never recorded as household heads prior to 1980 (see U.S. Census Bureau, 2023) all households in our sample are characterized by a male farmer. In 7,901 of these households in the 1900 Census, both parents are farmers by occupation. We note that for an additional 4,556 nuclear families the household head is not a farmer but his spouse is a farmer.

[11] By assigning this variable definition, we avoid classifying as inheritors dependent children who are working on the family farm. Our classification also includes women as successors if they are married to the household head.

daughters are linked over spans of 20 years. These differential rates reflect the difficulty of linking women across surname changes that occur at marriage. Yet our linking approach retains nearly half of daughters over a 40-year span, representing a strength of the genealogical data that leverages private family information and publicly available marriage records. The remaining differences in linkage by gender may warrant caution in comparing succession between sons and daughters because marital status is plausibly related to both inheritance outcomes and the ability to link census records across time. Linkage rates also tend to decrease as the time between childhood and adult census records increases, with a higher likelihood of major life changes such as marriage, divorce, migration, and death.

To determine if a child inherits the family farm as an adult, we would ideally link the farmland over time and observe who operates it. This strategy is infeasible because the U.S. Census of Agriculture is not available for the years that we consider.[12] Despite our limitations in tracking farmland over time, we can obtain a reasonable approximation of stability in residence by observing a child's county of residence and their neighbors.

We use two criteria to determine whether a child resides on the family farm as an adult. The *County* criterion assumes that a child lives on the family farm as an adult if they reside in the same county as their childhood home. Misclassification can occur with this measure, as some children may purchase a separate farm in the same county as the farm owned by their parents.

The *Neighbor* criterion further requires that, as an adult, a child has at least one neighbor who has not moved.[13] Neighbors are likely to be farmers themselves, and to be somewhat unlikely to move. We can thus infer geographic stability at a finer level by relying upon census

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[12] Census records appear to have been destroyed either by a fire in the U.S. Commerce Building in 1921 or intentionally as part of an effort to dispose of records. See U.S. Congress (1925; 1933). The Census of Agriculture also includes farm sizes, which would be ideal for validating whether larger farms are more likely to be passed down (see Stiglbauer and Weiss, 2000).

[13] We link neighbors to a later census to determine whether they reside near the child during both childhood and adulthood. Neighbors are defined as the set of up to 250 individuals recorded on groups of 5 consecutive census sheets (including the child's census sheet but not the child's household members), which likely represent adjacent roads or streets. Census sheets include up to 50 individuals, and sheets are numbered by the order of enumeration.

links of neighbors. Our *Neighbor* measure could exclude inheritors for whom all neighbors migrated during the time between censuses or who are difficult to link. Nonetheless, we obtain a higher degree of certainty in linking farmland across census years. This stricter measure is used primarily as a robustness check to see how sensitive our results might be to the misclassification of successor status, and to place some bounds on the results.

We use a data-driven method (see Gabriel et al., 2023; Otterstrom et al., 2022) to address temporal changes in county boundaries. We aggregate census links for the population living within each census enumeration district and observe each person's county of residence in the later census[14]. We then tabulate the number of these individuals who are later living in each possible county and identify the later county with the highest number of links[15]. For each child observed during adulthood, we then regard them as residing in the same county if most of the individuals from their childhood enumeration district are residing in the present county.

Analytic Strategy

We first ask whether there is a relationship between a child's gender and birth order and their likelihood of inheriting the family farm as an adult. We use a series of linear probability models with a binary outcome variable equal to 1 if a child inherited their parents' farm by a certain year in adulthood and 0 otherwise.

We jointly analyze birth order and gender with the following specification:

$$Inherit_{ij} = \alpha + \beta_1 Son_{ij} + \beta_2 Oldest_{ij} + \beta_3 Son_{ij} x\ Oldest_{ij} + \sum_{l=1}^{18} \delta_l 1\{Age_{ij} = l\} + \gamma_j + \epsilon_{ij} \quad (1)$$

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[14] Counties are subdivided into census enumeration districts for each census wave.

[15] Two destination counties with the highest number of links are each assigned to a single enumeration district if neither has a strict majority of links and if the ratio of links to the second most-linked county and to the most-linked county is at least one-half. In these cases, the district is plausibly located within each destination county. Two destination counties are retained for 3% to 9% of enumeration districts over periods of 20 to 40 years. Districts are dropped from the crosswalk if the most-linked county is located in another state, which is possible for districts with high rates of out-migration.

The unit of observation is child i in family j. Our independent variables of interest are binary indicators for gender (equal to 1 for sons), birth order (equal to 1 for oldest children), and the interaction of the first two. Crucially, we include age and family fixed effects, with family fixed effects denoted as γ_j. Age fixed effects allow our model to net out any drivers of succession that could impact a particular birth cohort in the sample. Family fixed effects address selection bias from family characteristics that could impact succession decisions such as family size and mother's age at first birth. In all specifications, standard errors are clustered at the family level.

We estimate separate models along two different dimensions for any given sample of children. First, we analyze the relationship of farm inheritance with gender and birth order across different points in time. For a child in the 1900 sample, succession outcomes are separately observed in 1920, 1930, and 1940. If a child is present in the 1910 sample, we observe succession outcomes in 1930 and 1940. While the linked sample decreases with the length of time after childhood, a temporal analysis aids our understanding of succession timing as parents age.

Second, we separate our sample by family size. By doing so, we follow the convention of previous work on the economics of birth order (see Black et al., 2018). The intuition behind this modeling decision is simple: any effect of being the oldest child could be highly dependent on the number of children present in the family. We additionally estimate models that pool families of various sizes. The pooled models face a trade-off with the non-pooled models in that they may increase statistical precision but do not estimate the relationships for any particular family size. In practice, we estimate separate models for families with two children, three children, four children, and between two and four children. We focus on families with four or fewer children to maintain clarity in our reported results, and these families include sufficient variation in gender and birth order (see Table 1).

Rates of observed farm succession are very low for women and may be driven by infrequently reported occupations in the census. We turn our attention to sons for a more detailed analysis of birth order, but the Online Appendix contains an analysis of daughters' birth order. We proceed with the following specification:

$$Inherit_{ij} = \alpha + \sum_{k=2}^{4} \beta_k 1\{SonOrder_{ij} = k\} + \sum_{l=1}^{18} \delta_l 1\{Age_{ij} = l\} + \gamma_j + \epsilon_{ij} \quad (2)$$

Here we include a set of binary indicator variables for a son's birth order among male children in the family, with *k*=1 (oldest sons) the omitted category. As with Equation 1, we separately analyze succession for different outcome years and numbers of sons (two, three, or four).

Similar analysis to Equation 2 has been used to establish causal links between birth order and outcomes such as noncognitive abilities (Black et al., 2018) and crime (Breining et al., 2020). Critically, we aim to estimate the reduced form of a possible causal relationship. Farm succession involves complex decisions on the part of the parent and the child, and we do not attempt to estimate parameters of a structural model.

Motivated by our empirical hypotheses, we extend this analysis by separately estimating Equation 2 for families with a successor after 20 years (which we refer to as families with a succession plan, or "planning" families) and families with no successors 20 years after the initial census. In families which we designate as "non-planning" families, none of the children are inferred as successors, which is uncharacteristic of a farm with a succession plan (Calus et al., 2008). Here, in addition to the estimated birth order coefficients we also calculate the differences in estimated coefficients between "planning" and "non-planning" families.[16]

We additionally modify Equation 2 to study whether children's occupations and locations of residence as adults are associated with inheriting the family farm by the time of a later census. For families without an observed successor 20 years after the childhood census, we estimate the

[16] We use a two-sided statistical test for equality of coefficients across the "Yes" and "No" columns, using a standard normal estimator of the form z = (β1 - β2) / sqrt(se(β1)^2 + se(β2)^2).

relationship between succession 30 years after childhood and binary indicators for being the oldest son, being a tenant farmer (20 years after childhood) and living in an urban area (20 years after childhood). We also include age and family fixed effects and remove the binary indicators for second sons, third sons, and fourth sons.

We also estimate a series of regressions with the dependent variable as a binary indicator for whether a child had completed at least 4 years of college by the time of the 1940 census.[17] We estimate a version of Equation 2, except we replace the birth order variables with a binary indicator for whether a child inherited the family farm (in either 1930 or 1940). We focus on differences in estimated coefficients between regressions with "planning" and "non-planning" families.

Results

Data description

Table 1 highlights the prevalence of farm inheritance, census linking rates, and ages of over 4.5 million observations of children of farm owners in the 1900 and 1910 censuses. We first note that sons are far more likely than daughters to succeed their parents as farmers. Across any succession measure or outcome period, no more than 0.3% of daughters in the 1900 cohort and 0.1% of daughters in the 1910 cohort are classified as successors.[18] Second, the proportion of sons who are successors declines with birth order. As a typical example, 6.7% of oldest sons in the 1900 Census cohort are successors in 1920 using the *County* measure, while 5% of second sons, 3.5% of third sons, and 2.5% of fourth sons meet the criteria to be considered successors. Unsurprisingly, age is also highly correlated with sons' birth orders and is likely to impact succession outcomes. The third notable pattern is that the proportion of children who are successors generally increases with the time after childhood for each gender, birth order, cohort,

[17] We use the "educ" variable in the IPUMS Ancestry Full Count Data (Ruggles et al. 2021).

[18] Because our succession measure relies on having a census link, succession rates are likely higher than reported due to missing links.

and succession measure, despite lower census linkage rates over longer periods. Fourth, the 1910 cohort experiences lower rates of succession than the 1900 cohort. The mean age of children in 1900 is 6.8 years and the mean age in 1910 is 6.4 years.

We also note two facts about our measures of succession. First, and as expected, succession rates are lower with the *Neighbor* classification. Second, while succession rates using the *County* method increase over time for each cohort (as children age), these rates decline between 30 and 40 years after childhood when using the *Neighbor* method. This fact likely reflects the difficulty of linking neighbors over a 40-year period, and highlights the trade-offs we face with each measure.

Figure 1 displays the fraction of farm families with any successor after 20, 30, and 40 years (40 years is not available for the 1910 cohort). This fraction jumps between 20 and 30 years for both cohorts, with 10.3% of households having a successor after 20 years for the 1900 cohort (7.5% for the 1910 cohort) rising to 16.2% after 30 years (12.2% for the 1910 cohort). Using the *Neighbor* measure of succession, household succession rates rise from 8.2% after 20 years to 13.1% after 30 years for the 1900 cohort (6.2% to 9.1% for the 1910 cohort). Very little additional succession occurs after 30 years, however. Forty years after the 1900 childhood census cohort, 17.1% of families have a successor (11.9% using the *Neighbor* measure). The 1910 cohort features less succession than the 1900 cohort.

Table 2 provides more detail than Figure 1, reporting characteristics and succession outcomes for over 1.1 million families in our sample[19]. We show that, even 40 years after the childhood census, only 16.3% of households with at least one son have any male successor (with 2.8% having two or more male successors). The ratio of single-successor families among those with at least one successor remains fairly constant over time for the same cohort. This quantity

[19] We use the *County* succession measure in Table 2. Summary statistics for the *Neighbor* measure are included in the Online Appendix.

slightly falls from 0.86 in 1920 to 0.83 in 1940 for the 1900 childhood census cohort and from 0.88 in 1930 to 0.86 in 1940 for the 1910 cohort. The likelihood of having a successor is higher for families with more sons. Families with more sons are also more likely to have an oldest son successor in most outcome years, which is possibly due to larger families having greater differences in children's ages.

For families with at least one son, the average number of sons is 2 in the 1900 sample and 1.9 in the 1910 sample. Parents have been married for nearly 11 years on average. Mothers are, on average, 32 years old in the 1900 sample (with a standard deviation of 6.3) and 31.7 years old in the 1910 sample (with a standard deviation of 6.1 years). The age of mothers in our sample indicates that, while we are likely to observe her oldest biological child, we may be unable to observe children who are born after the census.[20] Fathers are older, at 37.5 years in the 1900 sample (with a standard deviation of 7 years) and 37.1 years in the 1910 sample (with a standard deviation of 7.1 years). The age of fathers has implications for succession timing, because the average age of fathers after 30 years is above life expectancy during this period.

<u>*Gender and birth order*</u>

We first jointly explore the roles of birth order and gender in predicting farm inheritance for children in the same family (hypotheses 1 and 2), as reported in Table 3 and Table 4. We use linked census data to estimate a set of linear probability models as specified in Equation 1, with results presented from both the *County* and *Neighbor* specifications of geographic linking. Because succession may be implied too frequently using *County* and too infrequently using *Neighbor*, the resulting estimates should provide reasonable bounds for estimates of the regression models unbiased by measurement error. We observe these associations for farm

[20] We later discuss the sensitivity of our results to removing younger mothers from the sample, as reported in the Online Appendix.

inheritance in 1920, 1930, and 1940 for children in the 1900 census cohort (Table 3) and in 1930 and 1940 for children in the 1910 cohort (Table 4).

Sons are more likely than daughters to inherit the family farm, conditional on age and family fixed effects. By 1920, sons in the 1900 cohort are 4.5 (in families with 2 children) to 6 (in families with 4 children) percentage points more likely ($p < .01$) to inherit the family farm when using the *County* criterion. Estimates using the *Neighbor* criterion are 3.9 (families with 2 children) and 4.9 (families with 4 children) percentage points ($p < .01$). For the same period, only 0.1% of daughters are successors in families with 2 to 4 children. While up to 0.6% of daughters are successors in 1940, sons maintain a 16 percentage point advantage ($p < .01$) when pooling across families with 2 to 4 children (using the *County* criterion). Similar patterns emerge for the 1910 cohort, with a large gender gap in succession that widens with the time after childhood.

In this cursory investigation, birth order appears to play a smaller, but still important role in predicting farm succession. Daughters who are the oldest child in the 1900 cohort are 2 to 2.6 percentage points less likely ($p < .01$) than other daughters to be inheritors in 1920, pooling across families with 2 to 4 children. These estimates diminish in later years, with a 0.7 to 1.2 percentage point lower ($p < .01$) likelihood of succession in 1940 (pooled across family size).

We now preview a result that will be later explored in more detail – while we see positive estimates of the interaction for oldest children and sons across most of our models, sons who are the oldest child appear no more likely than other sons to inherit the family farm after 40 years. If we add the coefficient estimates for the oldest child indicator with the interaction for sons who are the oldest child in families with 2-4 children, these sons are 2.2 percentage points more likely ($p < .01$) than other sons to inherit the farm in 1920 (the sum of estimates using the *Neighbor* measure is 1.7). Oldest sons maintain an apparent advantage in succession across family sizes and measures of succession in 1920 and 1930, but this is not true in 1940. The sum of estimates for sons who are the oldest is not statistically significantly different from 0 across family sizes and the *County* or *Neighbor* measures. Tables 3 and 4 provide a brief introduction to our birth order analysis, with results for the 1910 cohort in Table 4 resembling those for the 1900 cohort in Table 3. We now explore birth order specifically among sons.[21]

<u>*Sons' birth order*</u>

Sons are the predominant inheritors of family farms, but it remains unknown whether birth order among sons is an important factor in succession. In Tables 5 and 6 we provide evidence relating birth order among sons with the likelihood of succession within the same family (hypothesis 1). Models are estimated separately for families with 2, 3, or 4 sons because family size is associated with family-level succession outcomes (see Table 2)..

For a simpler exposition of our results, we hereafter discuss only the *County* results. The general patterns we observe are replicated in nearly every case by the *Neighbor* measure but attenuation resulting from known measurement error limits the capacity for statistical inference. It is also for this purpose that we include pooled models across families with 2 to 4 sons. While these pooled estimates are not representative of any particular family size, the larger samples frequently allow us to statistically distinguish the sign of the coefficient. We encourage readers to refer to the tables for the *Neighbor* results and to review our additional specification tests.

Three patterns hold across our results in Table 5 and Table 6. First, oldest sons are slightly more likely than other sons to become inheritors 20 years after childhood. Second, the probability of inheritance 20 years after childhood declines monotonically for sons who are born later. Third, as time progresses after childhood, oldest sons are no longer more likely to become inheritors.

[21] We include a birth order analysis for daughters in the Online Appendix. In Table A1 we show that, while oldest daughters may be more likely to be successors in two- or three-daughter families, the estimates pooled by family size are rarely distinguishable from zero. These results are difficult to interpret given the challenge of tracking land ownership and occupations for women in the early 20th century.

Focusing on outcomes in 1920, second-born sons in families with only 2 sons in the 1900 census are 0.7 percentage points less likely ($p < .01$) than oldest sons to inherit the family farm, controlling for age and family effects (see the top panel of Table 5).[22] In the same set of families, 10% of oldest sons are inheritors. In families with 3 sons, second-born sons are 0.6 percentage points less likely ($p < .05$) than oldest sons to be successors, while third-born sons are 0.8 percentage points less likely ($p < .05$) than oldest sons. Because 12.3% of oldest sons are successors in these families, birth order appears to confer an even smaller benefit. In families with 4 sons, the estimated coefficients for second-born, third-born, and fourth-born sons are statistically indistinguishable from zero at the conventional levels.

Similar patterns emerge in 1930 among the 1910 sample (see the top panel of Table 6). While we cannot distinguish a statistical difference across birth orders in families with 3 sons, second-born sons in families with 2 sons are 0.5 percentage points less likely ($p < .01$) than their brothers to succeed their farm-owning parents. Here, we again observe a monotonic decrease in the likelihood of succession by birth order for families with 4 sons. Second-born sons are 0.5 percentage points less likely ($p < .1$), third-born sons are 0.9 percentage points less likely ($p < .05$), and fourth-born sons are 1.5 percentage points less likely ($p < .01$) than oldest sons to become successors. In this most extreme case, fourth-born sons in these families have a 14.7% lower likelihood of inheritance than their oldest brothers.

The length of time after childhood appears to influence the relationship between birth order and succession. Thirty years after the 1910 childhood census cohort, the estimated birth order coefficients are not statistically significant for any family size in Table 6. By referencing Table 2, if all fathers were alive in 1940 then their average ages would be between 67 and 70 years old. Additionally, the number of sons in the 1910 cohort who are successors dramatically

[22] Estimates of birth order coefficients in Table 4 could be interpreted as causal, following previous literature using within-family models that assume birth order is randomly assigned conditional on age and family fixed effects.

rises from 3.9% in 1930 to 6.9% in 1940 (not requiring census linkage; numbers reported in Table 1). So 30 years after childhood is an important period both in terms of the number of sons who are successors as well as the possible need for a successor due to retirement or death of the farm owner. It is interesting, then, that birth order appears to play no role here.

A more nuanced pattern appears for succession after 30 and 40 years in the 1900 childhood census cohort (Table 5). Again, third- and fourth-born sons are no less likely than oldest sons to become inheritors. Second-born sons are 0.6 percentage point less likely ($p < .05$) than oldest sons to inherit the family farm after 30 years, but only in families with 2 sons. Yet in families with 4 sons, second-born sons are 1.1 percentage points more likely than oldest sons to inherit the farm after 30 years. Second-born sons are also anomalous after 40 years. These sons are 0.6 percentage points more likely to inherit the farm among 3-son families and 1.2 percentage points more likely to inherit the farm among 4-son families. As previously discussed, fathers of these children would be 68 to 70 years old in 1930 and 78 to 80 years old in 1940 if still living, and the succession rate among sons grows with the time after childhood.

We highlight the general patterns of this analysis in Table 7, which displays the signs of coefficients that are estimated with p-values of less than 0.05. The first question that arises from these results is why the birth order pattern disappears as time progresses. Our subsequent analysis seeks to address this question. Another puzzle, however, is the apparent advantage to second-born sons that is unique to the 1900 cohort. While addressing this question is outside the scope of this paper, we raise the possibility that second-born sons may have been necessary workers on the family farm while their older brothers served in World War I, and that these sons eventually inherited their parents' farm due to path dependence.

<u>*Succession timing*</u>

The diminishing importance of birth order for farm succession may hinge on the timing of farm transfers (hypothesis 4). In Table 8, we observe succession for the 1900 cohort in 1930 and 1940 with separate models based on families' succession timing. Specifically, we separately estimate the birth order coefficients for families with at least one successor son in 1920 and for families with no male successor in 1920. We then calculate the difference of each birth order estimate for families with and without an early successor.[23]

Observing succession in 1930 in families with 2 sons, we find that the estimated coefficient for second sons is 3.4 percentage points lower ($p < .01$) for sons in families with an early successor than families without an early successor. For families with 3 sons, second-born sons in families with an early successor are 4 percentage points less likely ($p < .01$) to inherit the farm, compared to their older brothers, than identical birth order sons in families without an early successor. A comparison for third-born sons yields a 5.3 percentage point lower likelihood ($p < .01$) of succession for families with an early successor. The differences in estimates for families with 4 sons are likewise negative, but only the coefficient for third-born sons rises to the level of statistical significance, with a 4.7 percentage point lower likelihood ($p < .01$) of succession. Extending forward to 1940, most coefficient differences can no longer be statistically distinguished from zero. However, second-born sons in 2-son families with an early successor continue to be 2.1 percentage points less likely ($p < .1$) to inherit the farm than their counterparts in families without an early successor, although the level of statistical significance is marginal.

These findings indicate that oldest sons in families with no early successor are relatively less likely to become inheritors. Additionally, this pattern seems to subsume the birth order differences in our earlier results, as we show in Table 8 that younger sons continue to face a lower likelihood of succession after 30 years in families with no early successor.

The attributes of farming families with an early, or planned, successor could also be displayed in the education and training that successors receive, relative to their siblings. We find

[23] Tables 8 and 9 only report results from the *County* measure of succession because of limited space in Table 8. Each of these analyses are reported with the *Neighbor* measure in the Online Appendix.

some evidence, presented in Table 9, that successors in these families are more likely to complete four or more years of college by the 1940 census when taking the differences across family types of the within-family estimates. This difference is not statistically significant for successors in 1930, but successors in 1940 are 0.4 percentage points more likely ($p < .05$) to complete four years of college if they are in a family with an early successor.

Predictors of succession in later farm transfers

Our previous analysis uncovers the changing role of birth order with the timing of succession. In Table 10, we explore the role of the sons' economic standing and geographic location during adulthood in predicting succession in families with no early successor (hypothesis 3). When comparing farm tenancy in 1920, living in a city in 1920, and being the first-born son in the 1900 childhood census cohort, economic and geographic situations take greater importance in predicting subsequent inheritance in 1930. Only in families with exactly four sons does birth order appear to matter, and in fact oldest sons are an estimated 0.6 percentage points less likely ($p < .1$) to become inheritors in this model. We again consider the evidence using the *County* and *Neighbor* succession measures for consistency with Tables 5 and 6.

Sons who are tenant farmers are 7.4 percentage points more likely ($p < .01$) to become successors in the pooled model with the *County* measure and 5.6 percentage points more likely ($p < .01$) with the *Neighbor* measure. In the non-pooled models, the *County* estimates range from 6.4 percentage points ($p < .01$) to 7.9 percentage points ($p < .01$) and the *Neighbor* estimates range from 4.4 percentage points ($p < .01$) to 6.1 percentage points ($p < .01$). In the absence of birth order considerations, it appears that a son's experience in farming may play a key role in determining succession.

Proximity to the family farm may be less likely when a son resides in a city. We find that sons who are living in a city in 1920 are 4.9 percentage points less likely ($p < .01$) to inherit the family farm in 1930 with the *County* measure (3.9 percentage points less likely ($p < .01$) with the *Neighbor* measure) when pooling across family size.

<u>*Specification tests*</u>

We have used a more stringent requirement of geographic linking, referred to as the *Neighbor* measure of succession, which attenuates our estimates but allows us to establish reasonable bounds on what may be the true predictive power of birth order and gender. We now turn to additional specification tests to address sample selection and measurement challenges, with these analyses reported in the Online Appendix.[24]

The centrality of birth order in our analysis lends particular importance to correctly identifying the oldest child of farming parents. If an oldest child is no longer living with their parents, then each subsequent child is assigned an incorrect birth order. We test the sensitivity of our results to requiring that fathers have married at a younger age, thereby lowering the probability of children living outside the household. As reported in Table A2, we do not find large differences in the magnitudes or pattern of coefficients across birth order for the full sample as compared to families where the fathers are 25 or younger when married.

Family size is difficult to measure because we do not observe children who are born after the focal census. Younger mothers may be especially likely to have children who are not in our sample, leading our observed family sizes to be biased downward and potentially affecting the validity of results reported by family size. We show in Table A3 that the signs of our estimates are similar when removing children of younger mothers (under age 35) from the sample, although smaller sample sizes result in imprecise estimates.

Discussion and Conclusion

In this paper, we have taken what may be considered a first look at farm succession decisions using population-level U.S. census records. Our new data construction allows us to evaluate the

[24] For simplicity we focus on succession 20 years after childhood as this is a critical time period for our analysis.

prevalence and timing of farm succession and the factors related to selection of a successor. We additionally analyze succession which appears to be unplanned, finding patterns which are distinct from planned succession. We build on prior studies which have been limited by small sample sizes and the inability to analyze the potential impacts of succession when there are nonexistent or failed succession plans. Our analysis is relevant for current policy and we find empirical relationships which persist across the observed census cohorts.

Our findings generally support existing theories and prospective survey analyses of succession. Sons are favored for succession, which is consistent with the limited economic and social opportunities available to women during this period. We also find that birth order plays a small role, with earlier sons slightly more likely than later sons to inherit the farm. The limited role of birth order in recent history is perhaps unsurprising, given that primogeniture is no longer considered to be a feature of U.S. agriculture. Gender, however, is a very strong predictor of succession in our sample, with daughters almost never receiving this opportunity. Indeed, large gender differences still exist today (Liu et al., 2023). Our research suggests that gender bias may be an obstacle to the continuation of family farms.

We find a divergent pattern for farm transfers later in the farmer's lifetime, in which case a succession plan may not have existed. Delaying succession until the farmer desires to retire or is forced to quit farming due to disability or death may limit the farmer's participation in succession decisions. In these cases of possibly unplanned succession, sons who inherit the farm are more likely to live in a rural location and to be tenant farmers without land of their own. Birth order is not predictive of unplanned succession. Thus, the absence of a succession plan seems to affect the outcome of succession.

The problem of insufficient succession planning appears to have existed historically. Many of the current barriers to having a succession plan (including inter-family disagreements, children's lack of desire to stay on the farm, and farmers' lack of knowledge about options) may have existed historically. Many of the successors in our sample appear to have been unplanned. However, the fraction of families with a successor after 20 years is over half the fraction after 40 years, resulting in less than one-fifth of families having a successor. This suggests that farmers who do not identify a successor early may be unlikely to find a successor at all. The low rate of succession during this period may help explain the co-occurring decline in family farms.

The importance of farm tenancy in predicting unplanned succession suggests that tenant farming offered a pool of willing successors when the family farm became available. Yet farm tenancy is much less common today, with only 16% of large family farms fully rented and declining numbers with farm size (Bigelow et al., 2016). This is compared to 42% of farmers as tenants in 1935 (Black and Allen, 1937). Without a succession plan, and without children who are tenant farming, family farms today may have fewer options for succession. Yet flexible ownership arrangements may limit the costs of inheriting the farm and help children settle on a mutually beneficial agreement.

A number of policies may help family farms thrive and continue across generations. First, assisting farmers to plan for their succession can increase the likelihood of an intergenerational farm transfer. Second, there may be a role for supporting young farmers by increasing their access to credit or farmland to rent while they wait for their inheritance. Third, improving opportunities for women in farming may expand the pool of eligible successors.

We provide the first population-level analysis of realized succession decisions, yet our ability to precisely measure outcomes is only possible by making certain inferences from survey questions in the historical census. Additionally, researchers may raise reasonable concerns about the adequacy of 20th century data in addressing problems in 21st century farming. The greatest opportunities for extending our understanding, then, lie in more systematic collection of data. Longitudinal studies of farming families would allow survey responses to be compared to actual farm succession decisions, thus greatly improving our understanding of farm succession. While we encourage government and research institutions to collect this type of data, currently available census data allows us to gain important insights.

In addition to improved data collection, future research may fruitfully address a series of questions raised by our work. For instance, it is unclear whether the low rate of intergenerational farm succession is primarily driven by selling land to a private party, abandoning farmland to state governments during economic turmoil, delayed succession through a will, or measurement error arising from incomplete census linkages. Additionally, longer time series would extend our understanding of the dynamics of succession, including across multiple generations, and illuminate whether our observed patterns of succession are relevant over a longer period. Current efforts to publicly provide the 1950 U.S. Census may pave the way to answering these questions. Our finding that sons living in rural areas are more likely to become successors suggests that children of farmers who migrated to urban centers improved their opportunities; this hypothesis could be further explored. Finally, researchers could explore further differences across families with planned or unplanned succession.

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Tables and Figure

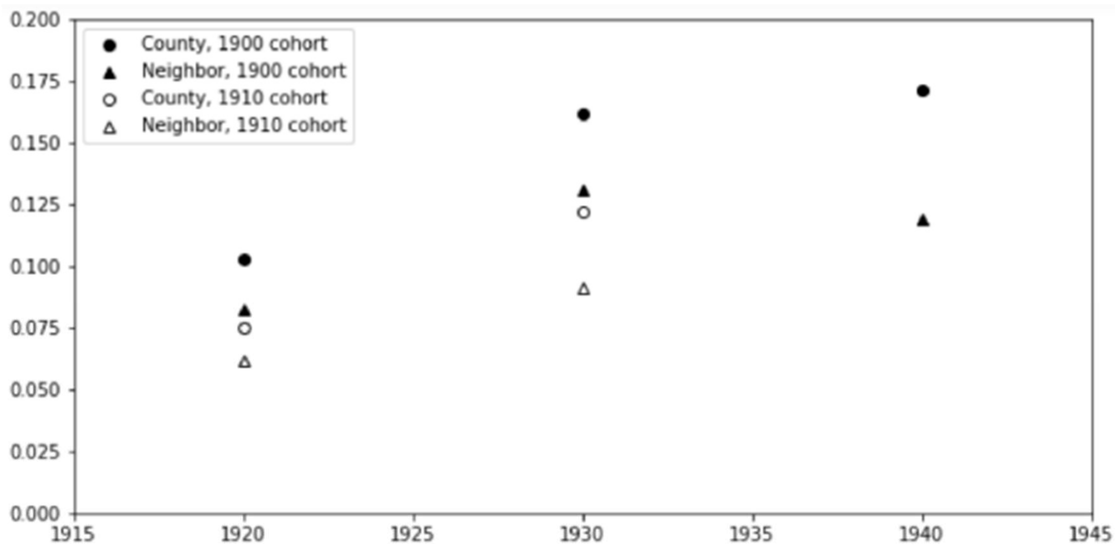

Figure 1: Fraction of Farm Families with a Successor

Table 1: Summary statistics, children of farm owners

	Daughters	Sons	1st sons	2nd sons	3rd sons	4th sons
1900 cohort						
Successor in 1920, County	0.1	5.4	6.7	5.0	3.5	2.5
Successor in 1920, Neighbor	0.0	4.3	5.3	3.9	2.8	1.9
Linked to 1920	61.8	70.8	71.4	70.5	69.7	69.3
Successor in 1930, County	0.2	9.3	10.1	9.2	8.0	7.3
Successor in 1930, Neighbor	0.1	7.4	8.1	7.3	6.4	5.8
Linked to 1930	52.0	67.4	68.2	67.2	66.2	65.6
Successor in 1940, County	0.3	9.9	10.3	9.9	9.1	8.5
Successor in 1940, Neighbor	0.1	6.7	7.0	6.7	6.0	5.5
Linked to 1940	47.1	61.1	61.2	61.1	61.0	61.1
Age	6.8	6.8	8.1	6.3	5.0	3.9
	(4.4)	(4.5)	(4.7)	(4.0)	(3.4)	(2.8)
Observations	1,015,705	1,065,188	538,348	302,255	142,078	56,952
1910 cohort						
Successor in 1930, County	0.1	3.9	5.0	3.4	2.3	1.6
Successor in 1930, Neighbor	0.0	3.2	4.1	2.8	1.9	1.3
Linked to 1930	56.3	72.4	73.3	72.0	70.8	70.2
Successor in 1940, County	0.1	6.9	7.7	6.6	5.7	5.0
Successor in 1940, Neighbor	0.1	5.1	5.8	4.8	4.1	3.7
Linked to 1940	47.7	65.8	66.6	65.5	64.5	63.4
Age	6.4	6.4	7.7	5.9	4.5	3.5
	(4.5)	(4.5)	(4.7)	(4.0)	(3.4)	(2.8)
Observations	1,219,478	1,276,867	655,046	360,172	165,953	65,871

Notes: Mean values are reported of farm succession and census linkage indicators for farm children in 1900 (top panel) and 1910 (bottom panel), reported as percentages. Mean ages are also reported, with standard deviations in parentheses. We infer farm succession for children who are farming and living on a farm in the same place as childhood, own a home, and are either the household head or married to the household head in the adulthood census. This measure depends on being linked to a later census, but it is possible to compute the fraction of successors among the linked subsample by dividing the fraction of successors by the census linkage rate.

Table 2: Summary statistics, farm-owning families

	1+ sons	2 sons	3 sons	4 sons
1900 cohort				
1 male successor in 1920	7.9	8.4	11.2	13.5
2+ male successors in 1920	1.3	1.2	2.6	4.3
Oldest son successor in 1920	6.7	7.1	8.6	9.6
1 male successor in 1930	12.5	13.4	16.0	17.4
2+ male successors in 1930	2.7	2.6	5.6	8.6
Oldest son successor in 1930	10.1	10.3	11.0	11.2
1 male successor in 1940	13.5	14.5	17.0	18.0
2+ male successors in 1940	2.8	2.7	5.8	8.6
Oldest son successor in 1940	10.3	10.4	10.4	10.0
Number of sons	2.0	2.0	3.0	4.0
	(1.2)	(0.0)	(0.0)	(0.0)
Father age	37.5	37.7	39.1	40.2
	(7.0)	(6.7)	(6.1)	(5.7)
Mother age	32.0	32.2	33.5	34.6
	(6.3)	(6.0)	(5.3)	(4.9)
Years since marriage	10.8	11.1	12.7	14.0
	(4.7)	(4.2)	(3.6)	(3.0)
Observations	538,348	160,177	85,126	38,009
1910 cohort				
1 male successor in 1930	6.0	6.1	8.7	10.5
2+ male successors in 1930	0.8	0.7	1.5	2.7
Oldest son successor in 1930	5.0	5.1	6.4	7.3
1 male successor in 1940	10.0	10.5	12.7	14.8
2+ male successors in 1940	1.6	1.6	3.4	5.2
Oldest son successor in 1940	7.7	7.6	8.1	8.4
Number of sons	1.9	2.0	3.0	4.0
	(1.1)	(0.0)	(0.0)	(0.0)
Father age	37.1	37.3	38.6	39.8
	(7.1)	(6.8)	(6.3)	(5.9)
Mother age	31.7	31.9	33.1	34.2
	(6.1)	(5.8)	(5.2)	(4.6)
Years since marriage	10.9	11.1	12.7	14.0
	(4.6)	(4.2)	(3.6)	(3.0)
Observations	655,046	194,219	100,082	43,880

Notes: Mean values and standard deviations (in parentheses) are reported, with percentages for farm succession indicators. We infer farm succession (using the *County* specification as defined in the paper) for sons who are farming and living on a farm in the same place as childhood, own a home, and the household head in the adulthood census.

Table 3: Farm succession by gender and birth order, children in 1900

	2-4 children		2 children		3 children		4 children	
Succession measure	County	Neighbor	County	Neighbor	County	Neighbor	County	Neighbor
1920								
Son	5.5***	4.5***	4.5***	3.9***	5.4***	4.4***	6.0***	4.9***
	(0.1)	(0.1)	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)
Oldest child	-2.6***	-2.0***	-1.8***	-1.4***	-2.9***	-2.2***	-3.2***	-2.6***
	(0.1)	(0.1)	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)
Son x Oldest child	4.8***	3.7***	3.7***	2.9***	5.2***	4.0***	6.2***	4.7***
	(0.1)	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
Observations	728,675		211,439		260,041		257,195	
Mean, daughters	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1930								
Son	13.3***	10.7***	13.0***	10.7***	13.4***	10.9***	13.2***	10.7***
	(0.1)	(0.1)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)
Oldest child	-1.7***	-1.2***	-0.8***	-0.6**	-1.9***	-1.4***	-2.0***	-1.3***
	(0.1)	(0.1)	(0.3)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)
Son x Oldest child	2.3***	1.8***	1.7***	1.3***	2.6***	2.1***	2.6***	1.7***
	(0.2)	(0.1)	(0.3)	(0.3)	(0.3)	(0.2)	(0.3)	(0.2)
Observations	653,666		187,844		233,402		232,420	
Mean, daughters	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2
1940								
Son	16.0***	11.3***	16.1***	11.8***	16.1***	11.3***	15.9***	11.1***
	(0.1)	(0.1)	(0.3)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)
Oldest child	-1.2***	-0.7***	-1.0**	-0.5	-1.2***	-0.5***	-1.2***	-0.7***
	(0.1)	(0.1)	(0.4)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)
Son x Oldest child	1.3***	0.7***	1.4***	0.4	1.2***	0.8***	1.1***	0.4
	(0.2)	(0.2)	(0.4)	(0.4)	(0.3)	(0.3)	(0.3)	(0.3)
Observations	592,531		170,409		211,521		210,601	
Mean, daughters	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes children who are living with their farm-owning parents in the 1900 Census and linked to a later census. We infer farm succession if a child is farming and living on a farm in the same place as childhood, owns a home, and is either the household head or married to the household head in the adulthood census. The *County* specification of succession requires that children live in the same county; the *Neighbor* specification requires that they also have a common neighbor.

Table 4: Farm succession by gender and birth order, children in 1910

	2-4 children		2 children		3 children		4 children	
Succession measure	County	Neighbor	County	Neighbor	County	Neighbor	County	Neighbor
1930								
Son	3.9***	3.3***	3.3***	2.9***	3.7***	3.2***	4.2***	3.6***
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Oldest child	-2.1***	-1.8***	-1.8***	-1.6***	-2.1***	-1.8***	-2.9***	-2.4***
	(0.1)	(0.1)	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)
Son x Oldest child	3.6***	3.0***	2.9***	2.5***	3.7***	3.1***	4.7***	3.7***
	(0.1)	(0.1)	(0.2)	(0.2)	(0.2)	(0.1)	(0.2)	(0.2)
Observations	869,850		262,744		308,789		298,317	
Mean, daughters	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1940								
Son	10.0***	7.7***	10.1***	8.1***	10.0***	7.7***	10.0***	7.6***
	(0.1)	(0.1)	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)
Oldest child	-1.6***	-1.2***	-0.9***	-0.4*	-1.8***	-1.3***	-2.0***	-1.3***
	(0.1)	(0.1)	(0.3)	(0.2)	(0.2)	(0.1)	(0.2)	(0.1)
Son x Oldest child	2.4***	1.8***	2.0***	1.3***	2.5***	2.0***	2.7***	1.8***
	(0.1)	(0.1)	(0.3)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)
Observations	761,952		226,994		270,034		264,924	
Mean, daughters	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.1

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes children who are living with their farm-owning parents in the 1910 Census and linked to a later census. We infer farm succession if a child is farming and living on a farm in the same place as childhood, owns a home, and is either the household head or married to the household head in the adulthood census. The *County* specification of succession requires that children live in the same county; the *Neighbor* specification requires that they also have a common neighbor.

Table 5: Farm succession by sons' birth order, children in 1900

	2-4 sons		2 sons		3 sons		4 sons	
Succession measure	County	Neighbor	County	Neighbor	County	Neighbor	County	Neighbor
1920								
Second son	-0.5***	-0.3***	-0.7***	-0.7***	-0.6***	-0.3	-0.1	0.1
	(0.1)	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)	(0.3)	(0.3)
Third son	-0.8***	-0.5**			-0.8**	-0.4	-0.2	0.0
	(0.2)	(0.2)			(0.4)	(0.3)	(0.5)	(0.4)
Fourth son	-1.0***	-0.8**					-0.0	0.0
	(0.3)	(0.3)					(0.6)	(0.6)
Observations	513,635		229,244		179,292		105,099	
Mean, oldest sons	11.2	8.8	10.0	7.9	12.3	9.5	13.9	10.8
1930								
Second son	0.1	0.1	-0.6*	-0.4*	0.2	0.2	1.1***	0.7*
	(0.2)	(0.2)	(0.3)	(0.3)	(0.3)	(0.3)	(0.4)	(0.4)
Third son	-0.4	-0.3			-0.1	0.1	0.5	0.2
	(0.3)	(0.3)			(0.5)	(0.4)	(0.6)	(0.5)
Fourth son	-0.7	-0.4					0.6	0.3
	(0.4)	(0.4)					(0.8)	(0.7)
Observations	490,098		217,711		171,517		100,870	
Mean, oldest sons	15.6	12.3	15.1	11.9	16.2	12.7	16.6	12.9
1940								
Second son	0.3*	0.3*	-0.3	0.1	0.6**	0.4	1.2***	0.7*
	(0.2)	(0.2)	(0.3)	(0.3)	(0.3)	(0.3)	(0.4)	(0.4)
Third son	0.0	0.2			0.9	0.6	0.4	0.2
	(0.3)	(0.3)			(0.5)	(0.5)	(0.6)	(0.5)
Fourth son	-0.2	0.2					0.2	0.3
	(0.5)	(0.4)					(0.9)	(0.8)
Observations	444,359		197,279		155,314		91,766	
Mean, oldest sons	17.0	11.3	16.8	11.4	17.3	11.3	16.9	10.8

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1900 Census and linked to a later census. We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home, and is the household head in the adulthood census. The *County* specification of succession requires that sons live in the same county; the *Neighbor* specification requires that they also have a common neighbor.

Table 6: Farm succession by sons' birth order, children in 1910

	2-4 sons		2 sons		3 sons		4 sons	
Succession measure	County	Neighbor	County	Neighbor	County	Neighbor	County	Neighbor
1930								
Second son	-0.4***	-0.2**	-0.5***	-0.4**	-0.2	0.0	-0.5*	-0.2
	(0.1)	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)	(0.3)	(0.2)
Third son	-0.7***	-0.4***			-0.4	-0.1	-0.9**	-0.6**
	(0.2)	(0.2)			(0.3)	(0.3)	(0.4)	(0.3)
Fourth son	-0.8***	-0.3					-1.5***	-0.9**
	(0.3)	(0.2)					(0.5)	(0.5)
Observations	622,753		284,115		214,885		123,753	
Mean, oldest sons	7.9	6.5	6.9	5.8	8.9	7.2	10.2	8.2
1940								
Second son	-0.0	-0.1	-0.0	-0.3	-0.1	0.1	-0.1	-0.2
	(0.1)	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)	(0.3)	(0.3)
Third son	-0.3	-0.3			-0.6	-0.0	-0.2	-0.5
	(0.2)	(0.2)			(0.4)	(0.3)	(0.5)	(0.4)
Fourth son	-0.4	-0.1					-0.7	-0.4
	(0.4)	(0.3)					(0.7)	(0.6)
Observations	567,402		257,194		196,546		113,662	
Mean, oldest sons	11.8	8.6	11.4	8.5	12.1	8.7	12.8	9.1

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1910 Census and linked to a later census. We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home, and is the household head in the adulthood census. The *County* specification of succession requires that sons live in the same county; the *Neighbor* specification requires that they also have a common neighbor.

Table 7: Farm succession by sons' birth order

	Children in 1900			Children in 1910		
	2 sons	3 sons	4 sons	2 sons	3 sons	4 sons
20 years after childhood						
Second son	-	-	0	-	0	0
Third son		-	0		0	-
Fourth son			0			-
30 years after childhood						
Second son	0	0	+	0	0	0
Third son		0	0		0	0
Fourth son			0			0
40 years after childhood						
Second son	0	+	+			
Third son		0	0			
Fourth son			0			

Notes: This table reports the sign of estimates from linear probability models. A "-" sign indicates that the regression estimate is negative with $p < .05$. Similarly, a "+" sign indicates that the regression estimate is positive with $p < .05$. A 0 is displayed if the coefficient was estimated with $p \geq .05$. The dependent variable in each regression is a binary indicator for inferred farm succession for a particular son. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1900 or 1910 census and linked to the 1920, 1930, or 1940 census. We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home, and is the household head in the adulthood census. We use the *County* specification of succession, requiring that that children live in the same county.

Table 8: Farm succession by sons' birth order across family types, children in 1900

	2-4 sons			2 sons			3 sons			4 sons		
Early successor in the family?	Yes	No	diff	Yes	No	diff	Yes	No	diff	Yes	No	diff
1930												
Second son	-3.2***	0.1	-3.3***	-3.7***	-0.4	-3.4***	-3.6***	0.3	-4.0***	-0.4	0.6	-1.0
	(0.6)	(0.2)		(1.2)	(0.3)		(1.0)	(0.3)		(1.2)	(0.4)	
Third son	-4.1***	-0.2	-3.9***				-5.0***	0.3	-5.3***	-4.4**	0.3	-4.7***
	(1.0)	(0.3)					(1.6)	(0.4)		(1.7)	(0.5)	
Fourth son	-1.4	-0.2	-1.2							-1.9	-0.2	-1.8
	(1.5)	(0.4)								(2.4)	(0.8)	
Observations	73,687	416,411		25,021	192,690		27,764	143,753		20,902	79,968	
Mean, oldest sons	48.7	10.0		50.9	10.3		48.3	9.8		44.4	9.1	
1940												
Second son	-0.7	0.1	-0.8	-2.2*	-0.2	-2.1*	0.1	0.3	-0.2	0.8	0.7	0.2
	(0.7)	(0.2)		(1.3)	(0.3)		(1.1)	(0.3)		(1.3)	(0.4)	
Third son	-1.3	-0.0	-1.3				-1.0	0.8	-1.8	-1.4	-0.1	-1.3
	(1.1)	(0.3)					(1.8)	(0.5)		(1.8)	(0.6)	
Fourth son	0.5	-0.2	0.8							-0.9	-0.4	-0.5
	(1.6)	(0.5)								(2.6)	(0.9)	
Observations	65,984	378,375		22,354	174,925		24,834	130,480		18,796	72,970	
Mean, oldest sons	43.3	12.6		44.8	13.2		43.3	12.2		39.6	10.9	

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1900 Census and linked to a later census. We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home, and is the household head in the adulthood census. Columns titled "Yes" include only children in families where there was at least one male successor in 1920, while the "No" columns represent the complement. We use the *County* specification of succession, requiring that that children live in the same county.

Table 9: College completion in 1940 by sons' farm succession across family types, children in 1900

Early successor in the family?	Yes	No	diff
1930			
Successor	-3.3***	-3.5***	0.2
	(0.2)	(0.1)	
Observations	84,112	493,148	
Mean, non-successors	3.6	5.1	
1940			
Successor	-3.5***	-3.9***	0.4**
	(0.2)	(0.1)	
Observations	90,911	560,172	
Mean, non-successors	3.6	5.3	

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is a binary indicator for whether a son completed at least four years of college by 1940. The key independent variable is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1900 Census and linked to the 1940 census (as well as the 1930 census if in the top panel). We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home, is farming, and is the household head. Columns titled "Yes" include only children in families where there was at least one male successor in 1920, while the "No" columns represent the complement. We use the *County* specification of succession, requiring that children live in the same county.

Table 10: Predictors of farm succession in families without a successor after 20 years, children in 1900

	2-4 sons		2 sons		3 sons		4 sons	
Succession measure	County	Neighbor	County	Neighbor	County	Neighbor	County	Neighbor
1930								
Tenant farmer	7.4***	5.6***	7.7***	6.1***	7.9***	6.0***	6.4***	4.4***
	(0.2)	(0.2)	(0.4)	(0.4)	(0.4)	(0.3)	(0.4)	(0.4)
Urban	-4.9***	-3.9***	-5.4***	-4.3***	-4.4***	-3.5***	-4.9***	-4.0***
	(0.2)	(0.1)	(0.3)	(0.2)	(0.2)	(0.2)	(0.3)	(0.3)
Oldest son	-0.2	-0.1	0.4	0.3	-0.3	-0.2	-0.6*	-0.2
	(0.1)	(0.1)	(0.3)	(0.2)	(0.3)	(0.2)	(0.3)	(0.3)
Observations	416,411		192,690		143,753		79,968	

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is a binary indicator for inferred farm succession for a particular son. Our key set of independent variables are binary indicators based on a sons' circumstances in the 1920 Census (tenant farming or living in a city) or birth order in the family. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1900 Census and linked to the 1920 and 1930 censuses. Additionally, the sample includes only children in families where there were no male successors in 1920. We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home and is the household head. The *County* specification of succession requires that sons live in the same county; the *Neighbor* specification requires that they also have a common neighbor.

Online Appendix

Theory of Succession

We propose a stylized model of farm succession decisions, including the motivations of the family members involved, how these motivations might influence the decision of which among several children might inherit a farm, and the impact of succession on second generation outcomes. While we do not solve for an equilibrium, we use Nash equilibrium intuition, with the acknowledgement that motivations within a family are far more complex than financial outcomes (Robison & Just, 2016; Siles et al., 2000). Thus, we consider the personal motivations of the first-generation farmer in selecting their retirement option, and in selecting among children as potential successors. Secondly, we consider the child's motivations in either accepting or rejecting the offer of succession. This model has some similarity to both individual and household models of migration (Gubhaju and De Jong, 2009, Kennan and Walker, 2011, Kennan and Walker, 2013). Indeed, migration has been tied to succession (Wegge 1999; Abramitzky et al. 2013). Models of migration generally consider a decision regarding relocating that involves expected differences in income with some substantial switching costs, often involving financial incentives to both the emigrant and the remaining household. In our case, we consider only two potential outcomes – inheriting the farm, or working elsewhere. Migration models involve complicated dynamics, and for this reason are often either specified with very restrictive assumptions (see Kennan and Walker, 2013, for a discussion) or discussed only in stylized terms. A stylized discussion is sufficient to illuminate the hypotheses we wish to explore.

At any point, the first-generation farmer has the option to (i) continue farming as the manager, (ii) sell the farm on the competitive market, (iii) lease the farm, or (iv) bequeath the farm to a child. The farmer who sells the farm upon retirement realizes

$$NPV_t^{sale} = \sum_{i=t}^{k} \delta^{i-t}\pi_i + \delta^{k-t}\Pi - C_{nf}(1, \dots, s)$$

Here π_i is the annual profit from farming to the farmer, Π is the value of all farm assets sold at time k and C_{nf} is the cost of preparing children for non-farm work (e.g., tuition) as a function of the children $1, \dots, s$.

The farmer who leases the farm at retirement realizes

$$NPV_t^{lease} = \sum_{i=t}^{k} \delta^{i-t}\pi_i + \sum_{i=k+1}^{d} \delta^{i-t}\rho_i + \delta^{d-t}\Pi - C_{nf}(1, \dots, s)$$

where ρ_t is the rental rate for land, d is the time of death, and it is assumed that all farm assets are sold upon death.

A farmer who plans on a successor will realize

$$NPV_t^n = \sum_{i=t}^{k} \delta^{i-t}\pi_i + \delta^{k-t}\alpha(n,k)\Pi + \sum_{i=k+1}^{d} \delta^{i-t}\beta\rho_i - C_{nf}(1, \dots, s \backslash n) - C_f(n)$$

where $\alpha(n,k)$ is a percentage of market price transacted as a function of child and timing of the transaction when land is handed over to the successor, β is a percentage of rental income that is remitted to the original farmer for support after transfer to the second generation, $1, \dots, s\backslash n$ signifies the set $1, \dots, s$ excluding element $n \in \{1, \dots, s\}$ and C_f is the cost of preparing a child for farm work. Notably, the cost of training for both farm and non-farm work may differ substantially by specific child, as may the percentage of market price available. Specifically, the percentage may be higher for a child who has accumulated greater creditworthiness over time, or for a child who has a greater desire to remain on the farm.

Presuming a fixed planned date of retirement, the first-generation farmer will prefer to name a successor rather than sell the farm if for at least one of the children $n \in \{1, \dots, s\}$

$$NPV_t^n - NPV_t^{sale} = \delta^{k-t}(\alpha(n,k) - 1)\Pi + \sum_{i=k+1}^{d} \delta^{i-t}\beta\rho_i + C_{nf}(n) - C_f(n) > 0$$

(assuming that non-farm education costs are additively separable). This condition will be met if the discount in purchase price is covered by the sequence of support payments plus any savings in training costs. The farmer will prefer a successor to leasing the farm if

$$NPV_t^n - NPV_t^{lease} = \delta^{k-t}\left(\alpha(n,k) - \delta^{d-k}\right)\Pi + \sum_{i=k+1}^{d} \delta^{i-t}(\beta - 1)\rho_i + C_{nf}(n) - C_f(n) > 0$$

This relation is similar to that for sale of the farm, though now the sale of farm assets under lease is discounted further and the first-generation farmer is also trading off continuing lease payments for the support payments from the child. Nonetheless, the same basic relationships apply. Considering this model, the first-generation farmer will prefer to pass the farm to the child for which: (a) training as a farmer is relatively inexpensive, (b) training as a non-farmer is relatively expensive, or (c) would be more profitable as a farmer or who has a greater desire to remain on the farm, and (d) has greater access to credit. A successor who is believed to be a more successful farmer might have a higher willingness to pay for the farm as well as a potentially increased support payment. A child that has proven farming ability may also face fewer credit constraints at the time of transfer. If abilities and costs are similar, the parent may prefer a child with greater wealth, allowing for a larger initial payment.

From the child's point of view, one is choosing between income profiles for either farming on the family's land or some other occupation (which may include farming on other land). For simplicity we will refer to inheriting the family farm as "farming" and all alternatives as "other". A child considering farming will obtain

$$NPV_t^{farming} = \sum_{i=t}^{k} \delta^{i-t}T_i - \delta^{k-t}\alpha\Pi + \sum_{i=k+1}^{d} \delta^{i-t}(\pi_i - \beta\rho_i) + \sum_{i=d+1}^{r} \delta^{i-t}\pi_i$$

Here, T_i represents the support payments or other income earned while waiting for transfer of the farm, and r is some future planning horizon perhaps representing retirement of the second generation. Alternatively, if they choose a different profession, they may realize

$$NPV_t^{other} = \sum_{i=t}^{t+j} \delta^{i-t}T_i + \sum_{i=t+j+1}^{r} \delta^{i-t}w_i - C_n$$

where j is the training period in the alternate profession, w_i is wage earned in the alternate profession, and C_n is the personal costs of training. A particular child given the opportunity to succeed the first-generation farmer will choose to do so if

$$NPV_t^{farming} - NPV_t^{other} = \sum_{i=t+j+1}^{k} \delta^{i-t}(T_i - w_i) - \delta^{k-t}\alpha\Pi + \sum_{i=k+1}^{d} \delta^{i-t}(\pi_i - \beta\rho_i - w_i) + \sum_{i=d+1}^{r} \delta^{i-t}(\pi_i - w_i) + C_n > 0$$

In order for a successor to be willing, profits from farming must exceed wages from alternate employment by a significant amount in order to outweigh both the delay in full income as one awaits transfer, assuming they remain on the farm, as well as the cost of the transfer and future support payments to the first-generation farmer. Alternatively, the personal cost of alternative training could be prohibitive. Inheriting the farm becomes relatively more attractive if alternative wages are lower, or if the farmer is retiring early in the life cycle of the child. Notably absent from this model are two additional important factors. This model treats time of transfer as if it is known at the time one decides on their course of training, ignoring the potential risk that the original farmer may change their mind. Secondly, this also ignores the potential for a child to establish income and wealth in some other profession, and then return to inherit the farm. If a child established income and wealth outside of the family farm, they would necessarily compare their potential farm income with their current earnings, but might also face additional costs if they had obtained fixed assets–such as a home–that could not easily be liquidated.

Supplemental Tables

Table A1: Farm succession by daughters' birth order

	2-4 daughters		2 daughters		3 daughters		4 daughters	
Succession Measure	County	Neighbor	County	Neighbor	County	Neighbor	County	Neighbor
1920, children in 1900								
Second daughter	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.1**	0.1*
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)
Third daughter	-0.1	-0.0			-0.1*	-0.1	0.0	0.0
	(0.0)	(0.0)			(0.1)	(0.0)	(0.1)	(0.1)
Fourth daughter	-0.1*	-0.1*					0.1	0.0
	(0.0)	(0.0)					(0.1)	(0.1)
Observations	422,339		194,350		146,046		81,943	
Mean, oldest daughters	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.1
1930, children in 1910								
Second daughter	-0.0	-0.0	-0.1*	-0.1*	-0.0	-0.0	0.1	0.1
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)
Third daughter	-0.0	-0.0			-0.1	-0.0	0.1*	0.1
	(0.0)	(0.0)			(0.0)	(0.0)	(0.1)	(0.1)
Fourth daughter	-0.0	-0.0					0.2**	0.1*
	(0.0)	(0.0)					(0.1)	(0.1)
Observations	456,175		213,985		156,622		85,568	
Mean, oldest daughters	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes daughters who are living with their farm-owning parents in the 1900 or 1910 Census and linked to a later census. We infer farm succession if a daughter is farming and living on a farm in the same place as childhood, owns a home, and is the household head or married to the household head in the adulthood census. The *County* specification of succession requires that daughters live in the same county; the *Neighbor* specification requires that they also have a common neighbor.

Table A2: Farm succession by sons' birth order with fathers 25 or younger when married

	2-4 sons		2 sons		3 sons		4 sons	
	County	Neighbor	County	Neighbor	County	Neighbor	County	Neighbor
1920, children in 1900								
Second son	-0.6***	-0.4**	-0.9***	-0.9***	-0.6*	-0.3	0.1	-0.0
	(0.2)	(0.2)	(0.3)	(0.3)	(0.3)	(0.3)	(0.5)	(0.4)
Third son	-1.0***	-0.7**			-0.8	-0.4	-0.1	-0.0
	(0.3)	(0.3)			(0.5)	(0.5)	(0.7)	(0.6)
Fourth son	-1.3***	-1.3***					-0.4	-0.6
	(0.5)	(0.4)					(0.9)	(0.8)
Observations	253,028		110,616		88,909		53,503	
Mean, oldest sons	11.9	9.3	10.5	8.2	13.3	10.2	14.6	11.5
1930, children in 1910								
Second son	-0.4***	-0.2*	-0.4*	-0.3	-0.2	0.0	-0.8**	-0.4
	(0.1)	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)	(0.4)	(0.3)
Third son	-0.9***	-0.5**			-0.5	-0.1	-1.2**	-0.8*
	(0.2)	(0.2)			(0.4)	(0.4)	(0.5)	(0.4)
Fourth son	-0.9***	-0.3					-2.2***	-1.3*
	(0.4)	(0.3)					(0.7)	(0.6)
Observations	334,790		149,570		117,188		68,032	
Mean, oldest sons	8.2	6.7	7.1	5.9	9.3	7.5	10.9	8.7

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1900 or 1910 Census, linked to a later census, and whose fathers were 25 years or younger when married in their current marriage. We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home, and is the household head in the adulthood census. The *County* specification of succession requires that sons live in the same county; the *Neighbor* specification requires that they also have a common neighbor.

Table A3: Farm succession by sons' birth order with mothers 35 or older

	2-4 sons		2 sons		3 sons		4 sons	
	County	Neighbor	County	Neighbor	County	Neighbor	County	Neighbor
1920, children in 1900								
Second son	-0.5**	-0.2	-0.4	-0.4	-0.5	-0.0	-0.5	-0.2
	(0.2)	(0.2)	(0.4)	(0.4)	(0.4)	(0.3)	(0.5)	(0.5)
Third son	-0.7*	-0.4			-0.9	-0.3	-0.4	0.1
	(0.4)	(0.3)			(0.6)	(0.5)	(0.7)	(0.6)
Fourth son	-1.0**	-0.6					-0.2	-0.0
	(0.5)	(0.5)					(0.9)	(0.9)
Observations	208,363		79,384		75,691		53,288	
Mean, oldest sons	14.0	11.1	13.3	10.7	14.3	11.1	15.5	12.0
1930, children in 1910								
Second son	-0.3	-0.1	-0.7**	-0.7**	0.0	0.3	0.0	0.3
	(0.2)	(0.2)	(0.3)	(0.3)	(0.3)	(0.3)	(0.4)	(0.4)
Third son	-0.6*	-0.4			-0.1	0.1	-0.6	-0.5
	(0.3)	(0.3)			(0.5)	(0.5)	(0.6)	(0.5)
Fourth son	-0.7*	-0.1					-1.2	-0.6
	(0.4)	(0.4)					(0.8)	(0.7)
Observations	240,985		95,350		86,247		59,388	
Mean, oldest sons	10.6	8.7	9.9	8.4	11.0	9.0	11.7	9.4

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1900 or 1910 Census, linked to a later census, and whose mothers were 35 years or older in the son's childhood census. We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home, and is the household head in the adulthood census. The *County* specification of succession requires that sons live in the same county; the *Neighbor* specification requires that they also have a common neighbor.

Table A4: Summary statistics, farm-owning families (*Neighbor* succession measure)

	1+ sons	2 sons	3 sons	4 sons
1900 cohort				
1 male successor in 1920	6.5	6.8	9.2	11.1
2+ male successors in 1920	0.9	0.9	1.9	3.2
Oldest son successor in 1920	5.3	5.6	6.7	7.5
1 male successor in 1930	10.4	11.0	13.2	14.8
2+ male successors in 1930	2.0	1.9	4.1	6.3
Oldest son successor in 1930	8.1	8.2	8.6	8.6
1 male successor in 1940	9.8	10.6	12.4	13.5
2+ male successors in 1940	1.6	1.6	3.3	4.9
Oldest son successor in 1940	7.0	7.0	6.8	6.4
Observations	538,348	160,177	85,126	38,009
1910 cohort				
1 male successor in 1930	5.1	5.2	7.2	8.8
2+ male successors in 1930	0.6	0.6	1.2	2.0
Oldest son successor in 1930	4.1	4.2	5.2	5.8
1 male successor in 1940	7.7	8.1	9.9	11.6
2+ male successors in 1940	1.0	1.1	2.2	3.3
Oldest son successor in 1940	5.8	5.7	5.8	6.0
Observations	655,046	194,219	100,082	43,880

Notes: Mean values are reported of farm succession indicators for farm sons, reported as percentages. We infer farm succession for sons who are farming and living on a farm in the same place as childhood (using the *Neighbor* measure as defined in the paper), own a home, and are the household head in the adulthood census.

Table A5: Farm succession by sons' birth order across family types, children in 1900 (*Neighbor* succession measure)

	2-4 sons			2 sons			3 sons			4 sons		
Early successor in the family?	Yes	No	diff	Yes	No	diff	Yes	No	diff	Yes	No	diff
1930												
Second son	-2.4***	-0.0	-2.3***	-2.5*	-0.4*	-2.1*	-3.0***	0.2	-3.2***	0.0	0.1	-0.1
	(0.7)	(0.1)		(1.3)	(0.2)		(1.1)	(0.2)		(1.3)	(0.3)	
Third son	-2.9***	-0.2	-2.7***				-3.9**	0.3	-4.3***	-3.1*	-0.3	-2.8*
	(1.1)	(0.2)					(1.8)	(0.4)		(1.9)	(0.5)	
Fourth son	0.3	-0.4	0.6							0.7	-0.8	1.5
	(1.6)	(0.4)								(2.6)	(0.7)	
Observations	59,514	430,584	20,259	197,452	22,365	149,152	16,890	83,980				
Mean, oldest sons	42.9	8.2	45.2	8.4	42.2	8.1	38.7	7.5				
1940												
Second son	0.0	0.1	-0.1	-0.9	0.1	-1.0	0.5	0.1	0.3	1.0	0.3	0.7
	(0.7)	(0.2)		(1.4)	(0.3)		(1.1)	(0.3)		(1.3)	(0.4)	
Third son	-0.6	0.0	-0.7				-0.9	0.5	-0.4	-0.6	-0.4	-0.3
	(1.1)	(0.3)					(1.8)	(0.4)		(1.9)	(0.5)	
Fourth son	1.5	0.1	1.4							0.6	-0.5	1.1
	(1.6)	(0.4)								(2.6)	(0.8)	
Observations	53,160	391,199	18,070	179,209	19,934	135,380	15,156	76,610				
Mean, oldest sons	33.0	8.5		34.8	9.0		32.8	8.0		29.1	7.1	

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1900 Census and linked to a later census. We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home, and is the household head in the adulthood census. Columns titled "Yes" include only children in families where there was at least one male successor in 1920, while the "No" columns represent the complement. We use the *Neighbor* specification of succession, requiring that that children live in the same county.

Table A6: College completion in 1940 by sons' farm succession across family types, children in 1900 (*Neighbor* succession measure)

Early successor in the family?	Yes	No	diff
1930			
Successor	-3.2***	-3.5***	0.3*
	(0.2)	(0.2)	
Observations	67,939	509,321	
Mean, non-successors	3.3	5.0	
1940			
Successor	-3.1***	-3.7***	0.7***
	(0.2)	(0.1)	
Observations	73,252	577,831	
Mean, non-successors	3.2	5.0	

Notes: Estimates are reported (as percentage points) from linear probability models. The dependent variable in each regression is a binary indicator for whether a son completed at least four years of college by 1940. The key independent variable is an indicator for farm succession. All estimations include household and age fixed effects. Sample includes sons who are living with their farm-owning parents in the 1900 Census and linked to the 1940 census (as well as the 1930 census if in the top panel). We infer farm succession if a son is farming and living on a farm in the same place as childhood, owns a home, is farming, and is the household head. Columns titled "Yes" include only children in families where there was at least one male successor in 1920, while the "No" columns represent the complement. We use the *Neighbor* specification of succession, requiring that children live in the same county.