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What Factors Encourage Intrafamily Farm Succession in Mountain Areas?

Evidence From an Alpine Valley in Italy

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Family farming plays a vital role in mountain areas. Its survival is related to multiple factors, including intrafamily farm succession. This study examined data on apple-producing family farms in an Italian Alpine valley, trying to identify which factors foster or

discourage intrafamily succession and to what extent they do this, both at the farm level and from the potential successor's viewpoint. To do so, various farm, farmer, and individual characteristics were analyzed using probabilistic regression. We found that intrafamily succession was more likely when the farm was managed by a woman (+20%) with a high school diploma (+13%) who had at least 1 child with specialized education in

agriculture (+27%) and when farm sales had increased in recent years (+25%). We also found that a child's willingness to take over the family farm decreases as the number of farm children increases and when the child is a female with a high school diploma; however, the likelihood that children will take over the family business rises as farmer education level and work experience increase. These findings, while mixed, suggest that women play a key role in keeping family farming alive in mountain areas, along with education of family members, improved marketability of agricultural products, and in general, competitiveness and profitability of the family farm.

Keywords: Family farm succession; education; gender; generational turnover; farm survival; family farming; Italy.

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Introduction

The Food and Agriculture Organization declared 2014 the International Year of Family Farming, pointing out its central role for agriculture and rural development, especially in mountain areas (Wymann von Dach et al 2013). Migration from rural to urban areas is a key feature related to economic development and structural change (Todaro 1969; Mundlak 1979; Lucas 2004). Farming may be essential to preventing or at least slowing outmigration and land abandonment in mountain areas. Furthermore, family farm persistence in disadvantaged areas, like mountains frequently are, is particularly important for protecting and managing the landscape, avoiding environmental degradation, and supporting local economic development (MacDonald et al 2000; Dax 2001). It is therefore important to keep family farming alive in mountain areas.

One element of farm survival is the ability to identify a successor to inherit the family farm (Inwood and Sharp 2012; Mann et al 2013). Agricultural activity on such a farm will hardly be taken over by someone outside the family, given the high investments required and the low profitability to be expected, and family labor lowers production costs compared to hired labor. Moreover, the farm transfer to someone who has not lived on the farm

implies the loss of skills and expertise accumulated within the family farm (Corsi 2009). For the previously mentioned reasons, intrafamily farm succession is often a necessary condition for farm survival in less-favored agricultural areas such as mountains. Better knowledge of the farm succession process is therefore of interest for mountain agriculture. Based on an analysis of a group of apple producers in an Italian Alpine valley (Figure 1), the aim of this paper is to add knowledge about intrafamily farm succession in mountain areas by quantifying its extent and identifying factors that may foster or discourage this practice.

The article is structured as follows: The following section reviews previous studies of family farm succession, and the next section summarizes data collection and statistical analysis methods. This is followed by a discussion of the results and a comparison with previous findings. Finally, we draw conclusions and policy implications and suggest future lines of research to extend knowledge of family farm succession to other mountain areas.

Previous studies on family farm succession

Family farm succession and related issues have been explored and summarized extensively (Lobley et al 2012).

FIGURE 1 Typical apple orchard landscape in Valtellina, a northern Italian Alpine valley. (Photo by Dr. Luca Folini)



These studies may be roughly classified as qualitative (Dumas et al 1995; Keating and Little 1997; Mann 2007b; Otomo and Oedl-Wieser 2009; Inwood and Sharp 2012) or quantitative (Kimhi 1994; Kimhi and Lopez 1999; Stiglbauer and Weiss 2000; Kimhi and Nachlieli 2001; Glauben et al 2004; Simeone 2005, 2006; Aldanondo Ochoa et al 2007; Mann 2007a; Calus et al 2008; Kerbler 2008, 2009, 2012; Mishra and El-Osta 2008; Corsi 2009; Glauben et al 2009; Mishra et al 2010). They examine family farm succession from different perspectives, focusing on the timing and intergenerational component of succession and retirement (Kimhi 1994; Kimhi and Lopez 1999; Glauben et al 2004), the effect of agricultural policy (Mishra and El-Osta 2008) or farm assets (Calus et al 2008), or the effect of intrafamily succession on farm performance (Carillo et al 2013).

One of the main tools of analysis in the quantitative studies is binary-choice dependent-variable regression (probabilistic, referred to as probit, or logistic) that allows quantification of whether and to what extent various characteristics of the family farm (and its individual components) increase or reduce the probability of intrafamily succession. Intrafamily succession is rarely

directly observable unless farm-level data are registered over a long time span, like the agricultural census (eg Kimhi 1994; Stiglbauer and Weiss 2000). When such information is not available, outcomes are more often deduced from interviews with farmers, family members, or both (Simeone 2005, 2006; Kerbler 2008), or the assumption is made that a farmer's children working on the farm will take it over. The latter case is represented by the research of Corsi (2009), which used data from the 2000 Italian Agricultural Census in the Piedmont region to study how various farm, farmer, and territorial features influence farm children's probability of working on the farm (full or part time), using this information as a proxy of farm succession. Among other results, Corsi found that children are 3% more likely to work on farms specializing in fruit, while the probability of this outcome is up to 6.5% higher on mountain farms (other explanatory factors being equal). The Piedmont region is next to the Lombardy region, the location of the present study. Simeone (2005, 2006) surveyed farms from 2 Italian regions and, going further than Corsi, included some sociodemographic characteristics and attitudes of farmer's children and partners. Kerbler (2008) surveyed

FIGURE 2 Location of the study area. (Map by Dr. Roberto Rovelli)



a large group of family farms in the Slovenian mountains to isolate and measure the effect of their sociogeographic structure on intrafamily succession.

Methodology and results from the previously mentioned papers were used, where possible, to identify and select variables for use in our analysis. Comparisons between our findings and those of previous studies are presented in the Results section.

Data and method of analysis

To study farm succession in our mountain region, we took advantage of a survey carried out in 2010 among 600 farms specializing in fruit and vegetables and belonging to various producer organizations, mainly located in Lombardy in northern Italy (see Frisio et al 2012a, 2012b). We used data from farms in Valtellina, an Alpine valley in Sondrio Province in Lombardy (Figure 2). These farms specialize in apple production under the rules of the “protected geographical indication”—a legally protected place-based product name in the European Union—*Mele [apples] di Valtellina* and belong to the producer organization Melavì, whose aim is to increase the quality and market value of farm products. The survey covered all full-time farms and a representative sample of part-time farms for a total of 178 family farms.

To examine farm succession, we considered only those 103 farms with at least 1 child older than 15 years. Among these, 27 farms had a child willing to take over the farm, while 75 farms did not (1 respondent did not answer the question). According to these data, only 26.5% of apple farms will have an intrafamily succession; for the previously mentioned reasons, such a low succession rate may raise concerns about the future of apple production in this area. Furthermore, this unbalance between farms with and those without a potential successor may represent a limitation for the analysis; even though the questionnaire contained questions about family farm succession, the survey sampling was designed for other purposes.

To explore farm succession patterns, we selected, following findings from the literature, all relevant farm and farmer characteristics, creating a farm-level data set whose dependent variable (succession) is whether the farmer thinks the next generation will take over the farm. Because the survey was carried out only once (in 2010), we could not observe actual intrafamily succession, so our analysis had to rely on farmers' expectations. The farm-level data set has the aim of relating these expectations with all relevant and observable farm, family, and farmer (intended as the primary decision-maker) characteristics. Table 1 shows the variables used in the farm-level data set;

TABLE 1 Variables used in the farm-level data set. The dependent variable is presented in bold type; variables found to have a significant effect on intrafamily farm succession are in italics.

Category	Code	Description	Unit of measure
Farmer	Succession	Farmer thinks the next generation will take over the farm	1 = yes; 0 = no
Child	chldschool	At least 1 child has a high school diploma	1 = yes; 0 = no
<i>Child</i>	<i>chldschoolagr</i>	<i>At least 1 child has a high school diploma in agriculture</i>	<i>1 = yes; 0 = no</i>
<i>Child</i>	<i>chldlivfarm</i>	<i>At least 1 child lives on the farm</i>	<i>1 = yes; 0 = no</i>
Farmer	Farmer children	Number of farmer's children	Number
Farmer	frmrage	Farmer's age	Years
<i>Farmer</i>	<i>frmrgender</i>	<i>Farmer's gender</i>	<i>1 = female; 0 = male</i>
<i>Farmer</i>	<i>frmrschool</i>	<i>Farmer has at least a high school diploma</i>	<i>1 = yes; 0 = no</i>
<i>Farmer</i>	<i>frmrexper</i>	<i>Farmer's years of working experience on the farm</i>	<i>years</i>
Farmer	frmroff	Farmer works off-farm	1 = yes; 0 = no
Farmer	frmroff%	Farmer's off-farm workdays as a proportion of all workdays	%
Farmer	Farmer PC	Farmer uses a personal computer	1 = yes; 0 = no
Farm	Farm children	Number of children on the family farm	Number
Farm	Farm sales variables	Annual amount of farm sales: revenues from selling farm products	Classes
<i>Farm</i>	<i>farmsalesincr</i>	<i>Farm sales have increased over the last 5 years</i>	<i>1 = yes; 0 = no</i>
Farm	farmhectar	Utilized agricultural area on the farm	Hectares
Farm	farmrent	Proportion of farm's utilized agricultural area that is rented	%
Farm	farmcosts	Total farm-explicit production costs	US\$
Farm	farmemploy	Workdays of nonfamily members as a proportion of all farm workdays	%
Farm	farmfamilyonly	Only family members work on the farm	1 = yes; 0 = no

Supplemental data, Table S1 (<http://dx.doi.org/10.1659/MRD-JOURNAL-D-14-00107.S1>) provides detailed descriptive statistics.

Variables were coded depending on their placement in 1 of 3 categories:

- *Child* (chld) variables control for the presence of at least 1 child living on the family farm with a certain level of general and agriculture-related education.
- *Farmer* (frm) variables include sociodemographic characteristics like age, gender, education, information technology skills, and number of children (Glauben et al 2004; Simeone 2005, 2006; Kerbler 2008; Corsi 2009), as well as on-farm work experience and off-farm employment (Aldanondo Ochoa et al 2007; Mishra et al 2010).
- *Farm* (farm) variables include total and rented utilized agricultural area (Simeone 2005, 2006; Kerbler 2008), economic dimensions expressed as annual farm sales

(revenues from selling farm products) and total explicit production costs (cost of purchasing production support not provided by the family farm; Glauben et al 2004; Corsi 2009), sales trends over the previous 5 years (Mishra et al 2010), proportion of farm work carried out by family members, and number of children in the farm family.

Several variables were expressed in dichotomous form (eg 1 = yes, 0 = no; 1 = female, 0 = male).

Among the 103 family farms examined, there were 196 children. Of these children, 34 (17.6%) were willing to take over the farm while 159 were not (there were 3 missing answers). We used survey data on individual children to create a child-level data set to explore the data variability within each family farm. The farm- and child-level data sets share the same farm and farmer's information, while the latter is more data rich

TABLE 2 Variables used in the child-level data set. The dependent variable is presented in bold type; variables found to have a significant effect on the probability of a child taking over the family farm are in italics.

Category	Code	Description	Unit of measure
Child	Takeover	Child is willing to take over the farm	1 = yes; 0 = no
Child	chldchos	Child has been chosen as the successor	1 = yes; 0 = no
Child	chldage	Child's age	Years
Child	agegap	Age gap between farmer and child	Years
<i>Child</i>	<i>chldgend</i>	<i>Child's gender</i>	<i>1 = female; 0 = male</i>
<i>Child</i>	<i>chldschooldipl</i>	<i>Child has at least a high school diploma</i>	<i>1 = yes; 0 = no</i>
Child	chldschooldiplagr	Child has a high school diploma in agriculture	1 = yes; 0 = no
Child	chldlivfarm	Child lives on the farm	1 = yes; 0 = no
Child	Child PC	Child uses a personal computer	1 = yes; 0 = no
Child	chldofffarm	Child works off-farm	1 = yes; 0 = no
Child	Brother/sister	Child has brothers and/or sisters	1 = yes; 0 = no
Farmer	Farmer children	Number of farmer's children	Number
Farmer	frmrage	Farmer's age	Years
Farmer	frmrgender	Farmer's gender	1 = female; 0 = male
<i>Farmer</i>	<i>frmrschooldipl</i>	<i>Farmer has at least a high school diploma</i>	<i>1 = yes; 0 = no</i>
<i>Farmer</i>	<i>frmrexper</i>	<i>Farmer's years of working experience on the farm</i>	<i>Years</i>
Farmer	frmroff	Farmer works off-farm	1 = yes; 0 = no
Farmer	frmroff%	Farmer's off-farm workdays as a proportion of all workdays	%
Farmer	Farmer PC	Farmer uses a personal computer	1 = yes; 0 = no
<i>Farm</i>	<i>Farm children</i>	<i>Number of children on the family farm</i>	<i>Number</i>
Farm	Farm sales variables	Annual amount of farm sales: revenues from selling farm products	Classes
Farm	farmsalesincr	Farm sales have increased over the last 5 years	1 = yes; 0 = no
Farm	farmhectar	Utilized agricultural area on the farm	Hectares
Farm	farmrent	Proportion of farm's utilized agricultural area that is rented	%
Farm	farmcosts	Total farm-explicit production costs: costs of purchasing production support not provided by the family farm	US\$
Farm	farmemploy	Workdays of nonfamily members as a proportion of all farm workdays	%
Farm	farmfamilyonly	Only family members work on the farm	1 = yes; 0 = no

about children's characteristics. Variables are divided into the same 3 main categories. In this data set, the relevant dependent variable (takeover) is whether each child is willing to take over the farm. While the farm data set provides information on factors affecting farmer's expectations on farm succession, the child data set deepens the analysis from the children's viewpoint.

Table 2 shows variables used in the child-level data set; descriptive statistics are provided in *Supplemental data*, Table S2 (<http://dx.doi.org/10.1659/MRD-JOURNAL-D-14-00107.S1>).

Because the dependent variables describing farm succession in the 2 data sets (succession at the farm level and takeover at the child level) are dichotomous, we used

TABLE 3 Probit regression: Variables affecting the probability of intrafamily farm succession (farm-level data set).^{a), b)}

Explanatory variable	AME on dependent variable	$P > z$
chldschoolagr	0.2669386	0.088
chldlivfarm	0.1549754	0.065
frmrgender	0.2048748	0.026
frmrschool ^{c)}	0.1329061	0.108
frmrexper	0.0098556	0.004
farmsalesincr	0.2526331	0.014

^{a)}The number of observations is 102.

^{b)}The mean value of farmer experience in the sample is 23.145 years.

^{c)}Logit regression on the same specification gives, for this variable, a similar marginal effect (0.1382914) with $P > z = 0.083$.

a limited dependent-variable probit regression model (Wooldridge 2012) to find which factors have a statistically significant effect on the probability (at the farm and child level) that succession will take place. Once we identified those variables via probit regression, we computed their average marginal effect (AME) in increasing or decreasing the probability of succession at both levels. This computation was necessary, because the first output of probit regression (parameter estimates associated with each explanatory variable) are not as easily interpretable as those of linear regression may be.

Results

Variables listed in Tables 1 and 2 were combined to run 2 probit regressions (the first at the farm level and the second at the individual child level), selecting from each data set those combinations of variables whose probit parameter estimates had a statistically significant effect on intrafamily farm succession or on individual takeover choice (*Supplemental data*, Tables S3 and S4; <http://dx.doi.org/10.1659/MRD-JOURNAL-D-14-00107.S1>). For such variables, AMEs were computed. The effect of each variable was compared, where possible, with findings of previous similar studies. (Results are not fully comparable, because different variables were used to approximate intrafamily farm succession outcomes.) Table 3 illustrates which factors affect farm succession and to what extent. In this model, the dependent variable (succession) reflects farmer expectations related to future generational turnover in the operation of the farm.

Only 6 of the explanatory variables listed in Table 1 had a significant effect on farm succession; 2 are related to child characteristics, 3 are related to farmer attributes, and 1 is related to a farm business trend. The AMEs reported in the second column of Table 3 quantify the change in the probability that farm succession will take place as a consequence of a change in the explanatory variable (accounting for the simultaneous effect of other

explanatory variables). If the explanatory variable is dichotomous, AME reports the change in probability of succession when it changes from 0 to 1. Considering the first (dichotomous) variable *chldschoolagr*, for instance, based on the present results, a farm family with at least 1 child with a high school education and an agriculture specialization has, on average, a 26.69% greater probability of intrafamily succession than does a farm family without this characteristic (other things being equal). When the explanatory variable is continuous, the AME indicates the probability change in farm succession because of a 1-point increase above its sample mean. In this case, an AME of 0.00986 associated with the (continuous) variable *frmrexper* means that an additional year of farmer working experience above 23.145 years (the sample mean) increases the probability of intrafamily farm succession by 0.9866%. Bearing in mind that in a probit model the marginal effect of a continuous covariate is not constant but rather changes as the value of the variable changes, we were able to calculate the probability of farm succession at different amounts of farmer work experience. For example, the estimated probability of intrafamily succession when the farmer has 30 years of experience is 32.41%, compared to 24.20% at the sample mean. The third column of Table 3 reports the P values associated with each AME; these values indicate the probability that the effect of the explanatory variable on farm succession is statistically insignificant. We have therefore listed only those variables with a P value equal to or smaller than 0.1.

Among child characteristics, the estimated effect on farm succession of the presence of a child with an education in agriculture (*chldschoolagr*), +26.69%, is in line with Kerbler (2008). When at least 1 child lives on the farm, succession probability increases by 15.5% (other things being equal), a result compatible with Simeone (2005, 2006) even if smaller in magnitude, both when the farmer has graduated from high school (+84.6%) and when the farmer's partner has a high school diploma (+25%). In our study, farmer attributes that were not

TABLE 4 Probit regression: Variables affecting the probability of a child taking over the family farm (child-level data set).^{a)-c)}

Explanatory variable	AME on dependent variable	<i>P</i> > <i>z</i>
Farm children	-0.0582880	0.047
chldgend	-0.1959806	0.000
chldschool	-0.0978308	0.072
frmrschool	0.1464946	0.002
frmrexper	0.0082117	0.000

^{a)}The number of observations is 193.

^{b)}The mean value of farm children in the sample is 2.3367.

^{c)}The mean value of farmer experience in the sample is 24.066 years.

found to play a significant role in succession were the number of children in the farm family, the farmer's age (although other studies found it had a positive or nonlinear effect on succession), off-farm employment (which usually depresses farm succession), and the farmer's information technology skills.

Farms managed by a woman had a 20.49% greater probability of intrafamily succession than those operated by a man. This result is in line with Corsi (2009), but stronger in magnitude, and with Glauben et al (2004), and it is meaningful in terms of insights and policy implications for enhancing farm succession in this context. On farms where the farmer has earned a high school diploma (frmrschool), intrafamily succession probability rises, on average, by 13.29%, a value lower than that found by Simeone (2006) and unlike that reported by Corsi (2009), who found that farmer education would lower by 2.3% the probability of children taking over the farm.

The only farm characteristic that significantly affected farm succession was farm sales (farmsalesincr): Other things being equal, a farm with sales that had increased over the past 5 years had 25.3% more probability of intrafamily succession. Such a variable can be intended as a proxy for farm product marketability and, in general, for farm competitiveness and profitability (no data on farm profits were available). Surprisingly, no other economic or structural variable affected intrafamily farm succession, although earlier studies found that it increases with farm size (Kerbler 2008). Neither the proportion of farmland that was rented nor the proportion of farm labor carried out by family members affected succession.

For the child-level data set, Table 4 reports the estimated effect of variables (as listed in Table 2) that significantly affect the willingness of a child to take over the family farm. While the dependent variable in the farm model reflects farmer expectations on farm succession, in this case the binary outcome and the subsequent analysis focused on what influences an individual child's choice to take over the family farm. Surprisingly, none of the farm

characteristics affected the probability that a child would take over the farm, not even farmsalesincr, which did affect intrafamily succession at the farm level. This lack of effect may be explained by statistical independence between farm features and takeover outcome, whose variability is better explained by child and farmer characteristics. The only farm characteristic that influenced individual takeover choice was the number of children in the farm family; the more competition among siblings on the farm to become a successor, the less willingness among them to continue. On average, female children (chldgend) were 19.6% less willing to take over the farm than their male counterparts, a finding in line with, but half the magnitude of, that of Simeone (2005, 2006). While specialized education in agriculture was not significant, having a high school diploma (chldschool) lowered by 9.8% the likelihood of a child's taking over the farm. This is in line with Simeone (2005, 2006), who found an inverse relationship between education level and willingness to take over the farm, because the former would increase the opportunity cost of continuing agricultural activity. In our specific case, where part-time farms are predominant, it is not surprising that higher education levels tend to push children to full-time off-farm employment. This explanation would be confirmed by the insignificant effect of child off-farm employment (chldoffarm), which is already accounted for by the education variable.

Farmer characteristics affecting individual choice to take over the family business were the same as those influencing the likelihood of farm succession, with the exception of farmer gender (frmrgender), which was not statistically significant at the child level. A high school-educated farmer (frmrschool) raises children's willingness to take over the farm by 14.6%, compared to a farmer without such education attainment; this effect is in line with those of the farm succession model (+13.3%). Child intention to continue the family farm activity rises by 0.821% for an additional year of farmer working experience (frmrexper) above the sample mean (24.06);

this characteristic also affects in the same direction both child takeover choice and farm succession probability, more so in the latter case (+0.985%).

Discussion and conclusions

This study analyzed intrafamily farm succession in a sample of mountain apple farms, measuring its extent and trying to identify its main drivers both at the farm level and from the viewpoint of the child and potential heir. This evidence may improve understanding of this system and point to some key policy implications.

The farm succession rate in our data set is very low (26.5%), which raises many concerns about the future of apple production in Valtellina. Losing such an important asset may cause problems from both an economic and an environmental perspective, with consequent risk of land abandonment on steep slopes and landscape degradation.

The characteristics of the farm do not seem to play a role in succession, with one exception: Intrafamily succession was 25% more likely when sales had increased over the previous years. As previously mentioned, given the structure of the data set, such a variable can be considered a proxy of farm product marketability and of farm competitiveness and profitability. Individual and collective strategies aimed at increasing the marketability of farm products, such as cooperatives and producer associations, should thus be implemented, or improved where they already exist. Likewise, all factors fostering farm competitiveness and profitability will indirectly foster intrafamily farm succession.

Results on the effect of farmers' and children's education are mixed, but taken together, they point to a positive effect on succession and takeover choice. High school education lessens by 9.8% the likelihood of a child taking over the farm, while this choice is increased by 14.6% when the farmer holds a diploma. Farmer and child education thus have opposite effects on individual takeover decisions, but the former is stronger than the latter. Farmer education has almost the same effect and magnitude both on child's choice to continue and on farm succession probability (+13.2%); furthermore, intrafamily farm succession is 26.7% more likely when at least 1 child has specialized education in agriculture. Higher education attainment (particularly in agriculture) should thus be encouraged in consideration of its beneficial effects on farm succession, even if it can increase to some extent off-farm migration.

Gender effect on succession also seems to be contradictory; being a female diminishes by 19.6% individual willingness to take over the farm, but when a woman becomes a farmer this event increases intrafamily farm succession likelihood by 20.5%. The latter effect may be because of widows taking over farm operation at their husband's death and then passing on the farm to the next generation. This interpretation may

be plausible in general, but it does not fit our sample, which showed that in family farms where succession takes place, female farmers are, on average, younger than their male counterparts. Women thus play a key role in keeping agriculture alive in mountain areas, and policies should be developed to recognize and reward this. Farmer working experience exerts almost the same effect on the probability of both farm succession and individual takeover choice (+0.99% and +0.82%, respectively, for an additional year of experience above the sample mean).

To summarize, our findings—while mixed—suggest that women play a key role in keeping family farming alive in mountain areas, along with education of family members and improved marketability of agricultural products. Our results also describe the dynamics within the population of family farms from which the sample used for this analysis was drawn (farms specializing in apple production in Valtellina, an Alpine valley in Sondrio Province), but they may indicate actions to be taken to keep alive such activity in mountain areas in general, which is endangered by a low succession rate.

To foster intrafamily farm succession, 2 types of solutions are feasible:

- On the market side, a renewed effort should be undertaken to valorize the Valtellina apple brand, which is less well known than that of Trentino, a formidable nearby competitor. This can be achieved by strengthening existing cooperatives and producers' associations through promotion of management that meets modern business criteria.
- On the policy side, current agricultural policies do not adequately support mountain farms with specialties such as fruit, viticulture, berries, and minor crops, which are usually small and managed part time. European Union Common Agricultural Policy payments and Less Favored Areas Compensatory Allowances (each a few hundred euro per hectare per year) are calculated based on utilized agricultural area and consequently provide little support for small farms. However, the Rural Development Program seems to be better suited for supporting both family farming in mountains and intrafamily turnover for a variety of reasons. First, it provides measures to specifically support young farmers who take over the family farm and to improve human capital in agriculture. Second, it provides measures that indirectly foster intrafamily farm succession by supporting investments and improving farm competitiveness. In view of our results, the latter measures could be preferably oriented toward young and female mountain farmers.

Further research is needed to deepen the knowledge of farm succession dynamics in the Alpine area, enlarging the examination and making comparisons with other farms—including farms in the same valley with different specializations (eg livestock and wine) and similar (apple-

producing) farms in other mountain areas in Italy, like the Trentino region. Cross-regional comparison would make it possible to control for variables that are (almost) invariant in the present study area but that significantly

affect off-farm labor migration, like the income difference between the agricultural and the nonagricultural sectors (Olper et al 2014) and the employment rate (Corsi 2009).

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Supplemental data

TABLE S1 Descriptive statistics of the farm-level data set.

TABLE S2 Descriptive statistics of the child-level data set.

TABLE S3 Full results of probit regression used to compute the AME in Table 3.

TABLE S4 Full results of probit regression used to compute the AME in Table 4.

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