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AGING AND SUCCESSION ON ITALIAN FARMS

JEL classification: Q12; Q18; D22

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Abstract. *The survival and competitiveness of the agricultural sector is increasingly threatened by the aging process of farmers and farms. In this perspective, the European Union has launched a number of initiatives directed towards favoring the entry of a new generation of young entrepreneurs in the agricultural sector. However, the way in which this transition occurs, whether via intra-family succession or via market transactions, may also have an*

influence on the economic performance of farms. In this paper, we test the influence of the age of the person who manages the farm and of intra-family succession on the economic performance of Italian farms. Our results indicate that younger farmers overperform and that inherited farms tend to underperform.

Keywords: *farmers' aging; farms' succession; intra-family transmission.*

1. Introduction

The inter-generational turnover in agriculture is a fundamental issue on the political agenda of the European Union (EU). According to Eurostat data, only 6% of European farmers are thirty-five years old or less, while more than half of them are fifty-five or older (European Commission, 2011). The situation in Italy is even worse: according to the 6th Agricultural Census, only 5% of people under thirty-five choose to invest in agriculture, while farmers beyond sixty-five are more than 37% (ISTAT, 2010). The shortage of young entrepreneurs may create serious problems to the productivity and survival of the agricultural sector. It is a widespread opinion, in fact, that a larger proportion of young entrepreneurs in the sector would contribute to improving the productivity of agricultural enterprises by increasing human capital and encouraging adoption of innovation, and long-term investment. Starting from such considerations, the European Union has introduced a number of new initiatives to promote the establishment of young farmers in the Rural Development Program 2007-2013. However, the rejuvenation of the class of farm managers may have different effects on the productivity of agricultural enterprises, depending on the way young entrepreneurs enter the sector, whether by inheriting the farm from their family or by acquiring it on the market.

There is a large body of literature focusing on costs and benefits of family firms (Bertrand and Schoar, 2006). On the one hand, transmitting farms within the family promotes the accumula-

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tion of farm-specific knowledge related to the weather, the quality of soil and the type of crops and breeding that best fits them. On the other hand, the ability to follow scientific, technological and organizational progress successfully relates more to knowledge acquired through a formal education than to farm-specific learning by doing. In addition, the inter-generational transmission of the farm within the family might not ensure the selection of the most talented entrepreneurs, and the prevalence of emotional issues might be in conflict with the objectives of business efficiency. Since both positive and negative effects may occur simultaneously, it is an empirical matter to establish which prevails and whether the development of a sector characterized by a large proportion of family businesses is a signal of strength or of weakness. This issue seems to be particularly relevant for Italian agriculture, where the existence of strong barriers to entry, such as the high investment required to start the business, the difficulty of access to bank credit and the low propensity to rent land (Corsi, Carbone and Sotte, 2005), discourage prospective young entrepreneurs from entering farm activity and the almost exclusive channel of entry into the agricultural sector is the intra-family transmission of farms.

In this paper, we test the influence of the farmer's age and intra-family succession on the economic performance of Italian farms. Using cross-section data collected by the Farm Accountancy Data Network (FADN) in 2009, we find that younger farmers tend to perform above the average (overperform). This finding suggests that factors related to higher human capital accumulation and propensity for technological innovation prevail over their lack of field experience, while the poorer results achieved by the oldest farmers highlight their inability to seize market opportunities and to adopt innovations.

With regard to the mechanisms of ownership acquisition, we find that, on average, inherited farms tend to underperform. In particular, we show that the propensity to diversify the farm's activity in related businesses such as agritourism, and to enroll in the most innovative market niches, such as the organic industry, are higher for non-inherited farms than for inherited ones. At the same time, the percentage of farms that do not receive extra income from non-agricultural activities is greater for those not inherited¹. Finally, we find that the different performance of inherited and non-inherited farms does not depend on the level of education of the farmer, suggesting that intra-family succession may select less talented farmers.

The rest of the paper is organized as follows. In Section 2 we briefly present the relevant literature. In Section 3 we describe our model of empirical analysis, the data we use and the results we obtain. In Section 4 we discuss some policy implications. Finally, in section 5 our conclusions are presented.

2. Review of the literature

The structure of the agricultural sector in Italy, and also in other European countries, is characterized by two major features: the dramatic aging of farmers and the large number of family farms. Although the literature has dealt with these two issues, the question of the impact they have on the economic and financial performance at farm level and, consequently, on the survival and productivity of the sector has not yet been fully explored.

¹ Typically, farms supplement their income by engaging in businesses other than agriculture when they are not able to survive through farming alone and this is a signal of likely exit from the sector (Weiss, 1999; Stiglbauer and Weiss, 2000; Simeone 2005)

2.1. Farmers' age and farm performance

To the best of our knowledge, there are only a few studies providing statistical evidence on the impact of farmers' age on farm performance. Weiss (1999) focuses on the determinants of farm growth and survival in Austria between 1985 and 1990, finding a non-monotonic, inverted U-shaped relationship with the age of the farmer. He argues that learning by field experience in years following the birth or transfer of the business causes the expansion of farms managed by younger entrepreneurs. By contrast, the shorter time horizon of old farmers reduces the prospective gains from growth, inducing a less intensive farm governance as their age increases, so justifying the negative slope of the curve. Kimura and Le Thi (2013) analyze the economic results of many types of farm businesses in nine OECD countries for the period 2004-2009 and find that, in addition to farm size, the younger age of the farm manager explains a great part of variability in performance.

With regard to Italian farms, the results do not clearly indicate the sign of the relationship. Russo and Sabbatini (2001) examine the performance of over 58,000 farms of the Istat sample in 1998, and find a negative relationship between farmers' age and the average standard gross margin per hectare of utilized agricultural area (UAA). Similarly, Corsi (2009), using ISTAT census data on farm businesses operating in the Piedmont region in 2000, shows that the standard gross margin is negatively correlated with the age of the farmer. In the same vein is the paper of Mazzieri and Esposti (2005) on 786 commercial farms of the Marche region, included in the FADN sample in 2003: according to the authors, entrepreneurs aged under 35 manage firms that have the largest economic dimension; furthermore, they invest more in their businesses than their elder competitors. While Giarè and Vagnozzi (2012), exploiting the same FADN dataset but on a national scale and for the period 2008-2010, find that farms run by farmers over 40, on average, have a higher value added, with respect to farmers who are under 40. This difference in the results can be explained by the existence, also in the case of Italy, of a non linear relationship between the farmer's age and the performance of the firm. In this case the difference could not emerge clearly since results change according to which is the threshold age used to define young and old entrepreneurs. In a recent paper on the influence of the farmer's age on farm performance, Carillo (2012) finds an inverted-U shaped relationship between the farm's gross production value and the age of farmers, by confirming the existence of a non linear relationship between age and farm performance also in the case of Italy.

2.2. Succession in family farms

The second issue we face refers to the predominance of family farms usually observed in agriculture. The literature underlines that farm survival depends on inter-generational business transfer within the family (Weiss, 1999; Kimhi and Nachlieli, 2001; Glauben, Tietje and Weiss, 2002; Mishra, El-Osta and Johnson, 2004; Breustedt and Glauben, 2007; Lobley, 2010). In addition to contributing to the survival of the farm, the existence of successors within the family also contributes to the growth of the farm sector. Wherever heirs exist, founders are stimulated to invest extensively in new technologies, products and activities, and in improving organization (Perrier-Cornet *et al.*, 1991; Kimhi, Kislev and Arbel, 1995; Potter and Lobley, 1996; Calus *et al.*, 2008), while farms without successors tend to be managed less intensively, with production in decline, to the level that merely ensures the farmer's subsistence when he retires (Symes, 1973). Some other studies also show that succession encourages the purchase of agricultural land (Harrison, 1981; Hutson, 1987), reduces farmers' risk aversion (Stiglbauer and Weiss, 2000; Viaggi *et al.* 2011), and favors expansion into new business (Sottomayor, Tranter and Costa, 2011).

Agricultural economists explain the development of family farms on the basis of the greater return through “farm-specific knowledge” that farmers acquire by experience in the field, and transmission of technical and tacit expertise within the family. However, there are only a few studies in the literature analyzing the effects of accumulated experience on the economic performance of farms. Laband and Lentz (1983), for example, find evidence of a significant and positive difference between profit on inherited and on non-inherited farms in the U.S. Rosenzweig and Wolpin (1985) empirically test the hypothesis of family farms overperforming in developing countries and find that the accumulation of land-specific knowledge becomes particularly important in periods of more adverse weather conditions.

The study realized by McNally (2001) relative to 24 European regions, confirms the higher performance of inherited farms. However, the advantage enjoyed by heirs in the first years following the take-over is cancelled out after 15 years. This suggests a hypothesis of diminishing returns to experience, a question that seems to matter more in recent years. According to Huffman (2001), in most advanced economies, where business success depends on factors such as the professional and management capacities of the entrepreneur, her/his propensity to adopt innovation and ability readily to exploit market opportunities, the benefits from accumulated experience are uncertain, while the selection of entrepreneurs with the highest skills becomes crucial.

A large number of studies on this topic, however, has been carried out in the literature on family firms operating in manufacturing industry. A common result that emerges from these studies points to the lower performance of family firms where the successor succeeds the founder in the management and control of the firm than in those in which external CEOs are hired (Villalonga and Amit, 2006; Perez-Gonzales, 2006; Bennedsen *et al.*, 2007; Barth, Gulbrandes and Schone, 2005). Some of these papers find that successors have a lower level of education than managers from outside the family, others, that the performance gap increases when firms operate in the most innovative sectors. In sectors where innovation matters more, the selection of the best talents becomes a fundamental tool for achieving better results. Finally, a large proportion of studies questions the family firm’s organization itself, regardless of the inter-generational transmission of the business within the family. According to this line of literature, factors such as respect for family values and obligations may interfere with economic objectives; as a consequence family utility maximization might not correspond with the firm’s profit maximization (Demsetz and Lehn, 1985; Burkart, Panunzi and Shleifer, 2003, Bertrand and Schoar, 2006). For example, some authors find that family firms are generally excessively risk averse (Agrawal and Nagarajan, 1990; Gallo and Vilaseca, 1996); whenever the leading goal consists in providing a legacy to heirs, the level of investment might be lowered to avoid jeopardizing business stability, thus compromising the firm’s expansion path.

So taking into account that results shown in the literature are mixed and that different and opposite effects may follow from the family business organization and succession process, in the next section, after the age-performance analysis, we present our findings from a study in which we analyze the effect that inter-generational turnover within the family has had on farm performance in Italy.

3. Empirical analysis

The objective of this study is to investigate the influence of farmers’ age and intra-family succession on the economic performance of farms in Italy. In particular, we test two hypotheses:

1. the “young” status of farmers is positively related to the farm’s business performance;
2. the intra-family business transfer is negatively related to the farm’s economic results.

In order to find confirmation of the above hypotheses, we first examine the performance-age relationship and the performance-intra-family succession relationship, using the Student’s t-test analysis on mean differences between the economic results realized by younger and by older farmers and between those achieved by inherited and by non-inherited farms. We make this comparison by using different proxies of farm performance. This analysis gives us a first indication on the existence of differences in performance among different groups of entrepreneurs. In order to investigate what are the factors that are responsible for this result, we make a Student’s t-test analysis, where the two groups of farms, inherited and non-inherited, are compared according to the different dimensions of managerial ability, such as the human capital of entrepreneurs, their ability to innovate and to put high effort into farming. Then we proceed with an OLS regression model analysis, in which we investigate both the impact of age and of succession on farm value-added per work unit -the measure of farm productivity that we have chosen-, by considering also the effect of other characteristics of entrepreneurs’ abilities and other factors that determine the firm’s performance.

The study is carried out using data collected by FADN in 2009 on a sample of over 11,000 Italian “commercial farms²”, i.e. farms exceeding an economic size³ of €4,800. Excluding the smallest firms, the FADN sample is not completely representative of the entire universe of farms over the country, but it allows us to analyze those that operate in the most effective and efficient ways. Moreover, the dataset includes a considerable amount of information relative to the farms’ characteristics – such as the physical and economic size, the type of farming, the altimetry, the geographic location, diversification into related agricultural businesses-, relative to the features of farmers and family members – such as gender, age, education, category of labor, total farm working days, extra-income from non-agricultural activities-, relative to the production process – such as work units, physical capital use, machinery and hours of work, types of process, types of production – and, finally, relative to the public subsidies that farms receive – such as the type of subsidy and amount received. So it is very useful in exploring the effects of the variables of interest to us, i.e., the age of entrepreneurs and the channel of succession, on farm performance, since it allows control for a high number of other relevant variables.

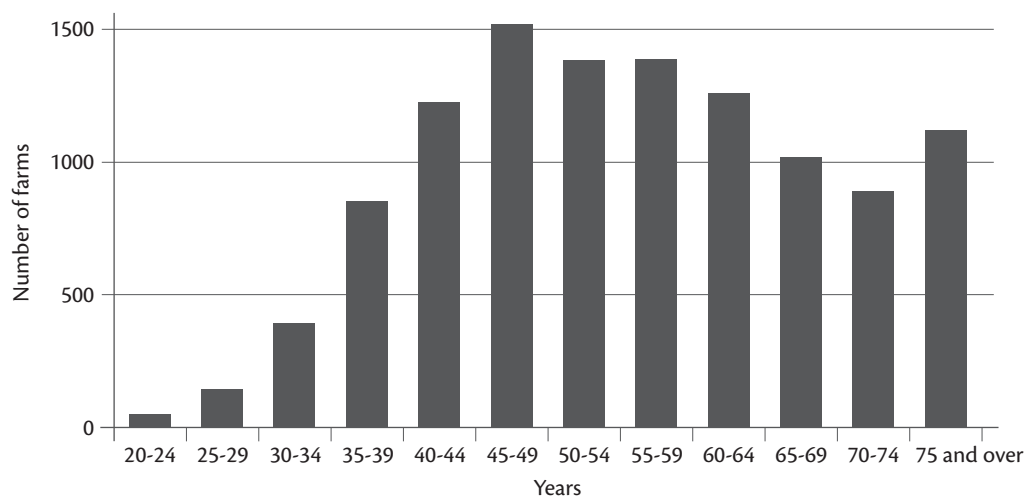
3.1. The performance-age relationship

Looking at the distribution of the FADN sample, the average age of farmers is 55 years, 14.4% of them are younger than 40, only 5.1% are aged less than 35, about 48.5% are over 55 and more than 25% are over 65. Thus, the data confirms the progressive aging of farmers in Italy as a cause for concern, due to a strong bias towards the oldest age groups, as we can see from Figure 1.

² According to Council Regulation (EC) No 1217/2009 of 30 November 2009 and subsequent amendments “A commercial farm is defined as a farm which is large enough to provide a main activity for the farmer and a level of income sufficient to support his or her family. In practical terms, in order to be classified as commercial, a farm must exceed a minimum economic size. However, because of the different farm structures across the European Union, a different threshold is set for each Member State. Consequently, the set of farms which constitute the FADN field of observation in a given country is represented by those agricultural holdings with an economic size exceeding the threshold set for that country”.

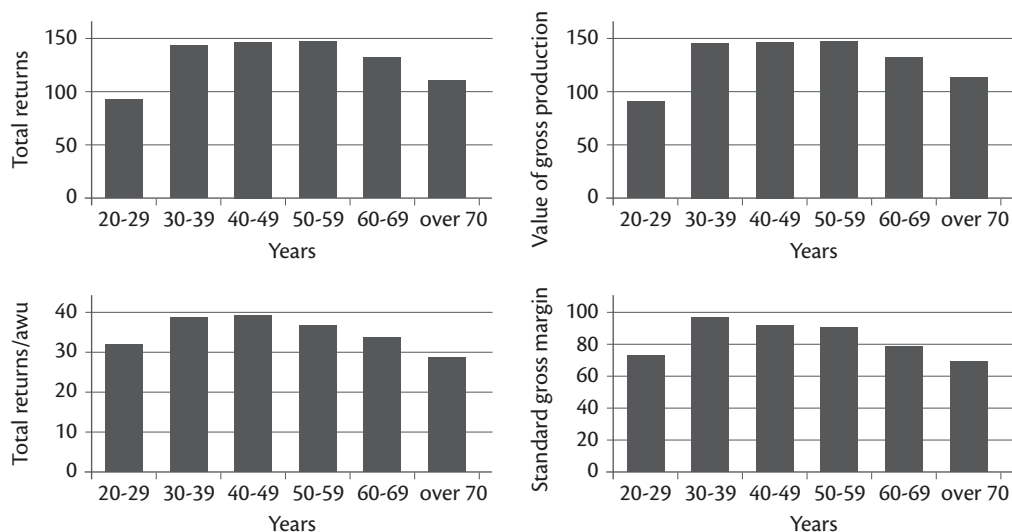
³ The economic size of the holding is expressed in terms of European Size Units (ESU). The value of one ESU is defined as a fixed number of EUR/ECU of Farm Standard Gross Margin. Over time, the number of EUR/ECU per ESU has changed to reflect inflation.

Fig. 1 - Farm distribution by age class



As we have underlined in the previous section, the results on the relationship between age and performance are not clear, since some authors find a negative relationship, while others find no evidence of such a relationship, or even a positive one. Hence, first of all we search for evidence of the type of age-performance relationship in Italy, by using a Student's t-test analysis and other descriptive statistics. In this regard, we found that, as can be seen from Figure 2, which shows the average value of the measures per age class, the relationship between farm performance and entrepreneurial age in Italy is non-linear.

Fig. 2 - Farm performance by age class (value in thousands of euro)



In particular, it is first increasing and then decreasing, reaching a sort of stability in middle size classes starting from that of “30-39 years”. Hence, we can say that before the threshold of 40 years, farmers’ age increases performance, probably because of the increasing experience and learning by doing, while after that threshold, the positive effects due to the learning activity do not compensate for the negative ones due to other characteristics, such as higher risk aversion and the lower propensity to innovate and seize market opportunities, typical of the oldest entrepreneurs. In any case, even if the type of age-performance relationship is radically different between the group of entrepreneurs aged below 40 years and that above 40 years, it is not clear which group shows the highest average performance. For this reason we split the data between entrepreneurs aged under 40 and those over 40, and compare them according to different measures of performance in order to detect which class has the larger average productivity. Results are reported in Table 1 and show that farms where farmers are aged 40 years or less overperform on average compared with those with farmers aged over 40, in terms of all the measures we use, i.e. value of gross production (column 1), standard gross margin (column 2), total returns per annual work unit -awu- (column 3), total returns (column 4), and value added (column 5).

Tab. 1 - Test on Mean Differences (t-test)§ Farm performance by farmers’ age

| | Value of gross production ^a | Standard gross margin ^a | Total Returns / awu ^a | Total Returns ^a | Value added ^a |
|----------------------------|--|------------------------------------|----------------------------------|----------------------------|--------------------------|
| Farmers aged ≤40 | 161115.8 | 107201.5 | 40404.48 | 157273.7 | 92039.73 |
| Farmers aged >40 | 131894.9 | 80379.65 | 34206.37 | 132163.7 | 76670.71 |
| Difference§§ | 29220.89** | 26821.88*** | 6198.111*** | 25109.99* | 15369.01** |
| Observations | Farmers aged ≤40 | Farmers aged >40 | All farms | | |
| | 1588 | 9618 | 11206 | | |

§ The t-test assesses whether the means of two groups are statistically different from each other
 §§ Significance: *** p<0.01, ** p<0.05, * p<0.1
^a Values in euros

In order to find some indication of why the first group shows a higher performance compared with the second one, we analyze whether some particular characteristics of entrepreneurs may explain the result. Table 2 summarizes our results.

Tab. 2 - Test on Mean Differences (t-test)§ Farm characteristics by farmer’s age

| | Education ^a | Diversification ^b | Organic ^b | Rented land ^c | Extra income ^b | II Pillar subsidies ^b |
|----------------------------|------------------------|------------------------------|----------------------|--------------------------|---------------------------|----------------------------------|
| Farmers aged ≤40 | 10.53904 | .0711587 | .0384131 | 20.48569 | .1366499 | .2978589 |
| Farmers aged >40 | 8.235888 | .0536494 | .025577 | 13.33889 | .3256394 | .1889166 |
| Difference§§ | 2.303154*** | .0175093*** | .0128361*** | 7.146802*** | -.1889896*** | .1089423*** |
| Observations | Farmers aged ≤40 | Farmers aged >40 | All farms | | | |
| | 1588 | 9618 | 11206 | | | |

§ The t-test assesses whether the means of two groups are statistically different from each other
 §§ Significance: *** p<0.01, ** p<0.05, * p<0.1
^a Completed years of schooling ^b Percentage of farms ^c Values in hectares

As expected, we find that younger farmers on average have a higher level of education, a higher propensity to diversify agricultural activities in related business and to invest in highly innovative sectors, such as organic farming. In addition, they use a higher amount of rented land, that could be interpreted as a signal of a greater effort employed in the activity of the farmer. In fact, when farmers utilize rented land for agricultural purposes, because of the higher cost implied, they are incentivated to employ more effort in entrepreneurial activities (CNEL, 2004). The results show also that younger farmers are less inclined to receive extra income from non-agricultural activities; we interpret this result as an evidence of a greater propensity of the younger farmers to invest in effort and a lower propensity to exit from the sector. In fact, according to many agrarian economists (Weiss, 1999; Stiglbauer and Weiss, 2000; Simeone, 2005), the farms that supplement their income by engaging in businesses other than agriculture demonstrate a lesser intention to sustain themselves through farming alone, and a high probability to leave the sector. Finally, from the t-test we can see that younger farmers better respond to public policies that encourage farm growth, as they are more capable of receiving public support for investments. Hence, due to their higher human capital accumulation, to their higher propensity for technological innovation and higher propensity to dedicate more effort to farming activity, as appears to emerge from our t-test analysis, younger entrepreneurs contribute to the competitiveness and growth of the agricultural sector. In this respect, the European policies that support young people's entry into the market are justified.

3.2. The performance-family succession relationship

While the study carried out so far highlights the fundamental role assumed by younger farmers in enhancing productivity and growth in the agricultural sector, we emphasize that different entry mechanisms to the sector, via the market or by intra-family succession, are non-neutral to farm performance. According to leading research on this topic, inter-generational transmission within the family could be detrimental to businesses, by failing to ensure that farms are managed in the most efficient way and that incumbents are succeeded by the most talented entrepreneurs. Table 3.a shows that on average "inherited" farms, i.e. enterprises transferred by family transmission⁴, achieve lesser economic results than non-inherited, according to all the variables we use as proxy of performance. We compare inherited and non-inherited farms in the subgroups of those whose farmers are aged 40 or less and those managed by farmers over 40. We do not find differences between inherited and non-inherited farms in the class of age "under or equal 40" (Table 3.b), while when we consider the older class, we find that the inherited farms have lower performance (Table 3.c) -the entire distribution by class of age and by type of access is reported in Figure 3. This evidence can be explained by the fact that the young successor gains an advantage over competitors who do not inherit their farms, in terms of initial investment, of farm-specific experience and of a network of relationships that the parent/founder has set up and transferred, that compensate the heirs' lesser ability in managing the farm. After the early years of setting-up, however, non-inheriting farmers acquire field experience, set up their own network of relationships and improve productivity, so that, after some time, the initial gap is cancelled out and factors related to their higher skills prevail. This can justify the lack of difference in performance for entrepreneurs aged 40 or less, and the better performance achieved at a later age by farmers that did not inherit the farm.

⁴ To identify inherited and non-inherited farms we use a dummy variable equal to one if the accession occurs by intra-family succession and zero otherwise.

Tab. 3a - Test on Mean Differences (t-test)§ Farm performance by type of access

| | Value of gross production ^a | Standard gross margin ^a | Total Returns / awu ^a | Total Returns ^a | Value added ^a |
|-----------------------|--|------------------------------------|----------------------------------|----------------------------|--------------------------|
| Inherited | 114657.8 | 77485.91 | 32577.35 | 115098.2 | 72666.91 |
| Non- Inherited | 152303 | 95990.47 | 37021.38 | 148886.4 | 87370.1 |
| Difference§§ | -37645.24*** | -18504.56*** | -4444.032*** | -33788.27*** | -14703.19*** |
| Observations | Inherited | Non-Inherited | All farms | | |
| | 3672 | 2700 | 6372 | | |

Tab. 3b - T-test§ Farm performance by type of access: farmers aged ≤40

| | Value of gross production ^a | Standard gross margin ^a | Total Returns / awu ^a | Total Returns ^a | Value added ^a |
|-----------------------|--|------------------------------------|----------------------------------|----------------------------|--------------------------|
| Inherited | 128860.8 | 89518.38 | 37559.26 | 127254.3 | 78313.44 |
| Non- Inherited | 126754.2 | 94690.63 | 33570.64 | 124108.5 | 76691.19 |
| Difference§§ | 2106.61 | -5172.245 | 3988623 | 3145.817 | 1622243 |
| Observations | Inherited | Non-Inherited | All farms | | |
| | 519 | 467 | 986 | | |

Tab. 3c - T-test§ Farm performance by type of access: farmers aged >40

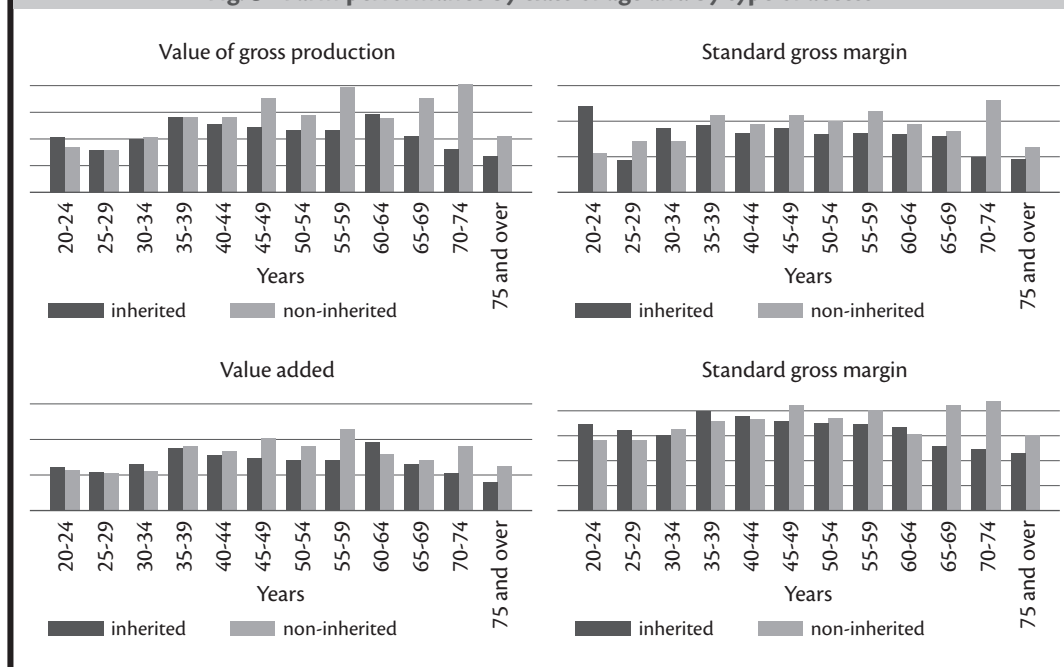
| | Value of gross production ^a | Standard gross margin ^a | Total Returns / awu ^a | Total Returns ^a | Value added ^a |
|-----------------------|--|------------------------------------|----------------------------------|----------------------------|--------------------------|
| Inherited | 111952.2 | 75505.3 | 31754.43 | 113097.2 | 70038.9 |
| Non- Inherited | 157421.1 | 96262.31 | 37743.05 | 154068.4 | 87192.34 |
| Difference§§ | -45468.89*** | -20757.01*** | -5988.625*** | -40971.19*** | -17153.45*** |
| Observations | Inherited | Non-Inherited | All farms | | |
| | 3153 | 2233 | 5386 | | |

§ The t-test assesses whether the means of two groups are statistically different from each other

§§ Significance: *** p<0.01, ** p<0.05, * p<0.1

^a Values in euros

Fig. 3 - Farm performance by class of age and by type of access



In order to detect whether entrepreneurial ability is one of the major factors that can explain the difference in performance between the inherited and non-inherited farms, or whether other family characteristics are more responsible for the result, we examine whether the two groups differ according to different dimensions of entrepreneurial ability. One of the most important dimensions of managerial skills is the human capital of the entrepreneur. In this respect, we have that, on average, there are no significant differences in a statistical sense between successors and entrepreneurs that do not inherit businesses, relative to the years of schooling completed (Table 4, column 1). However, since we believe that scientific and technological progress might have changed the value of human capital over time, providing greater incentives to invest in education to the most recent successors than to those who inherited farms in the past, we distinguish the more recent from the older intra-family business transfer, by splitting the sample into those aged 40 or less and those over 40, in order to see if differences in educational levels emerge. Results in column 2 and 3 confirm the previous findings: differences between farmers who inherited and those who did not in the past and today are negligible. Hence even if the human capital of entrepreneurs is an important dimension of managerial ability, factors other than education explain the lower performance of heirs. Another important characteristic that we analyse is the ability to innovate captured by the diversification of production and the investment in the organic sector. In this regard, as Table 4 shows, the propensity to diversify agricultural activities into related business or to enroll in the most innovative sectors, such as organic, are higher for non-inherited farms, whether farmers are young or old (as we can see from columns 2 and 3).

Tab. 4 - Test on Mean Differences (t-test)§ Farm characteristics by type of access

| Education^a | All farms | <=40 years | >40 years |
|--|------------------|----------------------|---------------------|
| Inherited | 9.026151 | 11.0289 | 8.696383 |
| Non- Inherited | 8.969596 | 11.43041 | 8.45426 |
| Difference§§ | .0565551 | -.4015051* | .2421232** |
| Diversification^b | All farms | <=40 years | >40 years |
| Inherited | .0487473 | .0558767 | .0475737 |
| Non- Inherited | .0759259 | .0899358 | .072996 |
| Difference§§ | -.0271786*** | -.0340591** | -.0254222*** |
| Organic^b | All farms | <=40 years | >40 years |
| Inherited | .0261438 | .0231214 | .0266413 |
| Non- Inherited | .0411111 | .0620985 | .0367219 |
| Difference§§ | -.0149673*** | -.0389771*** | -.0100806** |
| Extra income^b | All farms | <=40 years | >40 years |
| Inherited | .3050109 | .1233141 | .3349191 |
| Non- Inherited | .2807407 | .1156317 | .3152709 |
| Difference§§ | .0242702** | .0076824 | .0196482 |
| Rented land^c | All farms | <=40 years | >40 years |
| Inherited | 10.42661 | 17.73541 | 9.223546 |
| Non- Inherited | 19.7435 | 21.66304 | 19.34206 |
| Difference§§ | -9.316892** | -3.927626 | -10.11851*** |
| § The t-test assesses whether the means of two groups are statistically different from each other | | | |
| §§ Significance: *** p<0.01, ** p<0.05, * p<0.1 | | | |
| ^a Completed years of schooling ^b Percentage of farms ^c Values in hectares | | | |

We also consider factors indicating the entrepreneurs' effort in farming, like the use of rented land, which is higher for non-inherited farms, and the percentage of farmers engaged in extra-agricultural activities, which is lower for non-inherited farms. The differences in both characteristics indicate that non-inherited farms have a higher propensity to invest in effort. Hence, by interpreting all these variables as different dimensions of entrepreneurial abilities of farmers, the study has provided some evidence of less talented heirs as compared with farmers who enter the sector via the market, a finding that causes concern about the state of health of Italian agriculture if we consider that over 60% of the farms in the sample are inherited. Furthermore, because of a large number of missing values in the variable describing the kind of access, we suspect that the percentage of intra-family successors in Italy could be higher. In these circumstances public policies to support the entry of younger and more skilled people in the sector appear crucial.

3.3. The regression model

The above descriptive analysis has given strong indications in favor of the hypothesis that entrepreneurs under 40 years old are more productive and that the most efficient channel through which the new generations enter the agricultural sector is the market. In order to have a more complete test of this hypothesis we use an OLS regression model through which we estimate the impact of farmers' age and intra-family transmission on the economic performance of farms in Italy, by controlling for other characteristics of entrepreneurial abilities that, as we have seen in the previous section, are relevant in explaining, at least in part, the age-performance relationship

and the effects of the different channels of inter-generational transmission of farms. As measure of firms' performance, we use the value added per work unit. In particular we estimate the following model equation:

$$\text{Value added /lawu} = \alpha + \beta \text{ farmers aged} \leq 40 + \gamma \text{ inherited farms} + \delta X + \varepsilon$$

the *value added/lawu* is reported in log terms. To distinguish younger and older farmers we use a dummy variable (*farmers aged* ≤ 40) equal to one if the entrepreneur is 40 years old or younger and zero otherwise. The inherited status of farm is represented by a dummy variable (*inherited farms*) equal to one if the mode of accession is by gift or intra-family succession and zero if it occurs by purchase, lease or free loan⁵. In general, we have information on the kind of access to the farm available for only 6,372 sample units and about 60% of them (3,672 observations) consists of inherited farms. *X* indicates the vector of the other variables that affect the farm's performance. It includes measures of inputs that farms employ in their production process, such as total *physical capital value* and total *annual work units*, that are expressed in log terms. Adopting the hypothesis of diminishing returns to work units, we introduce the square of the labour variable in the regression. The amount of utilized agricultural area that farms have rented (*utilized agricultural area rented*) is used as another measure of size of enterprise. Moreover, we insert the number of family members on the farm (*family members working on the farm*) since this variable captures the strong connection between families and the businesses they run and gives indications about the probability of intra-family farm transfers in the future. We use this variable as an additional check of the impact of family organization on farm performance. The other variables in our model are a proxy for farmers' human capital, represented by their completed *years of schooling*, and dummies that account for farms' involvement in related businesses, such as agro-tourism (*diversification*), or operating in the most innovative sectors, such as the organic sector (*organic*), or that receive income from extra-farming activities (*extra-farming income*). The inclusion of these variables allows us to see whether these dimensions of managerial skills are relevant in explaining the farm's performance and if, after controlling for them, the variable *inherited farms* is still significant. If this were to be the case it would imply that they do not exhaust and do not explain all of the effect of the intra-family succession channel.

As further control variables, we have included the type of public subsidies that farms receive, since it gives information about the status of their economic health. We believe that farms that receive income support (*Pillar 1 subsidies*) might be less efficient, while enterprises that receive investment supports (*Pillar 2 subsidies*) might show better ability in creating more stable and self-sustaining firms. So we expect an opposite influence of the two variables on farm performance. Finally, we include types of farming, altimetry and region where farms are located, to take account of the particular sub-sector of production to which farms belong and of their geographical location.

3.3.1. Results

According to the results in column 1 of Table 5 (model 1), the age of farmers negatively affects the performance of Italian farms: entrepreneurs aged 40 or less overperform by about 13.3 % compared with their competitors over 40. As we can see, the coefficients of the other included

⁵ We exclude farms which are classified by the FADN questionnaire under code "98" and "99" (4,834 sample units) because we were not able to identify them with certainty.

variables have the expected signs. For some of them the impact is very strong. Apart from the physical capital value and the total annual work units, whose positive effect is straightforward, we emphasize the negative influences deriving from receiving extra-farming income and income subsidies that both reduce farms value added per work unit, respectively by about 20% and 15%. The human capital coefficient is significant and shows a positive sign, as do the coefficients of variables that indicate the propensity for innovation.

Tab. 5 - Ols Estimation (Dependent variables: Value added over total annual work units)

| Variables | (1) Model | (2) Model |
|---|--------------------------|--------------------------|
| Physical capital value | 0.451*** (0.00741) | 0.438*** (0.00992) |
| Annual work units | 0.621*** (0.0542) | 0.693*** (0.0701) |
| Annual work units squared | -0.170*** (0.0181) | -0.190*** (0.0231) |
| Utilized agricultural area rented | 0.00370*** (0.000180) | 0.00379*** (0.000245) |
| Farmers aged <=40 years | 0.133*** (0.0221) | 0.154*** (0.0281) |
| Farmer's years of schooling | 0.0152*** (0.00211) | 0.0143*** (0.00277) |
| Inherited farms | | -0.113*** (0.0214) |
| Family members working on the farm | -0.0488*** (0.00887) | -0.0502*** (0.0114) |
| Extra-farming income | -0.206*** (0.0176) | -0.194*** (0.0231) |
| Diversification | 0.0724** (0.0338) | 0.0474 (0.0428) |
| Organic | 0.0739 (0.0487) | 0.102* (0.0592) |
| I Pillar subsidies | -0.148*** (0.0225) | -0.164*** (0.0300) |
| II Pillar subsidies | 0.00335 (0.0219) | -0.0185 (0.0289) |
| Farming type | Yes | Yes |
| Altimetry | Yes | Yes |
| Regions | Yes | Yes |
| Constant | 1.919*** (0.460) | 3.754*** (0.772) |
| Observations | 11,009 | 6,260 |
| R-squared | 0.471 | 0.465 |
| Adj. R-squared | 0.469 | 0.462 |
| Dependent variable: Value added per work unit in log terms. Standard errors in parenthesis. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. | | |

The relationship between farm performance and intra-family business transmission is estimated with the model 2, where we have added to the previous model our variable of interest *inherited farms* (see column 2 of Table 5). Results show that farms that are inherited underperform by about 11.3% compared with non-inherited farms. Moreover, we find that increasing the number of family members enrolled in the family business reduces farm performance. This strengthens the results we obtained in the previous section and gives alarming warnings about the negative consequences that intra-family business transmission will cause for future productivity and growth in the agricultural sector⁶. We note that also in the more complete model (model 2), the variables that capture the particular dimensions of entrepreneurial ability are still significant and with the expected signs. Hence we can conclude that, even if the particular dimensions of entrepreneurial abilities that we have considered have the expected effects on the performance, they do not exhaust the negative effect of the intra-family succession channel. This means that our variable *inherited farms* captures other family characteristics and other dimensions of heirs' ability that can explain the result, but which constitute a still unexplored issue.

4. Policy implications

The results of our study permit us to remark on the suitability of public policies supporting younger people's entry into agriculture (measure 112).

Many reports on the evaluation of rural policy in recent years have pointed to several drawbacks arising from the previous regulations defined within the European Rural Development Policy 2000-2006. According to these, the main result achieved by the measure that stimulated younger farmers' entry into the sector was the early replacement of the incumbent by his children in the management of those family farms which were seeking funds to solve their liquidity problems. On the other side, the insufficiency of funds to cover start-up costs and/or to make the necessary investment that the business required, prevented new younger entrepreneurs from entering.

The study we have put forward in this paper highlights how the persistence of these mechanisms may be detrimental for growth and productivity in the agricultural sector. Indeed, the current European Program for Rural Development 2007-2013 has provided more effective tools for overcoming such problems, not only by promoting young people's investments in agriculture, but also by ensuring the growth of the farm over time. In this respect, the current plan involves a considerable increase in the amount of the premium for the initial setting-up of young farmers in the sector (measure 112). Submission of a business plan describing the essential stages of growth of the farm and underlining strengths and weaknesses due to the context in which the farm is located is obligatory, and finally it provides for the use of other measures of the rural program, such as advisory services, vocational training and information, diversification into non-agricultural activities, and investment for the modernization of the holding. So far, however, the effects of policy seem to be below expectations. In this respect, a recent study (Carillo *et al.*, 2013) shows that the progressive aging process of farms in Italy between the last two Agricultural Censuses has not yet stopped: as in 2000, the percentage of younger farmers in Italy is stabilized at around 10% in 2010. We believe that the new regulations should remove

⁶ We exclude farms which are classified by the FADN questionnaire under code "98" and "99" (4,834 sample units) because we were not able to identify them with certainty.

some obstacles to the proper functioning of the market and the barriers to entry for new young entrepreneurs. The difficult access to bank credit and the low propensity to rent land represent some examples of entry barriers still persisting in the agricultural sector. Under these circumstances, it is quite likely that the survival of farms and their inter-generational transmission remain firmly entrenched in traditional forms of family business, implying all the risks which have been discussed in this paper.

5. Conclusions

The dramatic aging of Italian farmers calls for and justifies the development of public actions such as those supported under the Rural Development Program 2007-2013, to promote market entry of younger entrepreneurs in the agricultural sector. In this regard, the analysis that we have carried out on the relationship between farm performance and farmers' age has shown that younger farmers would enable farms to achieve better economic results. However, the ways in which this replacement occurs affect farm performance differently. An interesting result of our research indicates that inherited farms have a lower value of performance, measured in different manners, than non-inherited farms. According to the literature regarding family firms, intra-family business transmission does not guarantee the best selection of talent; from our study it emerges that inherited farms are less capable than non-inherited ones of diversifying agricultural activities, of operating in the most innovative businesses, and, finally, of creating stable, efficient and self-sustaining companies.

The results we found cause concern about the possible consequences at macroeconomic level, especially in view of the insufficient support from the Rural Development Policy so far in increasing the setting-up of young farmers. The persistent prevalence of family farms is compromising the development of a stronger and more productive sector that could compete in the present international scenario.

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