1 **Farm succession at a crossroads: the interaction among farm characteristics, labour**

2 **market conditions, and gender and birth order effects**

3

4 **Abstract**

5 Farm succession is a relevant issue, as it is related to rural and youth migration, sustainability

6 and the ageing of the agricultural sector. Understanding the factors behind the willingness of

7 potential successors to take over the family business is crucial for farm continuity. We

8 examine the factors affecting children's likelihood of carrying on the family business in a

9 sample of 216 potential heirs of Italian horticultural farms. Using local labour market

10 conditions (income gap and employment rate) and surrounding context variables (population

11 density), we plug the farm labour migration/occupational choice theory into farm succession

12 analysis. This approach allows us to treat child succession as the opposite of the choice to

13 migrate out of the farm sector. While farm labour migration theory predicts linear negative

14 effects of labour market/contextual variables on farm transfer, we find that the income gap,

15 employment rates and population density exert both negative and positive effects on child

16 succession, according to their intensity. The pro-succession effects we find suggest that,

17 despite potential threats, the proximity to wealthy areas may represent an opportunity for farm

18 continuity and thriving. We also examine explicitly the effect of child characteristics (gender

19 and birth order), finding that male and first-born potential successors are more likely to take

20 over the family farm, in accordance with results from previous firm succession studies. This

21 finding suggests a persistence of traditional normative beliefs in the agricultural sector.

22

23 **Keywords**

24   Farm transfer

25   Farmers' ageing

26   Horticulture

27   Rural migration

28   Occupational choice theory

29

30   **Highlights**

31   Farm succession (FS) pertains to youth migration, sustainability and agricultural ageing

32   Heirs' features and local labour market/neighbouring conditions affect FS

33   FS is more likely among first-born and male children as a result of normative beliefs

34   We treat FS as the opposite of rural and agricultural labour migration

35   FS is favoured or depressed by neighbouring conditions, according to their intensity

36

37   **1. Introduction**

38   It is well known that the structure of agricultural enterprises is family-based in the majority of

39   countries around the world. According to Graeub *et al.* (2016), 98% of all farms are family-

40   based and concentrate 53% of total agricultural land. In addition, also in those areas with the

41   lowest share of family farms (e.g., South America) they represent the 82% of the total number

42   of farms. In developed countries, the share of family farms ranges from 97% of the European

43   Union (28 countries) to 63% of Australia (Bertoni and Cavicchioli, 2016a). Given the

44   prominent importance of family farming, it is evident that the perpetuation of agricultural

45   activity is mainly based on intra-family farm succession (Leonard *et al.*, 2017; Chiswell,

46   2016; Lobley et al, 2010). However such a view is challenged by some authors, that points on

47   the increasing role of new entrants in ensuring farming continuity (Joosse and Grubbström,

48   2017).

49   One of the necessary conditions for this transfer is the willingness of potential successors to

50   take over the farm business. However, there are many studies witnessing the intention of

51   young potential heirs to abandon agricultural activity and/or rural areas (Morais *et al.*, 2017b;

52   Bednaríková *et al.*, 2016; Demartini *et al.*, 2015; Chen *et al.*, 2014; Bjarnason and

53   Thorlindsson, 2006). This trend seems to be stronger for young women (Leibert, 2016;

54   Johansson, 2016), also as a consequence of the persistence of patrilineal culture in farming

55   activities (Price, 2012; Heggem, 2014). Even if rural and agricultural migration phenomena

56   do not overlap perfectly, they are undoubtedly connected, and choices and trajectories of

57   individuals and family farms are part of these patterns. A counterpart and consequence of

58   youth migration from agriculture and rural areas is the ageing of the population of farmers

59   (Duesberg *et al.*, 2017; Leonard *et al.*, 2017; Bertoni and Cavicchioli, 2016a). Such a claim is

60   supported by data (European Commission, 2012); in 2007, the ratio between young and old

61   farmers was 1 to 9 in the EU-27, even if these figures are quite scattered and differentiated in

62   each country (Zagata and Sutherland, 2015).

63   As the adoption of more sustainable and innovative farming practices is inversely correlated

64   with farm age, farm ageing induced by younger farmers' migration may lead to a lower

65   uptake of environmentally friendly farming practices (Leonard *et al.*, 2017; Gaviglio *et al.*,

66   2016; Suess-Reyes and Fuetsch, 2016; Paracchini *et al.*, 2015; Zagata and Sutherland, 2015;

67   Bertoni et al., 2011; Van Passel *et al.*, 2007). It is thus clear the relevance of farm succession

68 in slowing down youth migration from rural areas, counteracting the ageing of the farmers

69 population and promoting sustainability and innovation in the agricultural sector.

70 For the abovementioned reasons, it is relevant to analyse to what extent such transfer takes

71 place and the most relevant features that affect the probability of transfer. However, it is

72 worth noting that—so far—farm succession has been often analysed mainly in isolation with

73 respect to the wider phenomenon of agricultural and farm labour migration. Therefore, it is

74 important to highlight how external factors (such as local labour market and surrounding

75 territorial conditions) may interact with such a process.

76 Gender and primogeniture issues in farm succession have been widely explored from a

77 qualitative viewpoint (Chiswell, 2016; Fischer and Burton, 2014; Gasson et al., 1988;

78 Whatmore et al., 1987). However, the role of child gender, and especially birth order, has

79 been less frequently considered in the analysis of farm succession determinants using

80 quantitative methods (probit and logit regression), while such a topic has been examined in

81 the management/business literature on family firms' succession.

82 In this context, our paper is at a crossroads with different strands of literature. We merge

83 traditional literature on farm succession determinants (mainly at the farm level) with the

84 occupational choice theory—OCT, hereafter (Mundlak, 1978)— considering the intention of

85 potential heirs to take over the family business as a complement to searching for employment

86 outside of the agricultural sector (Bertoni and Cavicchioli, 2016b;. Olper et al, 2014). In doing

87 so, we make explicit the role played by the local labour market, the farm location and the

88 territorial features surrounding the farm in the intention of potential heirs to take over the

89 farm rather than to search for a non-farm job. As a further contribution to the existing

90 literature, we make explicit the effect of the birth order and the gender of potential successors

91 in the choice of taking over the family business (Ahrens *et al.*, 2015; Sharma and Irving,

92 2005; Chrisman *et al.*, 1998). We analyse such effects and interactions in a sample of Italian

93 horticultural farms using logistic regression and looking for nonlinear effects.

94 The reminder of the paper is structured as follows: Section 2 presents the three pieces of

95 literature (traditional farms succession determinants; occupational choice theory (OCT); birth-

96 order and gender effect in management/business) on which the paper is based; Section 3

97 illustrates the data, the variables and the applied methodology; Section 4 reports the main

98 results, which are discussed in Section 5; and Section 6 concludes.

99

100 **2. Family farm succession analysis, the occupational choice, birth order and gender: a**

101 **brief review**

102 Recently, there has been a growing field of literature focusing on various aspects related to

103 intra-family farm succession: the intra-family dynamics underlining the succession process

104 (Falkiner *et al.*, 2017; Fischer and Burton, 2014), the intention and/or reluctance of elder

105 farmers to retire (Conway *et al*., 2017; Conway *et al*., 2016), the identity and intention of

106 potential farm successors to take over the family business (Morais *et al.*, 2017a; Morais *et al.*,

107 2017b), the potential post-succession farm strategies (Ohe, 2017; Suess-Reyes and Fuetsch,

108 2016), and public policies affecting succession (Corsi, 2017, Mishra and El-Osta, 2008).

109 Within such a broad topic, there is a long-established tradition of analysing the determinants

110 of intra-family farm succession using an empirical approach, mainly at the farm level (Dudek,

111 2016; Corsi, 2009; Kerbler, 2008; Mishra and El-Osta, 2008; Glauben *et al.*, 2004; Kimhi and

112 Nachlieli, 2001; Stiglbauer and Weiss, 2000).

113 However, the availability or the intention of each child to succeed the family farm has been

114 rarely investigated (Cavicchioli *et al.*, 2015; Aldanondo Ochoa *et al.*, 2007; Mann, 2007;

Simeone, 2006). Using child-level data allows for the measurement of the effect of potential successors' characteristics on the probability of intra-family transfer. These features provide additional information, along with farm and farmers' characteristics. In greater detail, Mann (2007) tested the effect of individual and environmental factors on the potential heirs' willingness to take over the family farm in a sample of 454 male and female children in Switzerland. Male children's willingness was higher among those having at least a high school diploma and an increasing number of sons, while it was reduced by the amount of land owned. In line with previous farm-level analysis, Simeone (2006) found a negative relationship between child gender (female) and her probability to take over the family farm. In the same study, based on a sample of 225 farm children, farm holder education level (graduation), work intensity (full-time), and the share of rented land increased the probability of succession. In a sample of 195 children from 76 Spanish households, Aldanondo Ochoa *et al.* (2007) tested the determinants affecting child involvement in the farm (working full-time, part-time or not working) using an ordered logit model. They found that child education, the number of children in the household, farm acreage and the distance between the farm and the closest city discourage against the decision to work on the farm. They also found a nonlinear U-shaped relationship between child age and on-farm employment. Finally, Cavicchioli *et al.* (2015) examined which elements increase the probability of a child taking over the farm in a sample of 193 apple farm children in a northern Italian mountain region. Consistent with the findings of other authors, a lower succession probability (-19%) was found for female children. A negative effect was also noted based on the number of children on the farm (-5.8% for any additional child) and by children's education (high school diploma). On the other hand, farmer education (at least high school) increased the willingness of heirs to take over the farm by 14.6%.

139   Even if the likelihood of intra-family succession is influenced by internal factors linked to the

140   farm and family members' features, an important role may also be played by the territorial

141   and socio-economic context in which each farm operates. Particularly, two contextual factors

142   are worthwhile to investigate in relation to the farm succession: the rural-urban relationships

143   and the surrounding labour market conditions. Both of these factors may provide incentives or

144   disincentives to keep working in the farming sector (generally in the family farms) or to

145   migrate out of it. These incentives depend on the probability of finding an alternative non-

146   farm employment, a higher income, and, more generally, a better quality of life in urban

147   areas.

148   The relationship between farm succession and surrounding territorial socio-economic

149   conditions has not been deeply investigated, with some exceptions. Aldanondo Ochoa *et al.*

150   (2007) found an inverse relationship between the distance from the closest urban centre and

151   the succession probability. In a farm-level analysis, Corsi (2009) found a direct effect of the

152   relative labour size of the local agricultural sector on in-farm child employment and an

153   opposite effect of the regional employment rate. In general, using variables describing local

154   labour market conditions allows for the examination of intra-family farm transfer as a

155   complemental phenomenon with respect to out-farm labour migration. In fact, farm

156   succession may be considered a result of occupational choice made by potential heirs.

157   Following OCT (Larson and Mundlak, 1997; Barkley, 1990; Mundlak, 1978; Todaro, 1969),

158   the decision of farm household members to keep working in the agricultural sector depends

159   on their expectations to maximize personal welfare. The key factors considered to make this

160   choice are the income differential between the agricultural and non-agricultural sectors and

161   the probability of finding a job in the non-farm sector. This probability depends, in turn, on

162   the unemployment rate and the relative size of the non-agricultural sector (often approximated

163   by the population density). Applying OCT, Olper *et al.* (2014) found that out-farm labour

164   migration depends on the variables related to labour market conditions (share of agriculture in

165   the total labour force, unemployment rate), the income gap between agriculture and other

166   sectors and the population density. Alasia *et al.* (2009) found similar results, testing the role

167   of the same factors (except for income gap) in modelling off-farm labour choice in Canada.

168   Following these authors, we chose to test such factors in our analysis on farm children

169   succession.

170   In the current literature on farm succession, the role of birth order of potential heirs has not

171   been yet explored. On the other hand, this aspect is analysed in many studies on firm

172   performance and succession in the business and management domain.

173   Stavrou (1998) individuates four categories of factors influencing the decision process behind

174   the involvement of a child in her/his family firm: family, business, personal, and market

175   factors. Among family factors, which describe the interactions/relationships/dynamics among

176   family firm members, birth order assumes a prominent role in the decision process of

177   succession. Generally, first-order children tend to be more favoured in succession. There are

178   several explanations for this finding. Goldberg and Wooldridge (1993) report that first-born

179   children are more likely adopt their parents' beliefs and wishes, tending to identify themselves

180   with the previous generation's behaviour. However, this issue is also strictly linked with

181   family and social values and beliefs. In fact, as primogeniture remains again a distinctive

182   feature of many cultures in spite of meritocracy, the decision to pass control of the firm to the

183   first child may also be influenced by normative social concerns (Brockhaus, 2004; Chrisman

184   *et al.*, 1998). Sharma and Irving (2005) propose four bases of successor commitment, namely,

185   the affective (based on personal desires), the normative (based on a perceived sense of

186   obligation), the calculative (based on perceived opportunity costs) and finally, the imperative

187   (based on perceived firm needs). Particularly, the relations between gender, birth order and

188   succession pertain to normative commitments, as it can be seen as a sort of obligation of the

189 male heirs towards the family firm to prosecute the family business. This obligation can be

190 grounded in familial norms related to the birth order of potential heirs, but in many cases,

191 primogeniture could be socially institutionalized, being a popular practice that is difficult to

192 overcome (Sharma and Rao, 2000). Furthermore, primogeniture may be strictly linked with

193 norms related to the heir's gender. In a survey of Danish firms, Bennedsen *et al.* (2007)

194 reports that primogeniture is often practised in relation to a male-line succession. Falkiner *et*

195 *al.* (2017) reach a similar conclusion after interviewing a sample of Australian family firms.

196 One of the main contributions that highlights the role of birth order of potential successors is

197 given by Schenkel *et al.* (2016), who examines the relationship between the choice of

198 successor and performance in a sample of Korean family firms. In their study, Schenkel *et al.*

199 (2016) find that the attribution of managing responsibilities to successors in family firms is

200 directly linked with the birth order of potential heirs, clearly favouring the first child at the

201 expense of the next ones. This phenomenon is explained by the long-term reciprocity between

202 the first-born potential heir and her/his parents, increasing the likelihood of the internalization

203 of their values and the persistence of cultural norms related to primogeniture. The higher

204 propensity of the first son with respect to other successors to adopt well-established family

205 values and business vision may translate into a conservative and non-innovative behaviour of

206 the young firm manager. In many cases, as detected by the same authors, this practice has a

207 negative influence on firm performance, such that the first-child successor is more likely to be

208 subsequently replaced in leading the firm than in situations in which the management of the

209 firm is inherited by other siblings. Authors ascribe this result to a greater openness of non-

210 first-child successors towards non-familial governance resources and external meritocracy.

211 Finally, in reviewing the past literature on succession in family firms, Nordqvist *et al.* (2013)

212 suggest focussing on the birth order of descendants, as it is a relatively unexplored topic.

213   Given the abovementioned background literatures, the contribution of the present paper is

214   threefold: *i)* we nest OCT in farm succession analysis, making explicit the role of local labour

215   markets and surrounding conditions in the propensity of potential heirs in carrying out the

216   family business, and in doing so, we build upon and extend previous contributions, such as

217   those of Corsi (2009) and Olper et al. (2014); *ii)* following the management and business firm

218   succession literature, we test the role of gender and birth order on the willingness to take over

219   the family farm; *iii)* we test to what extent gender, birth order effect and local labour market

220   conditions interact and play a role in the probability of potential successors to continue in the

221   family business.

222

223   **3. Data and variables**

224   We analyse the willingness of children to take over the family farm in its main determinants

225   using survey data collected in 2010 among 362 farms associated with the most important

226   consortium of horticultural producer organizations (POs) in Italy (AOP UNOLOMBARDIA).

227   This sample covered approximately 95% of farms belonging to that consortium, and they

228   were located in 5 Italian regions (Lombardy, Piedmont, Veneto, Emilia-Romagna and

229   Campania). Considering this area of interest, our sample represents 8% of farms specialized

230   in horticulture. Among these farms, 41.5% were specialized in ready-prepared fresh

231   vegetables (RPFV), while the others were dedicated to fresh, frozen or semi-processed

232   vegetables. The RPFV sector is regarded as excellent in the Italian horticulture landscape,

233   with different features with respect to other horticultural farms. As RPFV incorporate a large

234   amount of services and value added, they need large investments and a continuous propensity

235   towards innovation to be produced. Consequently, a strict integration among farms and

236   processors/retailers along the supply chain has interested the RPFV sector, along with a

237   clusterization of farms into specific POs, whose main task is to meet higher quality standards

238   required by retailers and to improve coordination within the supply chain. According to

239   specific analyses (Casati and Baldi, 2011), RPFV farms were located mainly in two regions

240   (Lombardy and Campania) and consisted of approximately 700 specialized farms in 2010.

241   Thus, our sample represents 21.5% of RPFV farms. In this sense, our sample is not random

242   and overrepresents RPFV farms.

243   Starting from a sample of 362 horticultural farms, we used a sub-sample of 147 farms, in

244   which the age of the farm manager was at least 50 years and there was at least one child aged

245   15 years old or over. There were 267 children aged at least 15 years, who represented the

246   object of our analysis. Due to a lack of data for some variables, the number of children fell to

247   216, belonging to 118 farms.

248   The survey was not conceived to investigate the farm succession issue; rather, it was created

249   for self-informative purposes of AOP UNOLOMBARDIA[1]. However, it provides useful

250   information about children's willingness to prosecute their family business, along with factors

251   that are potentially influential in farm succession according to the literature (Bertoni and

252   Cavicchioli, 2016a). From survey data, we extracted a set of information on children, farm

253   holders and farm characteristics. All variables were coded at the child level, representing the

254   statistical unit of our analysis. We integrated such data with specific variables representing the

255   surrounding labour market and demographic conditions. These last variables were calculated

256   at the Local Labour System level. The Local Labour System is an Italian statistical territorial

257   unit, as defined by ISTAT (Italian Institute of Statistics), corresponding to a group of

258   municipalities having homogeneous features in terms of labour market conditions.

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[1] For further details and analysis on both AOP UNOLOMBARDIA and on the self-informative analysis see Frisio *et al.* (2012)

259 Different strategies may be adopted to assess whether intra-family succession takes place

260 (Bertoni and Cavicchioli, 2016a, b). In fact, farm succession is directly observable only

261 following the behaviour of the same farms over time, for example, through different series of

262 agricultural census data (Stiglbauer and Weiss, 2000; Kimhi, 1994). A second-best alternative

263 is to assume that a farmer's children currently working in the farm will take it over (Corsi,

264 2009; Aldanondo Ochoa *et al.*, 2007; Kimhi and Nachlieli, 2001). Another alternative is to

265 collect information on the expectations of the farm holder and/or potential heirs about the

266 farm succession process (Cavicchioli *et al.*, 2015; Kerbler, 2008; Aldanondo Ochoa *et al.*,

267 2007; Mann, 2007; Simeone, 2006; Kimhi and Nachlieli, 2001).

268 Given the cross-sectional nature of our survey, we chose the last option. As mentioned above,

269 we took advantage of a survey not specifically designed for farm succession analysis but that

270 nonetheless registered information on this topic. In particular, all the information on human

271 capital, family labour and orientation to farm succession have been provided by a single

272 interviewed person for each farm, usually the farm holder. This subject has been asked about

273 the orientation to take over the farm for each child in the family. We are aware that this

274 statement represents only a proxy of farm succession and that the expectations of the farm

275 holder and/or children do not always turn in farm succession, as reported by Väre *et al.*

276 (2010). However, according to other authors (Lobley *et al.*, 2010; Errington, 1998), the

277 succession process takes place in a progressive fashion (*succession ladder*); this process may

278 reduce the bias of using self-declared intention of potential heirs as a proxy of their future

279 actual choice. In the sample of 216 children, 89 of them were declared to be willing to

280 continue parental activity on the farm, with a child succession rate of 41.2%.

281 The list of variables used is reported in Table 1, while Table 2 provides descriptive statistics.

282 For each variable, previous studies using the same or similar variables and their estimated

283 effects on farm succession are reported. For contributions for which the dependent variable

284 was out-farm migration, the effects have been normalized with respect to farm succession.

285

286 *Table 1 – Data and variables*

Category	Variable	Definition	Unit of measurement	Previous studies using similar variables and their effect (+/-) on succession[1]
Dependent variable	Succession	Child is oriented to take over the farm	1=yes; 0=no	
Child	Child gender	Gender of the child	1= female; 0=male	Simeone (2006) (-); Cavicchioli *et al.* (2015) (-)
Child	Child age	The age of the child	Years	Aldanondo Ochoa *et al.* (2007) (US)
Child	Child order	The child order among farm holder children	1=the child is the first child of the farm holder; 2=the child is the second child of the farm holder; etc.	Stavrou (1998) (-); Schenkel *et al.* (2016) (-)
Farm and farmer	Farmer degree	Farmer has a degree	1=yes; 0=no	Simeone (2006) (+) Bertoni and Cavicchioli (2016b) (-)
Farm and farmer	Farm children	The number of children aged at least 15 years in the farm	Number of children	Aldanondo Ochoa *et al.* (2007) (-); Cavicchioli *et al.* (2015) (-); Mann (2007) (+)
Farm and farmer	Farmland	The area of the farm	Number of hectares	Aldanondo Ochoa *et al.* (2007) (+); Glauben *et al.* (2004) (+); Kihmi and Nachlieli (2001) (-)
Farm and farmer	Farm duration	Years since the farm foundation	Years	Bertoni and Cavicchioli (2016b) (+)
Farm and farmer	RPFV farm	The horticultural farm belongs to the ready prepared fresh vegetables (RPFV) branch	1=yes; 0=no	Kihmi and Nachlieli (2001) (-); Bertoni and Cavicchioli (2016b) (+)
Farm and farmer	Turnover_250	The farm annual turnover is over 250,000 EUR	1=the farm annual turnover is over 250,000 EUR; 0=otherwise	Corsi (2009) (+); Mishra and El-Osta (2008) (+); Aldanondo Ochoa *et al.* (2007) (+); Kerbler (2008) (+);
Farm and farmer	Growth	The farm annual turnover is growing over that of 2005	1= the farm annual turnover is growing over that of 2005; 0=otherwise	Mishra and El-Osta (2008) (+)
Farm and farmer	Distance	Distance from the headquarter of the producer organization	km	Aldanondo Ochoa *et al.* (2007) (-)

Farm and farmer	Rented land	Share of rented land on the total farmland	%	Simeone (2006) (+); Mann (2007) (+); Glauben *et al.* (2004, 2009) (-)
Farm and farmer	Emplwork	Share of hired workdays on total annual workdays in the farm	%	Kerbler (2008) (-)
Farm and farmer	Farm_costs/worker	The total farm production costs per worker	Thousands of euro per worker	Glauben et al. (2009) (-); Mishra and El-Osta (2008) (-)
Labour market and surrounding conditions	Popdens	The population density at the Local Labour Systems level	Inhabitants per sqkm	Alasia et al. (2009) (+); Olper et al. (2014) (-)
Labour market and surrounding conditions	Empl	The employment rate at the Local Labour Systems level	%	Corsi (2009) (-); Barkley (1990) (+); Alasia et al. (2009) (-); Olper et al. (2014) (+)
Labour market and surrounding conditions	Agrshare	The share of agricultural employment on total employment at the Local Labour Systems level	%	Barkley (1990) (-); Larson and Mundlak (1997) (-); Corsi (2009) (+); Olper *et al.* (2014) (+)
Labour market and surrounding conditions	Incgap	Income gap between non-agricultural sectors and agricultural sector in each province (NUTS 3). Income is measured as the ratio between gross value added of the sector and workers in that sector	Thousands of euro	Barkley (1990) (-); Larson and Mundlak (1997) (-); Olper *et al.* (2014) (-)
Labour market and surrounding conditions	Hills	Farm is located in the hills	1=yes; 0=no	Corsi (2009) (+); Glauben *et al.* (2004) (-)
Labour market and surrounding conditions	Regional dummies	Farm is located in a specific NUTS 2 region	1=yes; 0=no	

[1] Abbreviations for nonlinear effects. BS: nonlinear bell-shaped. US: nonlinear U-shaped

Among children's characteristics, we consider gender, age and birth order of each potential heir. Farm and farmer characteristics include variables related to the physical and economic dimension of the farm—represented by *farmland* and *turnover_250*, respectively—and its duration (*farm duration*). We also tested variables related to the share of hired land and labour (*rented_land* and *emplwork*) and farm efficiency, directly measured by the variables *farm_costs/worker* and *growth* and, more indirectly, measured by the variable *distance*. As

295   additional variables, we consider the education level of the farm holder and whether a farm is

296   RPFV.

297   Among surrounding characteristics and labour markets features, we include in the model

298   variables previously used in papers on employment choice between the non-farm and farm

299   sectors (Olper *et al.*, 2014). In particular, we test the hypothesis that a wider income

300   differential (*incgap*) between the agricultural and non-agricultural sectors increases the

301   opportunity cost to remain in the farming sector, thus reducing farm transfer probability. As

302   the probability of finding non-agricultural employment is also influenced by the relative size

303   of the sector, we added a variable representing the share of agriculture on total employment

304   (*agrshare*). Theoretically, the bigger the share of the agricultural workforce in the examined

305   area, the lower the probability should be of finding a job in other economic sectors. The same

306   effect can be exerted by the employment rate (*empl*), which should increase the probability of

307   finding an alternative job outside the family farm. Finally, an increasing population density

308   (*popdens*) would reduce the transaction cost of finding an alternative job in the surrounding

309   area, thus increasing the probability of succession. The last variable also approximates the

310   degree of urbanization in the area around the farm, allowing for the examination of the effect

311   of rural-urban linkages on children's succession. Therefore, the inclusion of population

312   density allows for the connection of occupational choice, farm succession, and farm

313   adaptation to the rural-urban interface (Inwood and Sharp, 2012; Zasada, 2011; Zasada *et al.*,

314   2011).

315

316   *Table 2 – Descriptive statistics of variables used in the analysis of farm succession*

Variable	Total children (cases=216)	Children without succession (cases=127)	Children with succession (cases=89)

	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Succession	0.41	0.49				
Child gender	0.40	0.49	0.54	0.50	0.21	0.41
Child age	27.43	9.26	27.17	8.82	27.80	9.88
Child order	1.66	0.85	1.72	0.87	1.57	0.82
Farmer degree	0.09	0.28	0.12	0.32	0.04	0.21
Farm children	3.19	1.78	3.01	1.62	3.44	1.97
Farmland	38.44	43.50	36.21	33.55	41.62	54.71
Farm duration	32.25	23.65	29.91	21.74	35.60	25.89
RPFV farm	0.42	0.49	0.28	0.45	0.61	0.49
Turnover_250	0.50	0.50	0.40	0.49	0.64	0.48
Growth	0.33	0.47	0.35	0.48	0.30	0.46
Distance	68.74	150.78	74.44	158.18	60.60	140.01
Rented land	43.05	41.92	42.15	41.12	44.33	43.24
Emplwork	43.24	34.06	39.54	35.10	48.52	31.97
Farm_costs/worker	24.30	53.36	-23.15	49.95	-25.93	58.14
Popdens	439.88	517.09	387.66	538.42	514.40	478.14
Empl	47.09	5.09	46.92	4.78	47.33	5.52
Agrshare	6.21	4.02	6.79	4.30	5.38	3.44
Incgap	24.97	4.90	25.10	5.54	24.80	3.85
Hills	0.05	0.22	0.03	0.18	0.08	0.27
Campania Region	0.25	0.43	0.22	0.42	0.28	0.45
Piemonte Region	0.13	0.33	0.19	0.39	0.03	0.18
Veneto Region	0.05	0.21	0.05	0.21	0.04	0.21
Lombardia Region	0.55	0.50	0.51	0.50	0.60	0.49
Emilia-Romagna Region	0.04	0.19	0.03	0.18	0.04	0.21

317

4. Methodology

The declared intention of each potential heir in the family farms to take over the business represents our dependent variable, which is dichotomous (1=yes, 0=no). The shortcomings of and justifications for using such variable are presented in Section 3. Given the binary nature of our dependent variable, we use logit regression to estimate whether and to what extent some variables of interest (birth order, farm/farmer characteristics and labour market conditions) affect the likelihood of potential successors to continue farming (Scott Long and Freese, 2014).

326   The estimated effects of such relevant factors are computed, accounting simultaneously for

327   the influence exerted by other covariates on the intention of taking over the family farm

328   (*ceteris paribus*). The estimated effects (sign and magnitude) and their statistical significance

329   on the willingness to continue farming are reported in the second and third columns of Table

330   3. The meaning of logit estimated parameters is not straightforward. For this reason, in Table

331   3, along with this information, we report two additional effects of the covariates on farm

332   succession probability: the marginal effect at the means (MEM) and a semi-elasticity.

333   The MEM measures the probability change that a potential successor continues the family

334   activity, as a consequence of a 1-unit change in the independent variable for which it is

335   computed. When that variable is continuous/discrete, this change in probability is computed

336   starting from the mean value of the variable of interest and keeping all the other covariates at

337   their mean values, while when the explanatory variable is dichotomous, the MEM expresses

338   the effect on probability caused by a change in the state of the variable (e.g., from male to

339   female potential successors), with all other covariates at their mean values.

340   Obviously, a change in the status of a dichotomous variable is far stronger than a 1-unit

341   change in a continuous variable. For this reason, the change in probability caused by a 1-unit

342   change in a continuous variable (e.g., *farmland*, *distance*, *emplwork*) is not comparable with

343   that caused by a change in the status in a dichotomous or a strongly discrete variable (e.g.,

344   *child_gender, farmer_degree, child_order*).

345   To assure comparability among the effects of different variables, we provide an additional

346   indicator of probability effect: the semi-elasticity, measured as the probability change for a

347   1% increase in continuous and slightly discrete variables (last column of Table 3). This

348   indicator makes the effects of continuous and slightly discrete variables comparable both in

349   terms of unit of measurement and in terms of magnitude.

350 According to the aforementioned OCT and its recent applications to European agriculture

351 (Olper *et al.*, 2014), local labour markets and surrounding conditions affect decisions to leave

352 the agricultural sector in a linear manner; in particular, agricultural labour migration is

353 fostered by increasing levels of the income gap between the agricultural and non-agricultural

354 sectors, decreasing levels of unemployment in the economy and growing levels of population

355 density. Following Bertoni and Cavicchioli (2016b), we consider potential successors'

356 willingness to succeed as a complement of their choice to migrate out of the agricultural

357 sector. For this reason, we include *incgap*, *popdens*, *agrshare* and *empl* to plug OCT into the

358 farm succession analysis. In doing so, we also test the non-linear effects of these variables by

359 entering their linear and squared terms. It is worth noting that for the abovementioned

360 variables, both the MEMs and the semi-elasticities take into account their non-linear effects.

361

362 **5. Results**

363 The influence of each explanatory variable on the probability that a child is willing to take

364 over the farm is shown in Table 3. The estimated model explains a large share of the

365 variability in the dependent variable, with a pseudo R-squared of 0.55. The percentage of

366 correct predictions is 87.5%. The variables with a statistically significant effect on the

367 probability to take over the farm are those with a $P > |z|$ value smaller than 0.1.

368

369 *Table 3 - Results of estimated logit model of farm succession*

Variables	Parameter estimates	P>|z|	Marginal effect at the means (dy/dx)[a,b]	Pr change for 1% increase in x (dy/Δ1%x)[b]
Child gender	-3.436	0.000	-42.818	
Child age	0.040	0.074	0.346	0.105

Child order	-1.043	0.000	-9.109	
Farmer degree	-2.907	0.000	-52.594	
Farm children	0.272	0.098	2.378	
Farmland	0.046	0.000	0.400	0.169
Farm duration	0.032	0.037	0.276	0.098
RPFV farm	4.898	0.000	44.543	
Turnover_250	1.452	0.007	12.672	
Growth	2.117	0.000	15.267	
Distance	-0.002	0.000	-0.021	-0.016
Rented land	-0.011	0.140	-0.097	-0.046
Emplwork	-0.024	0.040	-0.214	-0.103
Farm_costs/worker	-0.024	0.000	-0.212	-0.057
Popdens	-0.007	0.000	-0.029	-0.144
Popdens squared	0.000	0.000		
Empl	25.640	0.000	16.619	5.814
Empl squared	-0.252	0.000		
Agrshare	-0.448	0.313	-3.911	-1.555
Incgap	-3.585	0.004	6.174	1.634
Incgap squared	0.086	0.007		
Regional dummies			Yes	
Altimetry dummies			Yes	
Number of observations			216	
Log-pseudolikelihood			-65.605	
Pseudo R^2			0.552	
% of obs. correctly classified			87.5%	
Yes=1			86.1%	
No=0			88.5%	

370

All variables referred to as children's characteristics affect the probability of succession. Particularly, the birth order of farm children (*child order*) is significantly associated with succession probability (MEM of -9.11%). The interpretation of this MEM is that the succession probability decreases by 9.11% as the variable *child_order* increases by 1-point from its mean value (1.66), keeping all the other variables at their mean value. Being such discrete variable, its MEM is not informative. For this reason, we have computed the change in succession probability passing from the first to the second child (-8.12%).

Child succession probability is deeply affected by his/her gender (*child gender*), being 42.8% lower for females with respect to their male counterparts. Succession probability grows by

380   0.105% as a consequence of a 1% increase in *child age* (semi-elasticity in the last column of

381   Table 3), even though this variable is only significant at the 10% level. Unexpectedly, the

382   number of potential successors in the farm family (*farm children*) increases the succession

383   probability of each child, with a statistical significance near 10%. Moving to farm and farmer

384   characteristics, the child succession probability decreases by 52.6% when the farmer holds a

385   degree. On the other hand, this probability is higher among bigger farms both in physical

386   (*farmland*) and economic terms. For farms having a yearly turnover greater than 250,000

387   Euro (*turnover_250*), the estimated MEM is +12.7%. Also, the farm duration influences the

388   probability of succession; in fact, the older the farm, the higher the probability of child

389   succession (7.87% succession probability change between a farm founded 20 years ago and

390   another founded 50 years ago). Likewise, child succession is more likely in thriving farms. In

391   fact, the variables *growth* and *farm_costs/worker* are both statistically significant. Children

392   living on farms whose turnover has increased since the year 2005 are more likely to inherit

393   the farm (MEM=15.3%); the same finding applies to farms having lower costs per worker

394   (*farm_costs/worker*). The more distant (variable *Distance*) the farm from the headquarters of

395   the PO, the lower the child's probability of inheriting it. Furthermore, succession probability

396   is 44.5% higher among RPFV farms than other horticultural farms. The share of hired labour

397   (*emplwork*) discourages succession, while the *rented land* does not play any significant role.

398   Finally, we test the effect of the local labour market and surrounding socio-economic

399   conditions. All estimated parameters belonging to this category have a statistically significant

400   effect ($P<0.01$), with the exception of *agrshare*. Furthermore, *popdens, empl* and *incgap* exert

401   a nonlinear effect on child succession. The population density of the neighbouring region has

402   a negative linear effect and a positive effect of the squared term, yielding a U-shaped relation.

403   The regional employment rate (*empl*) presents a sizeable linear effect that seems to

404   counterbalance the negative effect of the nonlinear term, resulting in an overall MEM of

405 5.8%. Also, the relation between child succession and the income gap (*incgap*) is well

406 described by a U-shaped relation, given by a negative estimated coefficient for the variable in

407 level and a positive one for the quadratic specification. In this case, the estimated MEM is

408 +1.6%. The magnitude of the semi-elasticities (last column of Table 3) of the surrounding

409 context variables is higher than that of other covariates. Figs. 1-6 plot the effect of increasing

410 values of labour market and context variables (*popdens*, *empl* and *incgap*) on child succession

411 probability. These trends are split according to the gender (*child gender*) and the birth order

412 (*child order*) of potential successors. Note that such plots report the child succession

413 probability computed for different levels of labour market and surrounding conditions and

414 children's characteristics, keeping all the other covariates at their mean values. As this last

415 condition is unlikely, the plots have to be interpreted as indicators of trend lines rather than as

416 precise quantifications of the probability of succession. Finally, we include in the model

417 regional and altimetry dummy variables to control for unobserved territorial variability.

418 *Figs. 1,2,3,4,5 and 6 – Change in child succession probabilities (by gender and birth order)*
419 *for increasing values of population density, employment rate and income gap between the*
420 *agricultural and non-agricultural sectors (vertical red line is the mean of the variables on the*
421 *horizontal axis)*

422

6. Discussion

423
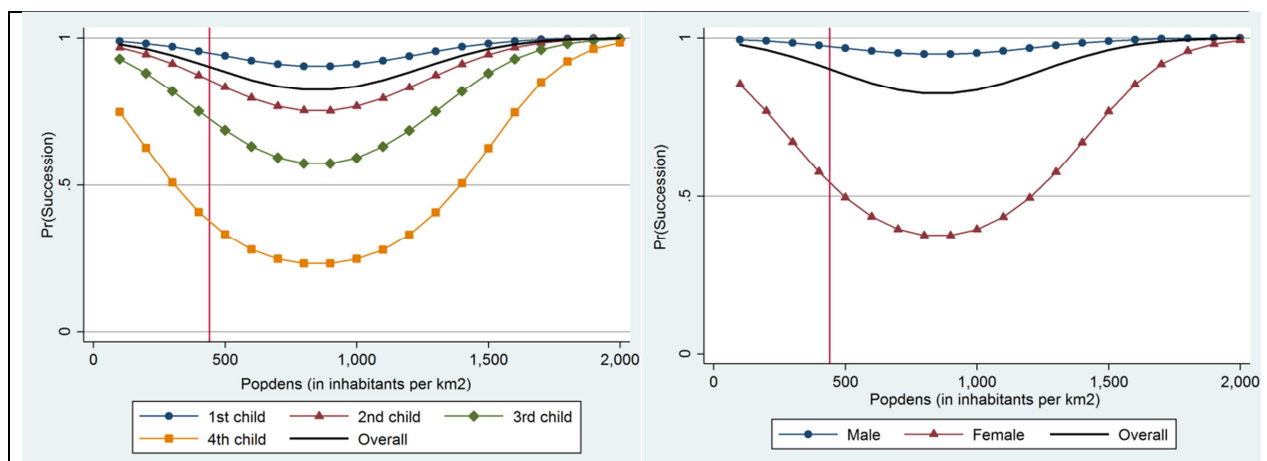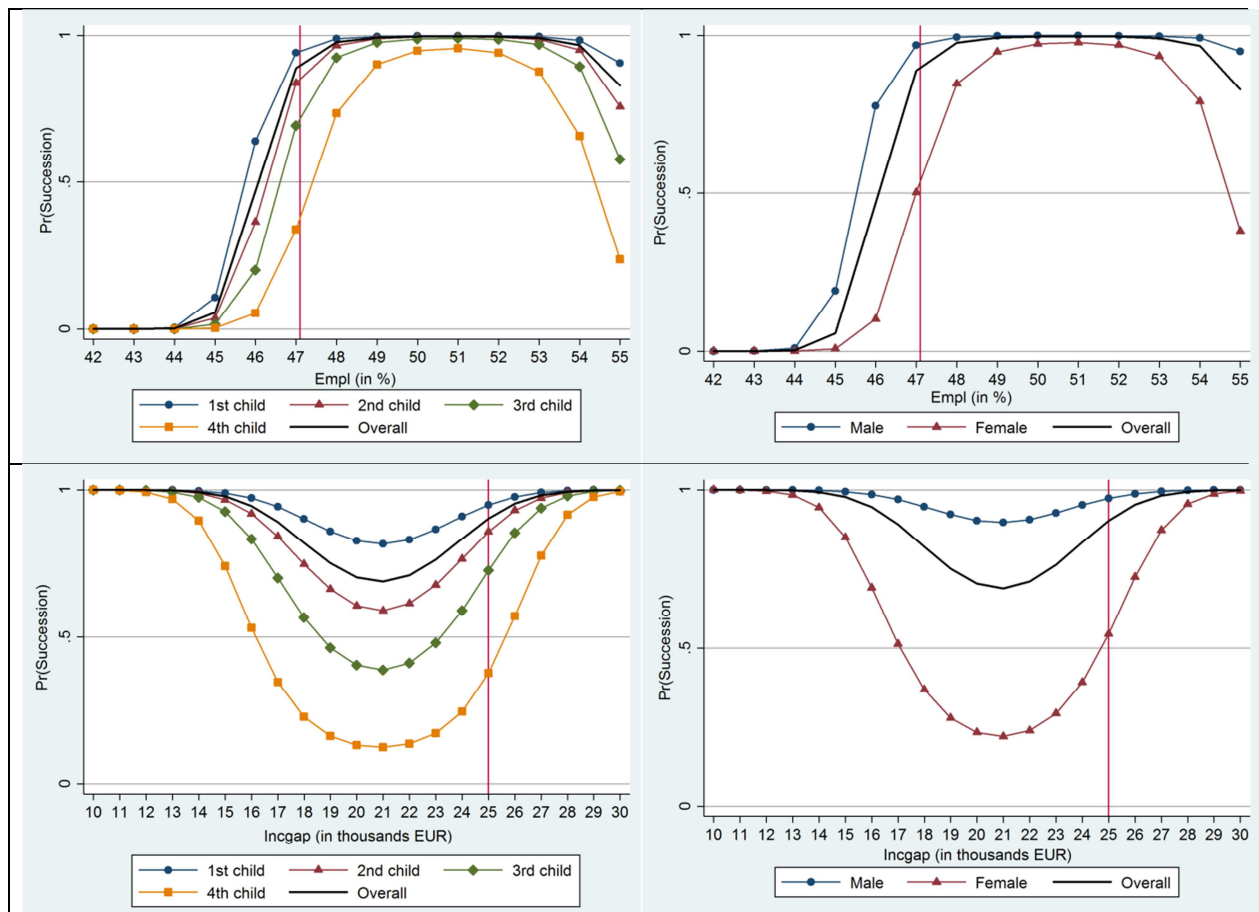
424 In accordance with previous studies, we find several farm and farm household characteristics

425 affecting children's willingness of take over the family farm. We also find significant effects

426 of child-level characteristics and local labour market and surrounding conditions. We test

427 determinants of farm succession at the child level, using the child orientation to prosecute the

428 agricultural activity in his/her farm as a proxy of the succession. Furthermore, as the data used

429 come from a survey designed for informative aims on horticultural farms belonging to a POs

430 consortium, the results should be considered representative of Italian professional

431 horticultural farms organized in POs. Furthermore, as stated in the data description, our

432 sample is mainly representative of a particular category of professional horticultural farms,

433 namely, RFPV. Therefore, our findings may be extended to and representative of this sub-

category of farms and, in general, professional horticultural farms, as the sample covers 8% of this group in the reference area. The extendibility of our results to the rest of the agricultural sector is debatable. However, as discussed below, our findings on the effects of farm and farmer characteristics on succession are consistent with previous evidence in the agricultural sector.

Our discussion starts by commenting on the effects of the variables that have been less explored in previous works on farm succession (e.g., child-level and labour market/contextual variables), both in isolation and in interaction. The effects of other farm and farmer characteristics will be discussed later.

6.1 Discussion I: the effect of birth order, gender and labour market conditions on child succession probability

According to our results, the highest probability of succession is associated with the first-born child on the family farm and decreases when moving to subsequent heirs by 9.11%. To the best of our knowledge, this finding is the first contribution that measures the birth-order effect on farm succession probability. We use this variable referring to the literature on firm succession. Our results are congruent with part of the firm succession literature (Falkiner *et al.*, 2017; Bennedsen *et al.*, 2007; Sharma and Irving, 2005; Chrisman *et al.*, 1998), suggesting that familial and social norms, which privilege first-born children, persist within the agricultural sector or at least among professional horticultural farms. However, our results provide different evidence with respect to another strand of literature in family firm succession, suggesting a switch of priorities from gender and birth order to attitudes and meritocracy (Brockhaus, 2004; Chrisman *et al.*, 1998; Drozdow, 1989).

457 Regarding other child characteristics, we find that the succession rate increases strongly if the

458 potential heir is a male (+42% probability). This result confirms those of many studies in the

459 agricultural sector, both at the farm level (Glauben *et al.*, 2009; Kerbler, 2008; Glauben *et al.*,

460 2004; Keating and Little, 1997) and at the individual level (Cavicchioli *et al.*, 2015; Simeone,

461 2006). Such evidence may be due to the particular features of the sample examined

462 (professional horticultural farms) that have a strong level of specialization and where

463 diversification activities, such as direct selling and agritourism, are marginal. According to

464 previous evidence (Sharpley et al., 2006; Benjamin and Kimhi, 2006; Cassel and Pettersson.,

465 2015), such activities are those in which women working in agriculture are usually more

466 involved.

467 The evidence in family firm succession is mixed in determining the role played by both the

468 gender and the birth order of potential heirs; some authors have found such characteristics

469 (i.e., being male and the first-born heir) to be important in appointing the successor (Falkiner

470 *et al.*, 2017; Ahrens *et al.*, 2015; Bennedsen *et al.*, 2007; Sharma and Irving, 2005), while

471 other scholars suggest that gender and birth order are less prominent in choosing successors

472 (Brockhaus, 2004; Chrisman *et al.*, 1998; Drozdow, 1989).

473 The child's age is linearly correlated with farm succession, while the quadratic specification

474 (not reported) does not give a significant result, in contrast to the findings of Aldanondo

475 Ochoa *et al.* (2007), who detected a U-shaped relationship. However, the estimated linear

476 coefficient is also significant only at the 10% level. The same level of significance (*p=0.098*)

477 applies to the number of children in the family farm, whose effect is positive. This result

478 seems counterintuitive, as the probability of individual succession is fostered by the number

479 of other potential heirs, which is explainable by a competition effect among children. In fact,

480 while in farm-level analyses (Bertoni and Cavicchioli, 2016b; Stiglbauer and Weiss, 2000),

481 the number of children increase the succession probability previous studies at the child level

482 find the opposite result (Cavicchioli *et al.*, 2015; Aldanondo Ochoa *et al.*, 2007). However,

483 our results are in line with those of Mann (2007), which suggests a positive relation between

484 the number of male children on the farm and the probability of succession for each son.

485 The variables on the local labour market and neighbouring features (*popdens, empl, agrshare,*

486 *incgap*) are used to plug OCT into the farm succession analysis. In this way, we treat the

487 choice of potential successors to take over the family business as the counterpart (the

488 opposite) with respect to their decision to find an off-farm job in a non-agricultural sector.

489 According to OCT, the migration of workers from agricultural to non-agricultural sectors is

490 influenced by the income gap between the two sectors, low levels of unemployment and high

491 levels of population density (Olper *et al.*, 2014; Larson and Mundlak, 1997; Barkley, 1990).

492 The last two variables, along with the relatively smaller size of the agricultural sector,

493 increase the probability of finding non-agricultural employment. Given that our dependent

494 variable is the opposite of the choice to find non-agricultural employment, it is noteworthy

495 that the expected effect of the labour market/territorial variables should be negative for

496 *popdens*, *empl* and *incgap*, while the expected effect should be positive for *agrshare*. We find

497 a nonsignificant effect of the relative size of the agricultural sector (*agrshare*) on the

498 individual decision to take over the family farm, while the other three variables play a

499 significant role. The effects of income gap and population density are in line with those

500 predicted by OCT applied to farm succession. On the other hand, the level of employment of

501 the local labour market exerts a positive effect on the willingness to take over the family farm,

502 which is not in line with the expected outcome. To better explore this discrepancy between

503 expected and actual results, possible nonlinear effects of the three variables have been tested,

504 with their linear and quadratic forms entered in our specification. It turned out that all three

505 variables exert a significant nonlinear effect on the willingness to take over the farm. This

506 result is quite innovative with respect to OCT, which assumes only linear effects.

507   To obtain a more accurate representation, we plot farm succession probability for increasing

508   levels of population density (Fig. 1-2), local employment rate (Fig. 3-4) and income gap (Fig.

509   5-6) within the sample intervals of each variable. Furthermore, for increasing values of these

510   variables, we compute separately the farm succession probability for different levels of *child*

511   *order* (Fig. 1,3 and 5) and *child gender* (Fig. 2,4 and 6).

512   In all the three abovementioned cases, the nonlinear relationships result from a combination

513   of anti-succession and pro-succession effects: the former are explained by OCT, while the

514   latter are explainable by a pool of considerations, presented hereafter. Even if our results

515   suggest a curvilinear relationship for each variable, the pro-succession or anti-succession

516   effect may be prevalent, depending on how the observations are distributed before and after

517   the turning point. For instance, looking at Fig. 1 and 2 (*popdens*), the main part of the

518   observations lies in the decreasing branch of the plot, meaning that the anti-succession effect

519   of population density is prevalent with respect to its pro-succession effect. In Fig. 3-4 (*empl*)

520   the main part of the observations is in the increasing branch of the plot, suggesting that the

521   pro-succession effect of employment rate is stronger than its anti-succession effect. In the plot

522   of *incgap* (Fig. 5-6), the observations on the increasing branch are prevalent.

523   It is worth noting that increasing levels of population density first depress farm succession up

524   to the turning point of the plot (until approximately 800 inhabitants per km2) and then

525   promote it; however, the former trend is decisively prevalent and is in line with the anti-

526   succession effect of *popdens*, predicted by OCT. For this reason, the effect of population

527   density may be considered almost linear and negative. This result is divergent with respect to

528   other previous contributions. For instance, Lange et al. (2013) found a correlation between

529   farm continuity and the level of urbanization. According to Zasada et al. (2011), densely

530   populated areas provide a beneficial environment for horticultural and greenhouse farms. The

531   main argument of this line of contributions is that farms near urban centres (or at the rural-

532   urban interface) gain higher benefits from multifunctional and diversification activities

533   (Zasada, 2011; Sharp and Smith, 2004). As our sample includes mainly professional

534   horticultural farms, where such activities are relatively marginal, it is plausible that there are

535   different effects of urbanization and population density on succession, compared to the

536   abovementioned contributions.

537   Turning to the effect of *empl* (Fig. 3-4), farm succession is fostered below the threshold of

538   approximately 51% of the employment rate (increasing branch of the plot). Such pro-

539   succession effect of *empl* contrasts with its predicted role according to OCT and needs a

540   different explanation. As in our sample, the employment rate is highly correlated (0.86) with

541   per-capita income in non-agricultural sectors, the pro-succession effect of employment rate

542   may be mediated by high levels of non-agricultural income. Most likely, the proximity to

543   richer areas may provide the horticultural farms with higher market opportunities (Wästfelt

544   and Zhang, 2016; Mackenbach et al., 2015; Inwood and Sharp, 2012; Jackson-Smith and

545   Sharp, 2008; Gulati et al., 2007). Beyond the turning point, the anti-succession effect of the

546   employment rate predicted by OCT countervails and overcomes its pro-succession effect.

547   The nonlinear effect of *incgap* on succession willingness diverges, in part, from what was

548   expected. Our findings are congruent with theoretical expectations (linear negative effect)

549   until a certain level of *incgap* (21,000 EUR), while differs beyond this threshold. The

550   interpretation of these results is quite difficult, as it could rely on the pro-succession effect

551   due to being localized in a relatively wealthy area with improved market opportunities for the

552   farm. However, in our sample, the level of *incgap* and per capita non-agricultural income are

553   not correlated.

554   The abovementioned non-linear effects of labour market and neighbouring conditions

555   variables on child succession probability are differentiated by birth order (Figs. 1, 3 and 5)

556 and by gender (Figs. 2, 4 and 6). These nonlinear relationships are less pronounced for first-

557 born and male potential successors, while they are more marked for non-first-born and female

558 heirs. In general, as previously evidenced in Table 3, for changing levels of labour market and

559 surrounding conditions variables, the estimated child succession probabilities are higher for

560 first-born and male heirs, while they are lower for other siblings (non-first-born heirs and

561 females).

562

563 *6.2 Discussion II: the effect of farm and farmer characteristics on child succession*

564 *probability*

565 The probability of child succession is 52.6% lower on farms where the farmer holds a degree.

566 Previous evidence is puzzling in this regard: some found a higher probability of succession

567 when the farmer has a high school diploma (Cavicchioli *et al.*, 2015; Mishra and El-Osta,

568 2008; Kimhi and Nachlieli, 2001; Stiglbauer and Weiss, 2000) or a degree (Simeone, 2006),

569 while others confirm our findings (Mishra *et al.*, 2010; Corsi. 2009). If a higher level of

570 operator's education may foster farm economic performance and its attractiveness for a

571 successor, on the other hand, it may increase the ability and openness of potential heirs to find

572 alternative employment. In our case, the latter effect overcome the former. We find a

573 significant effect of some farm characteristics on children's intentions of succession. The

574 physical and economic dimension of the farm (variables *farmland* and *turnover_250)* increase

575 the probability that a child will take over the farm, confirming the results of Glauben *et al.*

576 (2004) and Aldanondo Ochoa *et al.* (2007) for the physical dimension, as well as the findings

577 of other authors for the economic dimension of the farm (Bertoni and Cavicchioli, 2016b;

578 Cavicchioli *et al.*, 2015; Mishra *et al.*, 2010; Corsi, 2009; Glauben *et al.*, 2009; Kerbler,

579 2008). Similar to Mishra and El-Osta (2008), we find that children living on farms with

580 increasing turnover over the past five years are more likely to take over the farm. We also test

581 the effect of cost per worker (*farm efficiency*) on farm succession. Intuitively, the higher the

582 production costs per worker, the lower the probability of a potential heir's succession. Also,

583 the effect of the variable *distance* suggests that farms far from their PO headquarters are less

584 likely to find successors, supporting the idea that higher costs due to logistic disadvantages

585 play a role in succession dynamics.

586 The abovementioned evidence suggest that an heir's succession probability is higher among

587 larger, thriving and more efficient farms; this notion is congruent with the higher succession

588 probability among RPFV farms (+44.5%). This evidence suggests that a willingness to

589 succeed is also influenced by individual gratification of operating in a stimulating and

590 challenging working environment (along with the actual profitability of the farm). In our

591 sample, this condition is most frequent among RPFV farms, which are more technologically

592 advanced and inclined to innovation due to a closer interdependence within the supply chain

593 (Russo Spena and Colurcio, 2010; Fouayzi *et al.*, 2006; Fearne and Hughes, 1999). Notably,

594 in RPFV farms, the succession rate of male children (76%) is far higher than that of female

595 children (34%), confirming a different effect of farm specialization on succession trajectories

596 by gender.

597 The "age" of the enterprise since its foundation (*farm_duration*) increases the probability of

598 child succession, confirming the farm-level results of Bertoni and Cavicchioli (2016b). This

599 evidence has two non-mutually exclusive explanations. First, the child may feel

600 himself/herself responsible for continuing and renewing a long family tradition (Hauck *et al.*,

601 2016; Glauben *et al.*, 2009). Second, a longer family business tradition allows for a greater

602 accumulation of human capital and farm-specific skills, representing an incentive for younger

603 farmers to prosecute farming activities.

604 We test the effect of the share of rented land (*rented land*), meant as a complement of family

605 farm wealth. The rationale behind this approach is that intergenerational farm succession also

606 implies a transfer of physical assets, along with skills and responsibilities (Grubbström and

607 Sooväli-Sepping, 2012; Lobley, 2010; Lobley *et al.*, 2010; Calus *et al.*, 2008; Uchiyama *et*

608 *al.*, 2008). We find that a higher share of rented land discourages child succession, confirming

609 the results of Glauben *et al.* (2004, 2009) and contradicting those of Simeone (2006) and

610 Mann (2007). Most likely, the land rented may not be available for future farming activity,

611 representing a source of entrepreneurial risk for potential successors, thus discouraging them

612 from taking over the farm. We find an inverse relationship between the share of hired labour

613 and the probability of succession, explainable in terms of the discouraging effect of higher

614 responsibilities and commitments in assuring a stable income for hired workers.

615

Conclusions

617 In this paper, we examine the drivers of farm transfer in a sample of Italian horticultural

618 farms. Our contribution covers some relatively unexplored aspects of farm transfer related to

619 the characteristics of potential successors (gender, birth order) and to patterns and dynamics

620 of local labour markets and surrounding conditions. For this reason, the present paper is at a

621 crossroads and merges three different strands of literature: *i)* farm succession analysis, *ii)*

622 child gender and birth order effects in firm succession, and *iii)* farm labour

623 migration/occupational choice theory. The last two aspects have also been analysed in their

624 interaction.

625 We find that male and first-born potential successors are more likely to take over the family

626 farm. Previous comparable results in business management firm succession are mixed: for

627 some authors, gender and birth order are important characteristics in child succession, as a

628   consequence of familial and social normative beliefs. This phenomenon may also be the case

629   for the agricultural sector, particularly for professional horticultural farms.

630   Using some local labour market and surrounding context variables (income gap, employment

631   rate and population density), we plug the farm labour migration/occupational choice theory

632   into the farm succession analysis. Our results are, in part, divergent from those predicted by

633   farm labour migration theory, which points to a linear negative effect of these variables on

634   farm succession. Unexpectedly, we find that increasing levels of income gap and population

635   density exert a nonlinear U-shaped effect on child succession, while increasing rates of

636   employment affect succession in a bell-shaped fashion. However, within each nonlinear

637   relationship, there is one trend that is prevalent. For example, increasing levels of population

638   density are mainly depressive of farm succession, in line with the prediction of OCT. On the

639   other hand, increasing levels of the employment rate in the area surrounding horticultural

640   farms tend to favour succession. Even if this finding is in contrast with OCT, it may be

641   explained by the high correlation between employment rate and per-capita income in our

642   sample. In fact, being located in proximity of wealthy areas may provide better market

643   opportunities and services to professional horticultural farms that have become more

644   attractive for potential heirs. On the other hand, beyond a certain threshold of economic

645   prosperity, this pro-succession effect is counterbalanced by the attractiveness of non-

646   agricultural employment for farmers' children. The most unexpected result is the prevalent

647   pro-succession effect of income gap on heirs' willingness to take over the horticultural farms.

648   In fact, according to OCT, the gap between non-agricultural and agricultural income should

649   be the main driver of out-farm migration, and, consequently, its increase should discourage

650   farm succession.

651   The nonlinear effects of labour market and contextual variables are more pronounced on the

652   probability of child succession when potential heirs are female and non-first-born. Given the

653   importance of rural youth migration and female employment in agriculture, these interactions

654   are worth examination in greater depth. Furthermore, the use of contextual and child-level

655   variables allows for a more accurate estimation of the effect of farm and farmer characteristics

656   on the probability of child succession.

657   The results of the present analysis are limited to and representative of a particular category of

658   farms (professional horticultural) located in Italy and belonging to PO consortia. Despite the

659   peculiarity of the sample examined, our findings confirm those of many previous studies,

660   pointing to trajectories in child succession dynamics that are common to the entire farming

661   sector. Nevertheless, these trends show a different intensity (in terms of, for instance,

662   succession rate by gender) according to the field of specialization of the farms. In this respect,

663   further research is needed to shed light on the effects of child characteristics and labour

664   market/surrounding conditions on farm succession and youth migration in other farm

665   typologies. In particular, it would be worth examining whether and to what extent the impact

666   of birth order and gender on the probability of child succession changes across different

667   farming typologies. Furthermore, as the characteristics of the successor may affect farm

668   management, it would be advisable to measure the effect of birth order on the post-succession

669   economic performance of the family farm. This analysis would allow for the testing of

670   whether the persistence of familial and normative beliefs on primogeniture and male-line

671   succession may represent a source of economic inefficiency in farm management.

672

676 'coopetizione' tra le filiere ortofrutticole aderenti ad AOP UNOLOMBARDIA", undertaken

677 by the Rural Development Program of the Lombardy Region 2007–2013.

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