

# Labour market outcomes: Careers, transitions and durations.

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*To my family, my grandfather, my soulmate*

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## **Introduction**

This thesis contributes to labour economics by considering a wide range of factors influencing career paths, transitions to self-employment and duration in entrepreneurship. In the past literature, several studies have analysed labour market outcomes, transitions and durations. Nevertheless, there is the need of knowing more about the influence of individual and background characteristics on labour market outcomes. Hence, this thesis aims to add new perspectives to the previous literature, examining these topics in different ways. In the first case, background, childhood and school features are linked to individual early career paths (chapter 1). The second chapter aims to understand the effect of parental entrepreneurial attitude and social origin on individuals' self-employment propensity. The third chapter focuses on survival in entrepreneurship, mainly trying to shed more light on survival premiums or penalties that are due to starting the business out of necessity or out of opportunity and engaging in different types of innovative behaviour.

This thesis consists of three independent articles studying three separate issues that can stand-alone but are thematically linked one to each other by a common purpose of providing policy implications related to labour market outcomes. In particular, some tools are given to policy makers. Early prevention of career failures, in order to hinder chronic unemployment or fragmented work trajectories, could be adopted. Moreover, some advice is given to decision makers, in order to target particular social categories that are under-represented in self-employment and foster their entrepreneurial propensity through entrepreneurial training programs or other incentives. Finally, not only is important to foster entrepreneurship but to enhance firm survival and growth. Financial investors and policy makers undoubtedly want to understand the determinants of firm survival for the sake of financing and supporting start-ups that are less likely to fail in the long term.

This thesis comprehends three articles that study labour market careers, transitions and durations. They aim to add new perspectives and new methodological approaches to the previous literature. The three chapters are introduced below.

Chapter one deals with adolescence and nuclear family features affecting early career paths. This paper initially stresses the importance of sequence analysis as a useful tool for the study of life trajectories and career choices. In fact, taking into account a labour market outcome in a given point in time could represent a partial or incorrect information about actual individual working status in a given period. Using this method, researchers are able to univocally identify the principal career choice made by the worker, looking at all the working statuses registered during the period considered. Life-cycle events are studied from a holistic point of view through the use of these techniques (see Ravanera and Rajulton, 2004; Schumacher et al., 2012; Dorsett and Lucchino, 2014). Regarding early-stage determinants of career paths, previous literature points out that nuclear family and experiences in childhood shape individuals' choices throughout the entire life

(Elder, 1994). In addition, other childhood, environmental and school features might influence individual abilities, character and future decisions (Caspi et al., 1998). Thus, the aim of this research is to identify factors and individual's characteristics that could influence career inefficiencies, e.g. long-term joblessness or fragmented wage-employment. Identifying precursors of failing career pathways should be a source of interest for policy makers that want to act for an early intervention, in order to hinder these labour market failures. This research takes into account many individual and family traits that could eventually shape individual will, abilities and motivation, such as socio-economic status, context of the family of origin, school performance and childhood behaviour. The data source used derives from a Swiss longitudinal survey entitled "Transitions from Education to Employment" (TREE). Data were collected from a PISA sample in 2000, students were followed for nine waves until 2014. This research analyses the period between 2010 and 2014, using monthly data. The period between 25 and 30 years of age corresponds to labour market entry or consolidation. Three possible labour market outcomes are used to categorise workers: unemployment, wage-employment and self-employment. Optimal matching (OM) technique is used along with sequence analysis. The algorithm behind OM measures dissimilarities between two sequences measuring the minimum number of transformations required to turn one sequence into the other. OM allows to group observations into clusters. Four clusters containing distinct career paths are generated: wage-employment, unemployment, fragmented wage-employment and self-employment. This newly formed career trajectories are subsequently used as levels of the dependent variable in a Multinomial Logit model. Finally, this empirical model allows assessing the influence of background, parental characteristics, school performance and cognitive skills on the likelihood that Swiss working-age individuals will deviate from stable wage-labour career paths, pursuing alternative working trajectories. This chapter contributes to the previous literature methodologically, showing that methods like sequence analysis allow considering a unitary and holistic perspective by dealing with life-cycle trajectories. Secondly, this research considers working age individuals and entrepreneurial careers, while most of the past literature focus on school to work transitions. Thirdly, the choice of using a Swiss data set is justified by the importance of chronic unemployment in Switzerland. OECD stats show that, although Swiss unemployment rate is very low, the percentage of individuals that stay in unemployment for more than one year is higher than the OECD average (Lalive and Lehmann, 2017).

Chapter two initially stresses the importance of immigrant entrepreneurial ventures as a driver of economic and social benefits (Hettlage et al., 2007). Especially for immigrants, self-employment can be a way to escape unemployment or to override barriers to entry in wage-labour. Moreover, immigrants that start a business are more likely to produce "ethnic goods" and to hire other immigrants, fostering the economic and social integration of newcomers into the host country (Fairlie and Mayer, 2003). These benefits might be taken into account by policy makers that would like to incentivise both entrepreneurship and immigrants'

integration (Klapper et al., 2006). Comparing the entrepreneurial propensity of natives and immigrants in several countries, past research has found an over-representation of immigrants in self-employment, even in many countries where immigration is prevalent, e.g. US, Canada, Germany, Sweden, Australia, England and Wales (Fairlie and Meyer, 1996; Green et al., 2016; Constant and Zimmermann, 2006; Andersson et al., 2013; Le, 2000; Clark and Drinkwater, 2000). Nevertheless, Switzerland represents a unique case: self-employment propensity of immigrants is lower, compared to natives (Guerra and Patuelli, 2014; Guerra et al., 2012; Piguet, 2010; Juhasz Liebermann et al., 2014). During the 20th century, the Swiss labour market has been in constant need of recruiting foreign workers. Nevertheless, immigrants were allowed to live and work in Switzerland based on the actual labour market needs. Hence, newcomers were not allowed to start a business. The 1 June 2002 the Agreement on the Free Movement of Persons (AFMP) between Switzerland and the EU entered into force. The AFMP allowed free movement of persons and immigrant self-employment. Starting from the year after 2002, the percentage of foreign entrepreneurs in Switzerland has sensibly increased, but now it is still lower than natives. This could be due to barriers to entry and difficulties related to the immigrant status: foreign citizenship, temporary residency permit, access to venture capital and other business related networks and services (Piguet, 2010). Juhasz Liebermann et al. (2006) showed that being married to a Swiss citizen can facilitate starting a venture. Along with immigrant origin, intergenerational links and family background could influence entrepreneurial propensity. Previous literature pointed out that there could be many forces that play a role in the intergenerational transmission of entrepreneurial capacities (Hout and Rosen, 2000). At first glance, the inheritance of a family business is the most direct way of entrepreneurial transmission. Children acquire expertise and specific capacities helping their parents running the business (Hundley, 2006). Similarly, parental role models and tacit knowledge provide intangible incentives and motivation to start a business (Lentz and Laband, 1990). Apart from the intergenerational transmission, differences may be expected between immigrants of first and second generations, based on host country, national origin and traditions in their home countries (Fairlie, 1999; Portes and Shafer, 2007; Kasinitz et al., 2008; Andersson and Hammarstedt, 2010). Hence, this research tries to shed more light on self-employment propensity of immigrants in Switzerland, distinguishing between first and second-generation immigrants and ancestry groups. The data set used is the “Swiss Household Panel” (SHP). It contains crucial information about family and parental features at the point in time when the individual was 15 years old. Intergenerational transmission of entrepreneurial abilities in Switzerland was scarcely taken into account in the past literature. At the best of the authors’ knowledge, Juhasz Liebermann et al. (2014) were the only researchers that studied the entrepreneurial propensity of immigrant generations in Switzerland and found out that only second generation immigrants are more inclined to be self-employed than Swiss natives. Thus, the contribution of this article is to compare entrepreneurial capacities of Swiss natives and first and second-generation immigrants. Secondly, it allows

a deeper understanding of the mechanism of intergenerational transmission of self-employment capacities. Thirdly, tries to discover access barriers to entrepreneurship that could be overtaken through targeted policy interventions.

Chapter three assesses the topic of start-up survival. Undoubtedly, it should be a matter of interest, for policy makers, to not only make working age individuals start a business but also whether the business survives in the long term (Santarelli and Vivarelli, 2007). Hence, this chapter wants to shed more light on the determinants of start-up survival, mainly focusing on the motivation to start the business and the innovative behaviour adopted. Past research considered many factors that could influence start-up survival from a micro-economic perspective, e.g. gender, age and education, past experience and human capital accumulation (see Simoes et al., 2016 for an overview). Nevertheless, the effect of some survival features is still uncertain or controversial and surely needs more attention. The impact of individual's motivation for starting the business came relatively recently to the attention of researchers. Pioneering studies like the "Global Entrepreneurship Monitor" (GEM) (Bosma, 2013) mainly distinguish between opportunity and necessity entrepreneurship. In the latter case, individuals start a business due to unemployment or an entry barrier in the wage-labour. Vice versa, opportunity entrepreneurs think about the new venture as a mean to pursue their business idea or to improve their socio-economic condition. There is still an open debate about the impact of the motivation to start the business on firm survival (Baptista et al., 2014). Amit and Muller (1995) and more recently Belda and Cabrer-Borrás (2018) find a survival premium for Canadian and Spanish opportunity entrepreneurs, compared to necessity self-employed. However, Block and Sandner (2009) and Boursin and Cozarenco (2018) find no differences in relation to the motivation to start the business. Furthermore, the picture remains unclear for the innovative approach adopted by the firm. In most of the cases, a survival premium related to innovation is empirically proved (Audretsch, 1991; Helmers and Rogers, 2010; Cefis and Marsili, 2011; Aghion et al., 2014; Howell, 2015; Zhang et al., 2018). Vice versa, Boyer and Blazy (2014) using a French data set, find a survival penalty for innovative micro-enterprises. Furthermore, Cefis and Marsili (2011), distinguishing between product innovation and process innovations discovered that in very dynamic markets, introducing a new good may rise uncertainty and difficulties for the new product to find his market niche, thus increasing the risk of failure. Undoubtedly, the impact of innovation could be very different, depending on the proxy used to measure the innovative approach and market conditions (Buddelmeyer et al., 2010; Giovannetti et al., 2011; Fernandes and Paunov, 2015). Hence, this chapter aims to make a clearer portrait of survival premiums or penalties related to start-up features, and focusing on the innovative approach and individual motivations. The data set used is the result of a harmonisation of five international longitudinal studies about start-up ventures located in the USA, China, Sweden and Australia. Decision makers, business angels and venture capitalists should be interested in knowing more about factors influencing early-stage firm survival. Thus, being capable to distinguish



between start-up the will survive and grow over time and the ones that are more likely to fail. Hence, this chapter mainly aims to shed more light survival premiums or penalties that are due to start-up features, especially regarding individual motivation and the innovative approach. At the best of the author's knowledge, this is the first time a worldwide spanning data set is used. Hence, this research should be able to find if the impact of start-up features on its survival is homogeneous all-over the world and if "universal" conclusions could be drawn. Moreover, separate cohort analysis allows to disentangle the impact of survival factors in diverse market conditions or during economic downturns.

The introduction of this thesis gave an overview of the topics discussed afterwards, stressing the importance of this issues in the labour market field and their related policy implications. After the introduction, this thesis includes the three articles. Finally, some conclusions are drawn and some suggestions for future studies are made.

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# 1. Written in destiny: background factors and career paths. A sequence analysis approach

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## Abstract

Previous literature suggests that background characteristics influence labour market outcomes. Moreover, some authors empirically proved the existence of parental role models and their importance for children's attitudes. Childhood features and the transition from adolescence to adulthood and family formation represent other crucial aspects for an individual's career choice. Given the above, this research aims to explain to what extent individual characteristics and background factors influence working-age individuals' early-stage work trajectories. Previous studies use traditional techniques, mainly focusing on individual's labour market outcome as a specific (single or repeatable) event, ignoring the dynamics of working paths. In this paper, optimal matching and sequence analysis are applied. These techniques allow considering a unitary and holistic perspective on life-cycle events. Through the application of standard clustering algorithms, four distinctive career paths are identified: stable wage-employment, chronic unemployment, fragmented wage-employment and self-employment. These clusters are used as the dependent variable in a Multinomial Logit model. The data are taken from a longitudinal study of Swiss individuals entitled "Transitions from Education to Employment" (TREE). TREE was launched in 2000, based upon the Swiss PISA sample. Individuals were followed for nine waves until 2014. This analysis focuses on the period related to labour market entry or consolidation (2010-2014), analysing individuals' career paths approximately between 25 to 30 years of age, using monthly data. Results show that in addition to individual characteristics, cognitive skills and immigrant status, also parental education, social class and entrepreneurial attitude are able to explain the deviation from a stable career in wage-employment. From a policy makers' perspective, this research could be a useful tool for an early intervention, especially in order to prevent fragmented work trajectories characterised by long unemployment spells or chronic unemployment.

**Keywords:** *sequence analysis, optimal matching, career paths, work trajectories.*

## 1.1 Introduction

One hundred years after the seminal work by Thomas and Znaniecki (1918-1920), life course analysis has emerged as a notable source of interest for researchers. Especially in the last half-century, most of the life course research focused on finding early determinants of life trajectories and career choices, in order to prevent job failures and long-term unemployment. Researchers stressed the importance of nuclear family as a primary source for individuals to integrate into society. Undoubtedly, kinship bonds and children's experiences continue to shape life courses throughout the individuals' life (Elder, 1994). Another strand of the literature examines the antecedents of early adult career pathways, accounting for developmental change as well as the myriad contexts within which such change occurs. In addition, as children grow up, other environmental and behavioural features can influence individual abilities and resolution in the pathway through career choice. Primary and secondary education, acquisition of skills and knowledge, relationships with peers and the context during childhood affect individual temperance and disposition. Hence, developmental-contextual conditions in adolescence and young adulthood may affect life-span career (Caspi et al., 1998). The main concern for researchers and policy makers is to identify determinants and characteristics that are supposed to influence long-term joblessness or sporadic wage-employment and long unemployment spells. Finding the determinants of this social exclusion careers should funnel policy makers into targeted interventions that might prevent labour market failures. Thus, the aim of this research is to identify key precursors of early adult career pathways. Following the previous literature, several individual and family traits are taken into account in this study: background characteristics (e.g., context of the family of origin), relevant conditions affecting childhood (e.g., parental socio-economic status) and adolescence (e.g., school performance). Using a Swiss longitudinal data set named "Transitions from Education to Employment" (TREE) and focusing on labour market entry or consolidation (from approximately 25 to 30 years old individuals), three major occupational statuses are selected: unemployment, wage-employment and self-employment. Using sequence analysis and optimal matching, four distinct occupational trajectories are identified: stable wage-employment, chronic unemployment, fragmented wage-employment and self-employment. These clusters are used as dependent variable in a Multinomial Logit model. Results mainly show that Swiss natives are prevented from long-term unemployment, compared to immigrants. Females and first-generation immigrant males are less inclined towards entrepreneurial careers. Cognitive skills in adolescence affect long-term occupational outcomes, e.g. high reading literacy is related to future fragmented early work trajectories. Interestingly, high mathematical skills encourage females in the choice of an entrepreneurial career. Finally, parental education and social class affect career paths in different ways, depending on the working trajectory. A same-gender parental role model in the choice of occupational trajectories exists, especially for males and their fathers. The contribution of this paper is threefold. Methods like event history analysis focus mainly on specific (single or repeatable) events. Sequence methods allow

considering a unitary and holistic perspective by dealing with whole life-cycle trajectories. Thus, researchers are able to determine major career patterns identified through all working states experienced during the period considered. Secondly, most of the previous literature focus on school to work transitions, whereas this study considers working age individuals and entrepreneurial careers. Thirdly, factors determining long-term unemployment in Switzerland have scarcely been investigated. This is a notable issue for the Swiss confederation: albeit since 2000, Swiss unemployment rate has been steadily at only about a half of the OECD average, long-term unemployment rate has increased and today is still higher than the OECD average (Lalive and Lehmann, 2017). The remainder of this chapter is set out as follows. Section 1.2 discusses previous literature and formulates some research questions. Section 1.3 presents sequence analysis and optimal matching techniques. Section 1.4 illustrates the data set. In section 1.5, a cluster analysis is conducted. Estimates of a Multinomial Logit model are shown in section 1.6. Section 1.7 concludes.

## 1.2 Literature review

Past research identified several factors that might influence the deviation from a traditional career in wage-employment. First, previous literature indicates that individual characteristics such as gender and social origin affect employment choices and transitions. Regarding the latter, immigrant status is a crucial determinant for labour market outcomes. Newcomers face barriers in the recognition of their skills, experience, and capacities in the host labour market (Chiswick, 1979; Cobb-Clark et al., 2005). Moreover, career paths of migrants could be influenced by the transition period and subsequent adaptation process in the new country (Bhagat and London, 1999). Thus, immigrants may experience less successful careers than natives, due to longer unemployment spells, underemployment (i.e. under-use of a worker due to a job that does not make full use of its skills and abilities) or lower wages (Fang and Heywood, 2006). Moreover, Piguet (2010) hypothesises that a stable residence permit and a better knowledge of the local language foster self-employment propensity and economic integration of immigrants coming to Switzerland. Conversely, second generation immigrants and natives with an immigration background should not face local labour market barriers since they were born in the host country and have the same knowledge of the local language and skill recognition as native counterparts. Regarding gender studies, authors suggest less stability in women's career. Women are more subject to family transitions than men, e.g. after a childbirth, some mothers eventually drop out of the labour force or turn from full to part-time work, or alternatively shift to self-employment (Lu et al., 2017). After these considerations, the following research question might be formulated. *Do background characteristics influence work trajectories?*

Apart from nuclear family background, various environmental dimensions of childhood and adolescence affect personal orientation and disposition. Engaging in an antisocial behaviour or low attachment to school may influence the propensity and the ability to work (Caspi et al., 1998). Concerning school performance,



previous studies pointed out that poor school grades and early school dropout predict chronic joblessness and unstable career trajectories (Sanford et al., 1994). Furthermore, an optimal performance in subjects learned at school, starting from basic reading skills, is obviously important. Low individuals' reading literacy levels may strongly decrease capacity of searching for a job and the choices in the labour market. Maughan, Gray and Rutter (1985) find a link between poor reading skills as children and low salaries, low-paid, low-level jobs and unemployment in young adulthood. Using six longitudinal studies of children from the United States, the United Kingdom and Canada, Duncan et al. (2007) run a meta-analysis in order to find the determinants of later educational performance. Early math skills have the greatest predictive power for academic achievement. Bregant (2016) concludes that individuals' mathematical skills in early childhood predict crucial contributions to a greater prosperity to the society and provide leadership roles in critical occupations. In brief, cognitive skills, particularly oral language and conceptual ability may be increasingly important for later mastery of more complex problem solving and future life-span skills and achievements (Baroody, 2003). Given the above considerations, this research aims to answer the following question: *do school performance and cognitive skills affect career paths?*

Additional determinants of individuals' career are suggested by the literature about inter-generational transmission of human capital. Parents provide psychological and emotional support, orientation, expertise, and information during crucial life-cycle transitions, e.g., vocational guidance after completing education (Caspi et al., 1998). Becker and Tomes (1986) stressed the importance of parental characteristics in shaping offspring's motivation, formation and skills on which labour market success depends. Higher educational and occupational attainments are also related to heavy parental educational expectations (Fan and Chen, 2001). In addition, despite the endeavours of developed countries in providing equal opportunities, parents still play a significant role in the transmission of social class (e.g. Breen, 2004; Erikson and Goldthorpe, 2010) and education (Björklund and Salvanes, 2011). Dryler (1998) empirically demonstrated that parental role models exist and they are crucial for children's choices. For example, focusing on the transmission of entrepreneurial abilities, Hundley (2006) found that children with a self-employed parent are more likely to become entrepreneurs, due to a general children's propensity to choose the same occupations as their parents. Maccoby and Jacklin (1974) asserted that children imitate their same-gender parent in occupational choices. Chadwick and Solon (2002) focused on gender differences and discovered that males are more prone to imitate their parents' labour market outcome than females. Hence, this study aims to answer the subsequent research questions. *Do parental socio-economic status and same-gender role models affect career paths?*

### 1.3 Sequence analysis and optimal matching algorithm

Sequence analysis and optimal matching are well known techniques for the study of life-cycle events. Starting from the early 70s, sequence analysis and optimal matching algorithm were developed for the analysis of protein and DNA sequences. They were used as a tool to search a large database for matches to a particular sequence of interest, e.g. a protein. During the 80s, Sankoff and Kruskal (1983), further explored sequence comparison from a statistical and computational point of view. In the same year, Abbott (1983) additionally pointed out the importance of sequence methods to the social sciences and conceptualised the use of these methods for the analysis of order in social processes. In the 90s, sequence analysis became popular, alongside optimal matching algorithm (OM) (Abbott and Hrycak, 1990). OM technique allows to measure pairwise dissimilarities between sequences. The algorithm measures the distance between two sequences through the minimum number of transformations required to turn one sequence into the other. In the basic approach, three operations can be used: insertion, deletion and substitution. The cost of transforming one sequence into another is computed by summing up the elementary operations required by the algorithm. Nowadays, these methods have become a key tool used to identify, analyse and compare work-life trajectories and careers (e.g. Dorsett and Lucchino, 2014; Ravanera and Rajulton, 2004 and Schumacher et al., 2012). Scherer (1999) and Anyadike-Danes and McVicar (2005) additionally introduced, and empirically based, an explanatory analysis that used clusters generated from the optimal matching algorithm as levels in a dependent variable in an econometric model.

### 1.4 Data set

The data source used in this study is the TREE. This multi-cohort survey follows individuals from last year of compulsory education to adulthood. The research project was launched alongside the PISA test in 2000 (OECD, 2000) that was administered to 16 years old students attending the 9<sup>th</sup> school year. Older students are left aside from this analysis: only individuals that were born in 1984/85 are selected. These individuals were followed on their pathways through post-compulsory education, tertiary level education, labour market entry and consolidation. The last wave was recorded in 2014, when individuals were 29/30 years old. This research focuses on individuals from 25/26 to 29/30 years old, from 2010 to 2014. Only individuals that have been continuously observed for the 60 months from January 2010 to December 2014 are analysed.

### 1.5 Cluster analysis

The first part of the empirical procedure consists of three steps:

1. Define the possible states that may occur in the sequence.
2. Apply OM algorithm and obtain a dissimilarity matrix.
3. Apply hierarchical clustering and choose the “optimal” number of clusters.

The first step of the procedure is straightforward. For the sake of simplicity, only the most common occupational outcomes are selected: unemployment (U), wage-employment (W), self-employment (S). The portion of individuals that was still in education or training as a primary or secondary activity at 25/26 years of age was about 11% in January 2010. It suddenly declined to 1% one year later. In case education was individuals' primary activity, they are considered as unemployed in the present analysis. The second step implies the specification of a cost matrix required by OM techniques. Wu (2000) discussed some of these issues in optimal matching methods. Pairwise OM distances between sequences are computed with an insertion/deletion cost of 1 and a substitution cost matrix based on observed transition rates. Previous literature points out that the most direct way to build a dissimilarity matrix is using information about the extent of similarity between states (Piccarreta and Billari, 2007). This data driven approach is used in the attempt to restrict the arbitrary power of the researcher and the ad hoc fashion that often appears in the previous literature. Intuitively, this choice was made simply because some transitions are more likely than others are. For example, a transition from U to W is more likely to happen than opposite transition (from W to U). Transition probabilities between occupational states are shown in Table 1.

**Table 1** Transition rate matrix.

Status	W	S	U
W	0.996	0.000	0.004
S	0.002	0.998	0.001
U	0.031	0.001	0.968

Applying OM algorithm to this transition rates results in a 3,473x3,473 matrix that holds information about dissimilarities between each pair of observations. Nevertheless, Cornwell (2015) suggests to “experiment with alternative cost regimes that makes sense given the data and context being examined to ensure that findings are not too sensitive to different cost specifications, and to understand why any findings vary accordingly” (p. 124). As a robustness check, other substitution cost matrixes were specified (e.g. fixed substitution costs equal to 2). These costs give very similar results, supposedly because these distinctions are simply underlying the data. After the dissimilarity matrix has been defined, the third step consists in obtaining clusters of similar sequences. Hierarchical agglomerative clustering algorithm is used. It consists in a bottom-up approach, i.e. each observation corresponds to a cluster, and pairs of clusters are merged when moving up the hierarchy. Agglomerative nesting hierarchical clustering is made by using Ward's (1963) minimum variance algorithm. It builds similar size clusters whereas other common algorithms (e.g. single linkage, complete linkage, centroid and median) tend to produce a few large clusters and a number of small residual clusters. Two major findings support the choice of using Ward's algorithm. Firstly, Dlouhy and Biemann (2005) using simulated data, measured the percentage of incorrect assignments of sequences to clusters. Single, average and complete linkage, McQuitty's, k-means, median and centroid methods

resulted in a higher percentage of wrong classifications, compared to Ward’s clustering. Secondly, some authors (e.g. Martin et al., 2008; McVicar and Anyadike-Danes, 2002) using alternatives to Ward’s algorithm, obtained a very similar clustering. In order to identify the optimal number of clusters, some ex-ante techniques to check the internal validity are used. These methods include entropy (Shannon, 1948), Calinski-Harabasz index (Calinski and Harabasz, 1974), Silhouette index (Rousseeuw, 1987), Dunn (Halkidi et al., 2001) and a bootstrap evaluation of clusters (Hennig, 2007). As a rule of thumb, number of clusters should also be chosen in the light of an optimal performance in a Multinomial Logit model. Hence, number of sequences in each cluster must not be too small. Moreover, the number of clusters must not be too large (e.g. more than 10) and vice versa, not too small (e.g. less than 3). Finally yet importantly, Cornwell (2015) points out that “perhaps the most important validation task is that of demonstrating that a cluster solution represents the social phenomenon that it was intended to represent, from a conceptual standpoint. Moreover, the author clarifies that a researcher should ask a simple question: “Can I name these clusters – using concepts already available?” (p. 138). As an ex-post analysis, a Cramer Ridder (1991) test is applied. It tests whether two categories of the dependent variable have similar coefficients in a Multinomial Logit model. The decision process related to the choice of the “optimal” number of clusters is described in the Appendix. The chosen number of clusters is four. Figure 1 shows a state distribution plot for career paths, also known as chronogram. It represents sequences of the three major individuals’ monthly labour market outcomes from 25/26 to 29/30 years old.

**Figure 1** State distributions for 3,473 monthly occupational outcomes in Switzerland, 2010-2014.



In the Figure 2, all trajectories are plotted by cluster, ordered by starting labour market outcome. Clusters 2 and 4 look very homogeneous, they are clearly the most stable clusters. On the contrary, cluster 1 reveals the highest internal entropy, individuals in this cluster show very fragmented careers, having difficulties finding a job in wage-labour or finding it and subsequently losing it. Nevertheless, it is clearly visible that at the end of the observation period, most of the work trajectories are reaching a relative stability in the wage-employment status. Finally, mostly chronic unemployed individuals form cluster 3, some of them find a job at about 3 years after the beginning of the observation period.

**Figure 2** Individual sequences for 3,473 monthly occupational outcomes in Switzerland, 2010-2014.



The observation of Figures 1 and 2 allows a better interpretation of career paths and their labelling. Four distinct patterns of occupational trajectories are identified. In the first cluster, trajectories are clearly represented by short spells of unemployment, followed by wage-employment and vice versa. The second cluster clearly shows stable wage-employment. Individuals that experience difficulties finding a job represent the third cluster. The fourth cluster is dominated by self-employment trajectories. Thus, these career trajectories are labelled as fragmented wage-employment (FW), stable wage-employment (WE), unemployment (UE) and self-employment (SE).

## 1.6 Model and discussion

The second part of the empirical procedure implies using clusters representing career typologies as levels of the dependent variable in a Multinomial Logit regression. As a baseline, the most “regular” career path is used (WE). Hence, this empirical analysis allows finding the determinants of diverging from a stable career in wage-employment to other career paths. Two explanatory variables are observed at birth: gender and social origin. The latter combines information about individual and parental place of origin (Table 2).

**Table 2** Social origin categories.

Definition	Birth place	Parents' nationality
Native	Switzerland/Foreign country	Swiss/Swiss
Native with immigration background	Switzerland/Foreign country	Swiss/Foreign
First-generation immigrant	Foreign country	Foreign/Foreign
Second-generation immigrant	Switzerland	Foreign/Foreign

Other key explanatory variables are measured in 2000, when individuals were 16 years old. Parental education and social class are used to evaluate inter-generational links. Two dummy variables for paternal and maternal tertiary education are used. Social class is recorded according to the European Socio-economic Classification (ESeC) (Rose and Harrison, 2007). Starting from the 10-class distribution, the following merging and definitions are applied:

- a) “Working class”: routine occupations; lower technical occupations; lower services, sales and clerical occupations and lower supervisory and lower technician occupations.
- b) “Self-employed”: small employer and self-employed occupations (excluding agriculture).
- c) “Supervisors, managers and professionals”: intermediate occupations; professionals; administrative and managerial occupations; higher-grade technician, supervisory occupations, large employers.
- d) “Unemployed”: never worked and NEET.

School performance and cognitive skills were also recorded in 2000, during the PISA interview. In particular, a dummy variable for high or low reading literacy is constructed. It is a measure of “the capacity to understand, use and reflect on written texts, in order to achieve one’s goals, to develop one’s knowledge and potential, and to participate in society” (OECD, 2000, p. 10). The student’s school report card prior the interview is also investigated. Above or below pass marks received in mathematics are registered. Another schooling and behavioural feature regards voluntarily cutting school or arriving late in the previous two school weeks before the interview. Two controls about municipality and regional features are also included into the analysis: type of commune and linguistic region. These controls are added into the empirical model due to previous research showing that the presence of highly educated individuals in the region may imply a possible spillover effect. For example, living in dense urban areas may increase human capital accumulation more than living in a rural area (Peri, 2002). On the other hand, rural inhabitants benefit from stronger ties between individuals, an established professional network and knowledge of the surroundings

(Deakins, 2006; Dahl and Sorenson, 2012). Additionally, regional labour market factors have a significant impact on the decision whether or not continue education and on the capacity to find a job (Edzes et al., 2015). Sensible differences exist in unemployment rates, based upon the Swiss region: Lake Geneva and Ticino regions have had higher unemployment rates in every year between 2003 and 2016 (OFS, 2017). In fact, high unemployment rates in local labour markets are found to reduce the probability of re-employment for someone who lost his job (Forbes and Barker, 2017). Finally, two other control variables are added: highest educational attainment and a dummy for having a child before 2010. A considerable amount of literature poses the relationship between educational attainment and labour market outcomes, starting from Mincer (1958; 1974) and many others through the years (e.g. Goldberg and Smith, 2007 and Edgerton et al., 2012). Additionally, civil status and crucial family events surely influence labour market outcomes. In particular, motherhood is found to reduce female labour force participation and job stability (Chevalier and Viitanen, 2003; Narita and Montoya Diaz, 2016). Descriptive statistics are shown in Table 3.

**Table 3** Descriptive statistics for key explanatory variables, full sample and clusters, 2010-2014.

Variable	Full sample	FW	WE	UE	SE
<b>Measured at birth:</b>					
Gender: male	0.42	0.37	0.42	0.45	0.55
Immigrant status: native	0.67	0.68	0.68	0.58	0.71
Immigrant status: native with imm. background	0.15	0.18	0.14	0.20	0.13
Immigrant status: first generation immigrant	0.08	0.06	0.09	0.09	0.07
Immigrant status: second generation immigrant	0.10	0.08	0.10	0.12	0.10
<b>Measured at 16 years old:</b>					
Tertiary education mother: yes	0.18	0.25	0.16	0.23	0.19
Tertiary education father: yes	0.33	0.44	0.29	0.36	0.34
Mother: working class	0.30	0.24	0.32	0.26	0.27
Mother: self-employed	0.02	0.01	0.02	0.02	0.04
Mother: supervisors, managers, professionals	0.36	0.44	0.34	0.39	0.35
Mother: unemployed	0.32	0.31	0.32	0.33	0.34
Father: working class	0.44	0.34	0.47	0.37	0.37
Father: self-employed	0.10	0.09	0.10	0.06	0.19
Father: supervisors, managers, professionals	0.42	0.53	0.38	0.51	0.40
Father: unemployed	0.05	0.03	0.05	0.06	0.04
Reading literacy: low	0.25	0.14	0.28	0.23	0.30
Maths mark: pass or below	0.33	0.31	0.34	0.33	0.27
Skip class or late in the previous two weeks	0.32	0.32	0.31	0.38	0.34
<b>Observations</b>	<b>3473</b>	<b>543</b>	<b>2309</b>	<b>455</b>	<b>166</b>

Stable wage-employment (WE) represents the largest cluster. Variables' averages are very similar to the ones in the full sample. UE cluster is primarily characterised by the lowest percentage of Swiss natives, the lowest parental entrepreneurial attitude and the highest percentage of individuals that skipped a class or arrived late at school when they were 16 years old, compared to other clusters. Individuals in the fragmented careers (FW) cluster tend to have fewer difficulties at school, especially regarding experiencing reading

literacy problems, compared to the students in the reference cluster (WE). About social origin, the share of first and second-generation immigrants is sensibly lower. In addition, parental tertiary education quotes and managerial attitude are very high. Self-employed (SE) cluster is dominated by males (55%), whereas in the full sample the share of males is only the 42%. Self-employed are more accustomed to experiencing reading/writing proficiency problems at school. Nevertheless, they register the best performance in mathematics. Moreover, SE group shows the highest parental self-employment propensity among the four clusters. Table 4 shows marginal effect estimates for the Multinomial Logit model using these clusters as levels of the dependent variable.

**Table 4** Multinomial Logit model marginal effects estimates, monthly career paths, 2010-2014.

	FW vs WE	UE vs WE	SE vs WE
Gender: male	-0.0262** (-2.12)	0.0197* (1.66)	0.0205*** (2.70)
Immigrant status: native	-	-	-
Immigrant status: native with imm. background	0.0189 (1.06)	0.0432** (2.52)	-0.00876 (-0.86)
Immigrant status: first generation immigrant	-0.00837 (-0.33)	0.0416* (1.69)	-0.0156 (-1.29)
Immigrant status: second generation immigrant	-0.00670 (-0.30)	0.0532** (2.34)	-0.00182 (-0.14)
Tertiary education mother: yes	0.0327* (1.89)	0.0227 (1.38)	0.00529 (0.49)
Tertiary education father: yes	0.0388*** (2.59)	-0.00748 (-0.55)	0.00476 (0.53)
Mother: working class	-	-	-
Mother: self-employed	-0.0109 (-0.24)	0.0243 (0.51)	0.0177 (0.69)
Mother: supervisors, managers, professionals	0.0180 (1.12)	0.0138 (0.93)	0.00493 (0.51)
Mother: unemployed	0.00731 (0.45)	0.0199 (1.33)	0.00393 (0.43)
Father: working class	-	-	-
Father: self-employed	0.0233 (0.99)	-0.0201 (-1.08)	0.0471*** (2.84)
Father: supervisors, managers, professionals	0.0221 (1.49)	0.0468*** (3.28)	0.00789 (0.94)
Father: unemployed	-0.0310 (-1.13)	0.0361 (1.29)	0.00605 (0.34)
Reading literacy: high	0.0570*** (3.91)	0.0166 (1.20)	0.00112 (0.13)
Maths mark: above pass	-0.00181 (-0.13)	0.0123 (1.01)	0.0168** (2.26)
Skip class or late in the previous two weeks	-0.00130 (-0.10)	0.0248** (1.97)	0.00509 (0.63)
<i>N</i>	3473	3473	3473
Log-likelihood	-3225.9	-3225.9	-3225.9

*Multinomial Logit model marginal effects estimates. Control variables: type of municipality and linguistic region (2000), highest educational attainment and dummy for having a child (before 2010). t statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$*



The first column regards individuals going through fragmented career paths. Model estimates show that females are more inclined towards this work trajectory. Surely, previous literature suggests that females are more subject to family transitions than males, mainly due to pregnancies and nuclear family transitions and subsequent labour reintegration. Immigration background seems not to be a predictor for fragmented careers. A positive effect exists for parental tertiary education. Cognitive skills influence being unstable during early working paths. In particular, a high reading literacy is strongly related to pursuing this career. The higher educational attainment of the parents and the high reading skills could imply a longer educational path for the children, hence a higher instability in the period between 25 and 30 years of age. Moreover, it could signal a higher family income and a subsequent opportunity for the children not to stay in the first job they find, but maybe encourages them leaving that job in search for better opportunities. The second column regards the determinants of shifting from a wage-employment career to long-term unemployment. Males show a positive effect for being in this working path (statistically significant at 10% level). Interestingly, being an immigrant or of immigrant origin implies a higher propensity for experiencing chronic joblessness, compared to being a Swiss citizen. The highest penalty regards second-generation immigrants. Surprisingly, father's managerial attitude has a positive effect for experiencing chronic unemployment. This result is a new finding in the literature, other authors (e.g. Masters and Garfinkel, 1977; McDonald and Stephenson, 1979) found a negative effect between family income and early labour force participation. A possible explanation could rely on the fact that at an early stage of the career path, children of managerial/high-income households are more willing to stay in longer education or decline a low salary job offer, since their parents still provide them the resources to live and seek for better employment chances. Finally, those who show a low attachment to school in adolescence are more likely to fall in chronic unemployment in the future. Column 3 shows that females experience a penalty in entrepreneurial careers. Having a self-employed father has a positive effect in deviating from a wage-labour career to an entrepreneurial one. Social origin and maternal labour market status have no effect in pursuing an entrepreneurial career. Additionally, individuals that have superior mathematical skills are more inclined to long lasting business ownership, compared to students that are low skilled in mathematics. Models by gender show substantial differences (Table 5).

**Table 5** Multinomial Logit model marginal effects estimates, monthly career paths by gender, 2010-2014.

	FW vs WE	FW vs WE	UE vs WE	UE vs WE	SE vs WE	SE vs WE
Gender	Female	Male	Female	Male	Female	Male
Immigrant status: native	-	-	-	-	-	-
Immigrant status: native with imm. back.	0.0209 (0.85)	0.0124 (0.48)	0.0591*** (2.62)	0.0166 (0.64)	0.00131 (0.10)	-0.0237 (-1.39)
Immigrant status: first generation imm.	-0.0578* (-1.81)	0.0539 (1.32)	0.0598* (1.73)	0.0107 (0.31)	0.00933 (0.49)	-0.046*** (-2.80)
Immigrant status: second gen. imm.	-0.0284 (-1.02)	0.0228 (0.61)	0.0273 (1.02)	0.0967** (2.36)	0.0125 (0.70)	-0.0188 (-0.87)
Tertiary education mother: yes	0.0491** (2.00)	0.0136 (0.57)	0.0187 (0.87)	0.0316 (1.21)	-0.0127 (-1.16)	0.0248 (1.28)
Tertiary education father: yes	0.0613*** (2.90)	0.0109 (0.52)	-0.00515 (-0.29)	-0.0084 (-0.39)	-0.00095 (-0.09)	0.0120 (0.77)
Mother: working class	-	-	-	-	-	-
Mother: self-employed	-0.0423 (-0.71)	0.0211 (0.31)	0.0771 (1.10)	-0.0415 (-0.66)	0.0395 (0.93)	0.00255 (0.07)
Mother: supervisors, managers, profess.	0.00502 (0.23)	0.0317 (1.31)	0.0345* (1.90)	-0.0165 (-0.66)	0.00742 (0.65)	0.00150 (0.09)
Mother: unemployed	0.00258 (0.12)	0.0122 (0.52)	0.0408** (2.19)	-0.0089 (-0.36)	-0.00039 (-0.04)	0.0109 (0.64)
Father: working class	-	-	-	-	-	-
Father: self-employed	0.00114 (0.04)	0.0542 (1.44)	-0.0288 (-1.35)	0.00247 (0.07)	0.0135 (0.85)	0.103*** (2.99)
Father: supervisors, managers, profess.	0.0116 (0.58)	0.0373* (1.70)	0.0547*** (3.04)	0.0356 (1.56)	0.00925 (0.90)	0.00400 (0.28)
Father: unemployed	-0.0544 (-1.52)	0.00271 (0.06)	0.0629* (1.71)	-0.0095 (-0.23)	-0.00258 (-0.14)	0.0188 (0.54)
Reading literacy: high	0.0413* (1.89)	0.0735*** (3.88)	0.00949 (0.50)	0.0341 (1.67)	0.00240 (0.23)	0.00319 (0.22)
Maths mark: above pass	0.00366 (0.20)	-0.0135 (-0.66)	0.0187 (1.22)	0.00427 (0.21)	0.0291*** (3.58)	0.000273 (0.02)
Skip class or late in the previous 2 weeks	0.00476 (0.26)	-0.0109 (-0.59)	0.0209 (1.27)	0.0335* (1.70)	0.00441 (0.45)	0.00881 (0.65)
N	2008	1465	2008	1465	2008	1465
Log-likelihood	-1806.1	-1381.7	-1806.1	-1381.7	-1806.1	-1381.7

Multinomial Logit model marginal effects estimates. Control variables: type of municipality and linguistic region (2000), highest educational attainment and dummy for having a child (before 2010). *t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

The first two columns show gender-specific models for the comparison between stable careers in wage labour and fragmented work trajectories. First generation immigrant females are less likely to pursue this career path, compared to natives. The positive effect of obtaining a high score in the reading literacy test found in the full sample estimates persists for both males and females. Having a managerial father only positively influences males in the choice of this occupational path, deviating from the reference work trajectory (WE). Third and fourth columns show early determinants of chronic unemployment by gender. Albeit all the immigrant origin categories positively influenced chronic unemployment in the full sample estimates, this influence is different by gender. For females, only marginal effects related to natives with an immigration background and to first-generation immigrants are positive and statistically significant, whereas they are not significant for males. Vice versa, second-generation immigrant males are more inclined to long-term unemployment, whereas there is no effect for females. Parental managerial attitude only positively influences females falling in a chronic unemployment trajectory. Similarly, parental unemployment only influences females following the same occupational path. No effect for cognitive skills in mathematics or school performance is found, distinguishing by gender. Nevertheless, low attachment to school still negatively influences males entering in a chronic unemployment career path. The last two columns refer to entrepreneurial careers. Marginal effects' estimates related to this work trajectory are negative for first-generation immigrant males. The paternal transmission of entrepreneurial habits found in the full sample estimates is only valid for males and it is more than doubled in magnitude. Gender-specific models uncover a positive influence of registering a high score in mathematics only for females. Finally, the dummy variable for fathers having achieved tertiary education is not statistically significant. The same applies to maternal socio-economic status.

### 1.7 Conclusions and drawbacks

This paper analyses the impact of background, parental characteristics, school performance and cognitive skills on the likelihood that a Swiss working-age individual deviates from stable wage-labour early career paths, pursuing alternative working trajectories, from 2010 to 2014. This study highlights a number of issues and aims to answer three research questions. First, background characteristics such as gender and social origin have a crucial role in determining future career paths. Indeed, as previous literature suggests, females are less inclined towards entrepreneurial careers and chronic unemployment. Nevertheless, they are more likely to pursue fragmented work trajectories. Immigrants or Swiss born with immigrant origin are more inclined towards long-term joblessness, compared to natives. Distinguishing by gender, females with an immigration background and first generation immigrants are more likely to deviate from a stable career in wage-labour to chronic unemployment, whereas second-generation immigrant males experience the same detriment. First-generation immigrant males experience difficulties in entrepreneurial careers as well. The second research question regards the effect of school performance and cognitive skills on occupational trajectories. Having a high capacity in mathematics fosters pursuing entrepreneurial careers, especially for females. Furthermore, a high reading literacy in adolescence fosters individuals' engagement in unstable early career paths. Voluntarily missing classes or being late at school increases the likelihood of being chronically unemployed in the future career pathways. The third research question focuses on parental background, the existence of intergenerational links and a same-gender parental role model related to career paths. Parental educational attainment affects offspring's career. Having a highly educated parent fosters daughter's probability to experience fragmented career paths. Regarding parental socio-economic status, there is a parental unemployment hereditary effect for females. Surprisingly, this effect exists even for parents in supervisory and managerial positions. Finally, having a self-employed father encourages sons pursuing an entrepreneurial career.

At the end of this analysis, some drawbacks must be underlined. The definition of distance between states that underpins the sequence is usually chosen in an arbitrary manner. Ideally, it should be based on theoretical grounds, or at least empirical based, but often the rule is defined in a rather ad-hoc fashion. In this paper, some of the best practices defined by the previous literature are followed, in order to prevent the excessive use of subjective evaluations. Furthermore, cluster analysis typology choice is arbitrary (e.g. hierarchical or k-means). Selection of the appropriate number of clusters can be done *ex ante* or *ex post*. Again, in this case, many indexes for the *ex-ante* evaluation, a test for *ex-post* evaluation and many robustness checks were applied. This research is a first attempt to illustrate the determinants of early career paths in the Swiss labour market. Furthermore, this study uncovers some determinants of career paths useful for policy evaluations, e.g. there is a clear chronic unemployment penalty for immigrants. As suggested before, this should be a crucial issue in the Swiss political agenda.

## 1.8 Appendix

In order to identify the “optimal” number of clusters, preliminary analysis consists of observing the dendrogram. Cutting the dendrogram at a very low height (350), eight distinct working trajectories are detected. The first, third and seventh cluster relate to unemployment dominated trajectories containing some spells of wage-employment. The second and fourth clusters mostly include stable careers in wage-labour. Individuals in chronic unemployment represent the fifth cluster. Long-term entrepreneurs represent the sixth cluster. Finally, the eighth cluster contains individuals that end-up in self-employment both starting from unemployment and wage-employment. Starting from this eight-cluster identification, an iterative procedure is applied. Three indexes and average silhouette width are used, in order to check cluster consistency and stability. These measures represent very commonly used techniques for evaluating clusters’ internal validity: average silhouette width (SW), Dunn index (DI), entropy (EN) and Calinski-Harabasz index (CH). Larger values of CH, SW and DI indicate a better internal validity of the clusters, whereas a smaller entropy denotes little diversity of states observed at the considered time point and an improvement in the cluster consistency (Table 6).

**Table 6** Measures and indexes for cluster internal validation.

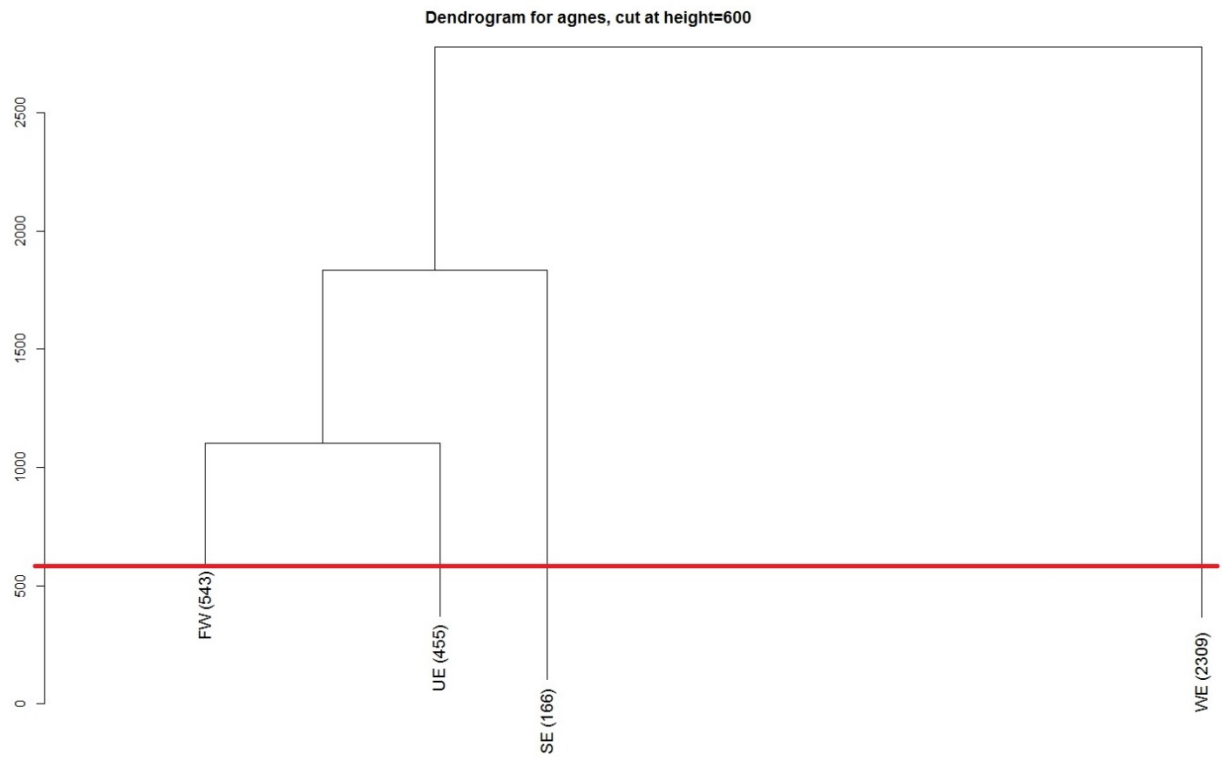
Clusters	SW	DI	EN	CH
n = 8	0.672	0.418	1.520	8031
n = 7	0.722	0.607	1.200	7966
n = 6	0.729	1.030	1.109	8264
n = 5	0.725	1.172	1.078	8493
n = 4	0.717	1.392	0.973	8641
n = 3	0.739	1.746	0.775	6713

Forcing the agglomerative hierarchical nesting algorithm to a seven-cluster solution, the second cluster is grouped together with the fourth. A very large cluster is formed (2,309 out of 3,473 observations). Apart from CH, other measures used to test cluster consistency improve their performance. Another step in the iterative procedure aggregates the third and the fifth cluster; all the measures improve their internal validity. Afterwards, forcing the five-cluster solution, the first and the eighth cluster are joint. In this iteration, the average silhouette width indicates a slightly worse performance of this clustering solution, albeit other measures improve their performance. The next step of aggregation “bottom up” the dendrogram is to group the first and seventh cluster. This grouping slightly further decreases the silhouette score, but other measures substantially improve their performance. Consistency measures suggest that the four-cluster solution represents an improvement in the internal validity of the clusters, compared to the five-cluster choice and previous iterations. Finally, the three-cluster solution implies an improvement of SW, DI and EN, but a huge fall in the CH index for the internal validity of the clusters. Hence, the four-cluster solution is most likely the “optimal” solution for the choice of the number of clusters.

A second check to verify the internal validity of the clusters consists in a bootstrap evaluation. This technique emerged relatively recently in the literature (Hennig, 2007). It is a useful tool to assess whether a cluster represents a true structure. Bootstrap resampling builds the clusters and evaluates how stable a given cluster is (cfr. Zumei and Mount, 2014). Cluster quality is measured by the Jaccard coefficient at each iteration of the original clustering. The mean value of this coefficient over all the bootstrap iterations is calculated. This value ranges from 0 to 1. The authors indicate a threshold of 0.6 as an acceptable value for the clusters to measure a pattern in the data. As a rule of thumb, 100 iterations were fixed. Starting the iteration from the eight-cluster solution, one or more clusters with smaller values than 0.6 can be found. The four-cluster solution is the first clustering that shows values that are larger than the threshold, indicating cluster's optimal stability; they are indicating a clear pattern in the data.

As an ex-post analysis, a Cramer-Ridder test is applied. This test is particularly useful for reducing the number of alternatives in a Multinomial Logit model. The null hypothesis is that two states of the dependent variable have the same regression coefficients apart from the intercept. Starting the Cramer-Ridder test iterative procedure from the eight-cluster solution, it suggests to aggregate clusters in many cases (e.g. 1<sup>st</sup> and 7<sup>th</sup>). Moving forward to seven and six clusters, it suggests to group together other clusters, e.g. 1<sup>st</sup> and the 6<sup>th</sup>. Moreover, testing the five cluster-solution, another suggested amalgamation is related to clusters 1<sup>st</sup> and 5<sup>th</sup>. Finally, applying the C-R test to the four-cluster solution, the test rejects the null hypothesis for each couple of levels of the dependent variable. The set of coefficients that explain the variability for different values of the outcome cannot be treated as equal. Since most of the measures conclude in favour of the four-cluster solution, this partition is chosen as the “optimal” solution in the light of the use of these clusters as levels of a dependent variable in a Multinomial Logit model. It is represented in the Figure 3, cutting the dendrogram at height 600.

**Figure 3** Dendrogram (height=600) for 3,473 monthly careers in Switzerland, from 2010 to 2014.



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## **2. Immigrant self-employment and intergenerational links. The Swiss case**

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### **Abstract**

An immigrant entrepreneurial venture bears economic and social benefits. Immigrant entrepreneurs support other newcomers, providing jobs and access to information. Previous research compared entrepreneurial capacity of immigrant and natives. An over-representation of immigrants in self-employment was found in several “immigration” countries. Switzerland represents a unique case: immigrants were not allowed to start a business (except in particular cases) before the 2002 European Union (EU) bilateral agreements. Hence, even today, the self-employment propensity of immigrants is lower, compared to natives. Considering this under-representation of immigrants in entrepreneurship, this paper aims to shed light on entrepreneurial capacities of immigrants and natives, distinguishing between first and second-generation immigrants. Moreover, intergenerational transmission of self-employment and its underlying mechanism are analysed. A longitudinal data survey entitled “Swiss Household Panel” (SHP) is used. It contains information about individuals and their parents from 2003 to 2016. The Chamberlain-Mundlak model estimates confirm that first-generation immigrants are less inclined to be self-employed, compared to natives, controlling for individual and parental characteristics. Vice versa, second-generation immigrants and individuals with an immigration background are more entrepreneurial than natives. Regarding intergenerational links, having a self-employed father has a positive effect on the propensity to start a business. This is especially true for males with a self-employed father.

**Keywords:** *immigrants, self-employment, entrepreneurship, parental role models, intergenerational links.*

## 2.1 Introduction

In recent decades, immigrant self-employment and entrepreneurial activity (in this chapter the terms “self-employment/self-employed” and “entrepreneurship/entrepreneur” will be used as synonyms) have become a notable source of interest for academic research. Undoubtedly, starting an entrepreneurial activity leads to economic and social benefits. Self-employment capacity is often considered an important aspect of the economic integration of immigrants in their host country due to their role as a “social hinge” (Hettlage et al., 2007). In particular, immigrant entrepreneurs support other newcomers providing jobs and access to information. Moreover, immigrant businesses may have an advantage in providing specific services or goods to co-ethnics, fostering their integration in the host country (Fairlie and Mayer, 2003). These social benefits could drive government spending on business school education, entrepreneurial training programs and promotion (Klapper et al., 2006). Previous research has found evidence for over-representation of immigrants in self-employment in several countries, compared to natives. This over-representation was found in many countries where immigration is prevalent, e.g. US, Canada, Germany, Sweden, Australia, England and Wales (Fairlie and Meyer, 1996; Green et al., 2016; Constant and Zimmermann, 2006; Andersson et al., 2013; Le, 2000; Clark and Drinkwater, 2000). The high entrepreneurial propensity of immigrants can be due to a variety of reasons. First, the social condition of foreign individuals in the host country typically disadvantages and limits labour market opportunities. Unemployment or low wages, lack of recognition of qualifications, wage labour discrimination and poor language skills may represent a pushing force for immigrants into self-employment. Second, the existence of ethnic enclaves may provide a comparative advantage in producing the so-called “ethnic goods” through hiring co-ethnic labour force. Third, migrants have taken the risk of moving to a new country, which could indicate that they are a self-selected “risk-lover” group. Hence, they might have higher levels of unobservable motivation (Borjas 1987, 1994). Switzerland represents a unique case: immigrants were not allowed to start a business (except in particular cases) before the 2002 European Union (EU) bilateral agreements. After 2002, newcomers had no legal barriers for the entry into self-employment, apart from some self-sustaining conditions. Albeit in the last 15 years the percentage of foreign entrepreneurs in Switzerland has sensibly increased, barriers to entry and difficulties for immigrants who want to start a venture are still relatively high. Even today, the self-employment propensity of immigrants is lower, compared to natives (Guerra and Patuelli, 2014; Guerra et al., 2012; Piguet, 2010; Juhasz Liebermann et al., 2014). Part of the difference may be due to some handicaps related to the immigrant status: having a foreign citizenship, having a temporary residency permit and being a newcomer in the Swiss economic and social context may represent a barrier to access to venture capital and other business related networks and services, thereby hindering the entry into self-employment. Moreover, immigrants have different self-employment traditions in their home countries, which affect their propensities as newcomers (Yuengert, 1995; Hammerstedt and Shukur, 2009). Juhasz Liebermann et al.

(2006) showed that the self-employment rate is higher among foreign citizens married to a Swiss individual. Having a Swiss citizen in the family can facilitate starting a venture. Distinguishing between first and second-generation immigrants, different entrepreneurial capacities may be expected. Previous literature suggests that the behaviour of immigrants of first and second generations could be very different, based on host country, national origin and traditions in their home countries. Another strand of the literature further explores intergenerational links in entrepreneurial propensity. Some authors have focused on the intergenerational transmission of self-employment and its underlying mechanism. Hout and Rosen (2000) define the “intergenerational pick-up rate” (with respect to self-employment) as the probability that the child of an entrepreneur will become self-employed himself. Their main assumption – given the existing sociological, psychological and economic literature – was that “the likelihood that a person succeeds in self-employment depends in part on the human capital he or she receives from a self-employed father/mother and the amount of that human capital may differ from one ancestry group to another” (p. 673). This intergenerational transmission can act through a variety of channels. The simplest explanation regards the inheritance of a family business. Children help their parents to run their business, acquiring expertise and specific networks that would ease the transition from the ancestors to the children (Lentz and Laband, 1990). In other cases, the informal business experience acquired by the offspring provides skills and motivation to start a new venture. The experience of a successful business history in the family may also decrease risk aversion in the decision process for the entry into self-employment. Little is known about the self-employment propensity of immigrant generations and individuals with an immigrant background in Switzerland. Previous studies have focused on immigrants’ self-employment propensity in general. A search of the relevant literature yielded one related article. Juhasz Liebermann et al. (2014) went deeper into the analysis of immigrant generations and established that “members of the second generation overtake the Swiss as self-employed” (p. 107). As stated previously, Switzerland is a particular case in the international panorama, due to a barrier to entry into self-employment for immigrants (until 2002) and their lower entrepreneurial propensity, compared to natives. Thus, the contribution of this paper is to distinguish between first and second-generation immigrants and shed light on their entrepreneurial capacity with respect to Swiss natives. It additionally aspires to elucidate the mechanism of intergenerational transmission of entrepreneurial abilities and the differences between ancestry groups. Finally, this research aims to drive policy makers through some important issues such as access barriers to entrepreneurship, venture financing and entrepreneurial training among particular social categories or ethnic groups. The longitudinal data survey used - “Swiss Household Panel” (SHP) - includes information about individual and household characteristics. Furthermore, the “Social Origin” data set contains information about parents when the individual was an adolescent. Hence, this data set allows an analysis of the entrepreneurial propensity of individuals based on their immigrant and family background. There is clear evidence for an under-

representation of first-generation immigrants and an over-representation of second-generation immigrants and individuals with an immigration background, compared to natives. There seems to be no ancestry group effect on self-employment propensity. Furthermore, inheritance of entrepreneurial habits is taken into account, having a self-employed parent facilitates business ownership. This is particularly true for males with a self-employed father. This chapter is organised as follows. The section 2.2 introduces the immigration history in Switzerland, with a focus on immigrants' labour market access. In the section 2.3, some research questions and hypotheses about the empirical model are formulated. The subsequent section shows descriptive statistics. Model specification and results are found in section 2.5. Final remarks are reported in the section 2.6.

## **2.2 History of immigrant labour market access in Switzerland**

Since its foundation in 1848, the Swiss Confederation has been an “immigration” country, due to its location, neutrality and economic stability. Since the end of the nineteenth century, the Swiss economy has been in constant need of recruiting foreign workers into its labour market. Immigration has had considerable effects on Swiss economic and social life. Until the aftermath of World War II, Swiss immigration policies were relatively expansive. The liberal admission policy adopted by the Swiss authorities fostered the increase in foreign population. In 1970 there were more than one million foreign citizens residing in Switzerland (Ruedin et al., 2015). In the years that followed, the economic situation drove the degree of liberalisation of the Swiss immigration policy. The Swiss government, pushed by populist and right wing parties, began embracing more restrictive policies. Immigrants were recruited as seasonal workers. Foreigners working in Switzerland were allowed to stay in the country at most for nine months a year and then they had to return to their home country. They were used as “cyclical shock absorbers” (Kreis, 1999) i.e. they were allowed to stay in Switzerland only in case of economic expansion and labour market demand. In 1991, the “three-circle” model was adopted. This new policy implied that EU citizens were considered as “priority” immigrants, USA and Canada nationals had lower priority, while the third circle included all other nationals, who were allowed into the country only in exceptional cases. In 1998, the “two-circle” model allowed EU immigrants and only high-skilled non-EU nationals into the country, based on the actual labour market needs. A huge step for the integration of immigrants was taken 1 June 2002 with the entry into force of the Agreement on the Free Movement of Persons (AFMP) between Switzerland and the EU. The AFMP lifted restrictions on EU citizens wishing to live or work in Switzerland. This was the first time, since the foundation of the Swiss confederation, that the provision for the self-employment of immigrants was possible. People from the EU or the European Free Trade Association (EFTA) were allowed to start a business on their own; they could obtain a five-year residence permit under some economic self-sufficiency conditions. A distinction was made between immigrants from EU/EFTA countries and those from so-called third countries; they were given permission to take up self-employment in Switzerland only in case of family



reunification or highly skilled workers responding to specific needs in the labour market. The right of free movement is complemented by the mutual recognition of professional qualifications, by the right to buy property, and by the coordination of social insurance systems. In 2009, there were 135'000 immigrant businesses owners in Switzerland (Piguet, 2010). In 2013, 2.4 million of the 6.8 million people aged 15 or more living in Switzerland had a migration background (Federal Statistical Office, 2015).

## 2.3 Discussion

Previous literature suggests some crucial determinants of self-employment propensity related to immigrant and parental background. In the first place, past research identifies a competitive advantage of second-generation immigrants, compared with their parents. Indeed, children of immigrants are likely to be more proficient in the official languages of the host country, to have higher levels of education, and to have been educated in the host-country educational institutions. These assets may provide them with the skills and information needed to start and operate a business, potentially leading to higher rates of self-employment (Sanders and Nee, 1996; Kloosterman et al., 1999). Fairlie (1999) found this evidence among US immigrants, but the strength of intergenerational transmission varied distinguishing by ethnic group. Furthermore, Andersson and Hammarstedt (2010) showed, using a Swedish sample, the over-representation of second-generation immigrants in self-employment, even compared to natives. Conversely, other authors suggest a decrease in entrepreneurial capacity of immigrants' children. Portes and Shafer (2007) analysed the mass migration of Cuban exiles in Miami in the 1960s and 1970s. They discovered that the self-employment rate among children was halved. Their hypothesis was that many second-generation Cubans entered into high-skilled wage-employment as they had the opportunity to obtain advanced degrees, thanks to the accumulated resources of their parents' entrepreneurship. Kasinitz et al. (2008) suggested that education and professional careers might be a preferred route to economic success among second-generation immigrants. According to Guerra and Patuelli (2014), immigrants coming to Switzerland from Germany, France or Italy show higher rates of self-employment with respect to other ancestry groups, due to speaking the same language as the locals. In addition, Piguet (2010) identified two nationalities that clearly have a higher propensity being self-employed than Swiss natives, *ceteris paribus*: Turkish and former Yugoslavian citizens. He attributes this finding to the "disadvantage hypothesis", which regards self-employment as resulting from necessity. In particular, for former Yugoslavian nationals, the main concern regards self-employment as an outside option to unemployment because of the non-recognition of qualifications and discrimination. Furthermore, he identifies the "convergence hypothesis" for Portuguese citizens. Self-employment is very rare for these nationals (4.2% in 2016, FSO). This hypothesis implies a positive correlation between length of stay in Switzerland and self-employment propensity, due to integration, more stable residence permit and knowledge of the local language. Hence, the following set of hypotheses may be advanced:

*1.a. Social origin influences entrepreneurial propensity.*

*1.b. Ancestry group influences entrepreneurial propensity.*

*1.c. There is a language barrier related to entrepreneurship.*

Focusing on the transmission of entrepreneurial abilities, Dryler (1998) empirically proved the existence of parental role models and their importance for children's choices. Individuals with a self-employed parent are more likely to be self-employed; some part of the correlation may be due to a general tendency for children entering the same occupations as their parents (Hundley, 2006). Other authors hypothesised a stronger same-gender effect in the transmission of entrepreneurial attitude. The relative effect of having a self-employed father (mother) on the probability of becoming self-employed is higher for males (females) (Lindquist et al., 2015; Tervo and Haapanen, 2010; Andersson and Hammarstedt, 2011; Hoffmann et al., 2015). Chadwick and Solon (2002) find that males are more inclined to inherit their parents' labour market position than females. Furthermore, the extent and the mechanism of inter-family interaction can be different, based on ancestry group. Some parents could have various traditions in the involvement of their offspring in the family business. Therefore, the transmission of entrepreneurial values will affect children's self-employment propensity in different ways (Hout and Rosen, 2000). Consequently, the following hypotheses can be raised:

*2.a. Individuals with a self-employed parent are more entrepreneurial.*

*2.b. There is a same-gender parental role model effect related to entrepreneurship.*

*2.c. Having a self-employed parent has a different effect across social origins.*

*2.d. Having a self-employed parent has a different effect across ancestry groups.*

## **2.4 Data and descriptive statistics**

The data source used in this study is a longitudinal survey by the Swiss Centre of Expertise in the Social Sciences (FORS). The "Swiss Household Panel" (SHP) was created in 1998, while the first wave was implemented in 1999. Three samples of individuals 14 years or older have been interviewed starting from 1999, 2004 and 2013. In addition, the "Social Origin" data set contains information about the social origin for all individuals who have been personally interviewed in any of the waves. In this survey, individuals are asked about family characteristics when they were about fifteen years old. Hence, the data set contains information about the parent's job, education, nationality and financial condition when the individual was an adolescent. There is no information whether self-employed parents were running a business in their country of origin or in Switzerland. The analysis focuses on the three samples for the period 2003-2016, i.e. after the policy change related to the allowance of entry into self-employment. The key explanatory variable about the social origin was constructed by combining information about the individual's birthplace and parents' nationality, due to the lack of information about parents' birthplace. Children that were born abroad

of whom at least one parent is Swiss are Swiss citizens at birth by law (*Ius sanguinis*). The selected social origin categories refer to natives, natives with immigration background, first and second-generation immigrants (see Table 1).

**Table 1** Social origin categories.

Definition	Birth place	Parents' nationality
Native	Switzerland/Foreign country	Swiss/Swiss
Native with immigration background	Switzerland/Foreign country	Swiss/Foreign
First-generation immigrant	Foreign country	Foreign/Foreign
Second-generation immigrant	Switzerland	Foreign/Foreign

According to the above discussion, other key explanatory variables are taken into account. First, a dummy variable related to language barrier is constructed. This variable equals one if the respondent “relates to and masters best” another language, compared to interview language. Second, two dummy variables for having a self-employed father and mother are constructed. Control variables include demographic characteristics such as gender, age, civil status, number of persons in the household, education, industrial sector (NOGA2008 classification), type of commune and interview language as a proxy for cultural identity: German, French or Italian. Only individuals aged 18 or older are selected and older individuals are dropped (>65 y.o.). Individuals who were unemployed for the whole period 2003-2016 are excluded. Consistent with previous literature, primary sector workers are also dropped from the analysis. Agriculture is in fact a particular sector, in which natives are traditionally over-represented (Fairlie and Meyer, 1996). Hence, NOGA2008 economic sectors “Agriculture, hunting and forestry” and “Extra-territorial organisation and bodies” are left out, due to the extraneity of the latter in the local labour market mechanism. Individuals whose net yearly household disposable income is smaller than 10,000 CHF are excluded. Finally, in order to reduce the cases of inherited or indirect conducting of a family business, individuals who define their main job as “partner in his/her relative’s firm” are excluded from the self-employment category and considered as wage-employed. Exact information about the inheritance of family business is missing. Previous studies have found that the inheritance effect is not large enough to fully explain the intergenerational transfer of entrepreneurial propensity (Aldrich et al., 1998; Sørensen, 2007; Parker, 2009). Table 2 reports descriptive statistics for key explanatory variables used in this analysis.

**Table 2** Descriptive statistics for key explanatory variables, by self-employment status, 2003-2016.

Variable	Full sample		Wage-employed		Self-employed	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Male	0.49	0.50	0.47	0.50	0.59	0.49
Age	46.24	9.94	45.82	9.98	49.48	9.05
Years of education	14.34	2.99	14.25	2.96	15.05	3.07
Other language personal use	0.09	0.28	0.09	0.28	0.09	0.29
Native	0.70	0.46	0.70	0.46	0.69	0.46
Native with immigration background	0.12	0.32	0.12	0.32	0.14	0.35
First-generation immigrant	0.14	0.34	0.14	0.35	0.12	0.33
Second-generation immigrant	0.05	0.21	0.05	0.21	0.05	0.22
Self-employed father	0.28	0.45	0.26	0.44	0.37	0.48
Self-employed mother	0.08	0.26	0.07	0.26	0.10	0.30
Observations	42,754		37,801		4,953	

Self-employed individuals are found to be, on average, about four years older than wage employed. Males are over-represented in entrepreneurship. Moreover, self-employed are more educated. No differences are noticed in the knowledge of the local language, comparing wage-employed and self-employed. Natives represent most of the sample (69.6%), first-generation immigrants follow (13.7%), then natives with immigration background (11.8%) and second-generation immigrants (4.9%). Regarding family context, the percentage of individuals with a self-employed father is higher among self-employed, similarly for mothers. For descriptive purposes, it is useful to focus on the self-employment rates by social origin and ancestry group (Table 3).

**Table 3** Self-employment rates by social origin and ancestry group and gender, 2003-2016.

Social origin and ancestry group	Full sample		Male		Female	
	Total obs.	%	Total obs.	%	Total obs.	%
Native	29,760	11.4	14,362	14.0	15,398	9.0
Native with immigration back.	5,059	14.0	2,539	17.8	2,520	10.1
First-generation immigrant	5,859	10.3	2,820	10.4	3,039	10.2
Second-generation immigrant	2,076	12.1	1,098	14.9	978	8.9
Switzerland	38,127	11.8	18,356	14.4	19,771	9.4
Germany/Austria	1,047	15.4	539	17.1	508	13.6
France	417	10.6	242	13.6	175	6.3
Italy	1,326	6.9	745	8.6	581	4.7
Iberian peninsula	592	5.4	315	7.6	277	2.9
Eastern European countries	644	10.3	306	10.8	338	9.8
Rest of the world	601	10.2	316	8.5	285	11.9
Total	42,754	11.1	20,819	13.6	21,935	8.7

Substantial differences exist in self-employment percentages, based on immigration background, nationality and gender. Firstly, there is descriptive evidence of a higher self-employment propensity of males with immigration background and second-generation immigrant males (17.8% and 14.9%), whereas first-

generation immigrant males show a poor entrepreneurial attitude (about 4 p.p. less with respect to natives). First-generation immigrant and females with an immigration background show higher entrepreneurship percentages, compared to other categories (10.2% and 10.1%). The ancestry group statistics indicate that huge differences exist. Spanish, Portuguese and Italians show very low self-employment rates. Moreover, gender-specific entrepreneurship rates are found to be very diverse, based on ethnic background. French gender differential between male and female self-employment rate is about 7 p.p.. The same differential for Eastern European countries is about 1 p.p. Finally, “Rest of the world” category shows a higher entrepreneurial attitude for females. Table 4 analyses self-employment statistics, conditional on having a self-employed parent.

**Table 4** Self-employment rates by parent’s self-employment and gender, 2003-2016.

Parental role models	Full sample		Male		Female	
Variable	Total obs.	%	Total obs.	%	Total obs.	%
Self-employed father	11,806	15.5	5,724	20.8	6,082	10.6
Not self-employed father	30,948	10.1	15,095	11.5	15,853	8.7
Self-employed mother	3,228	15.8	1,726	19.8	1,502	11.3
Not self-employed mother	39,526	11.2	19,093	13.5	20,433	9.1

The data indicate that 20.8% of males with a self-employed father decide to start a business, while the percentage for individuals with a not-self-employed parent is almost halved (11.5%). For females, there is a smaller gap between individuals with a self-employed father and the others (10.6% vs 8.7%). Regarding maternal entrepreneurial attitudes similar differences exist, but they are smaller in magnitude.

## 2.5 Model specification

In a seminal paper, Dunn and Holtz-Eakin (2000) introduced a micro-economic framework in which an individual decides to enter self-employment or to stay in wage-labour comparing the expected utilities of income in entrepreneurship and in wage-employment. Dunn and Holtz-Eakin define individual’s gross earnings as an entrepreneur as a production function which includes personal assets and individual entrepreneurial ability. At each point in time, individuals choose between wage-employment and self-employment, based on expected utilities of income. They switch from wage employment to self-employment only if they think their income will increase. Following this approach, the dependent variable is coded as a binary variable for choosing entrepreneurship. Nevertheless, individuals identified as self-employed only refer to wage labourers transitioning to self-employment, thus excluding unemployed individuals that opt for entrepreneurship. Hence, the dependent variable equals one if a wage labourer chooses to start a business or keeps running the business afterwards, and zero otherwise. This represents a particular case in which entering into self-employment can be considered as a “pull factor” i.e. an individual starts a business because of the existence of new opportunities and to improve his economic and working conditions (Falter, 2001). Accordingly, individuals who enter into self-employment due to a “push factor”,

i.e. to escape unemployment are excluded. Thus, this analysis takes into account the determinants of entrepreneurship as an “innovative” force in contrast to a “replicative” activity, as defined by Schumpeter (1965) “entrepreneurs as individuals who exploit market opportunity through technical and/or organisational innovation” (pp. 99-102). The exclusion of unemployed individuals that start a business also presumably prevents from endogenous sample selection. Immigrants are more likely to experience discrimination, lack of recognition of qualifications and other barriers to entry into wage labour. Hence, they could have a higher motivation for the entry into self-employment. Accordingly, this exclusion should potentially avoid this selection bias. In the sample, 7.6% of individuals (9% males, 6.3% females) switches from wage-employment to self-employment or remain in entrepreneurship afterwards. Dunn and Holtz-Eakin, additionally assume that the expected utility of income in self-employment depends on nuclear family income and parental assets and their accumulated human capital. They hypothesise that family’s entrepreneurial background influences the ability to become self-employed, e.g. children of self-employed parents inherit skills, knowledge, managerial expertise that increases the probability of being an entrepreneur. This framework shows that the decision to become an entrepreneur depends on not only tastes, demographic characteristics, parents’ job, social origin and transmission of human capital, but also on nuclear family and parental resources. Besides this approach suggests the existence of a positive effect of nuclear family and parental assets on self-employment, other authors assume that greater personal wealth relaxes capital market constraints and eases the transition into entrepreneurship. (Evans and Jovanovich, 1989; Meyer, 1990; Holtz-Eakin et al., 1994; Blachflower and Oswald, 1998). In addition, family wealth might be a source of informal financing, as an alternative to formal credit (Altonji and Dunn, 1991; Solon, 1992; Zimmermann, 1992). Given the above considerations, proxies for nuclear family and parental assets and liquidity are added as control variables into the model. Following Fairlie (1999), parents’ education is used as a crude proxy for parental assets. This choice is due to the lack of information about parents’ wealth or assets. Parental education is recorded as a categorical variable with 16 levels; it is transformed into a discrete variable for this purpose. A binary variable related to experiencing financial problems in youth is also added. Furthermore, since it is assumed that individuals use both parental and household resources for entrepreneurial purposes, net household disposable income (log) is included as a proxy for nuclear family liquidity. A dummy variable for house ownership as a proxy for household assets is used. Indeed, previous literature points out that home ownership represents a financial asset (Smith and Searle, 2010). Moreover, business owners who are proprietors of their own home can secure finance for their business through the mortgage market (Disney and Gathergood, 2009).

In order to estimate the effect of key explanatory variables on the self-employment choice, a Chamberlain-Mundlak random effects Probit model is estimated. The main issue with respect to a more straightforward panel data fixed effects model, regards obtaining an estimate for time invariant regressors' coefficients, e.g. social origin categories. On the other hand, the panel data random effects model requires the strong assumption that individual error term is not correlated with predictors. This could not be the case, i.e. unobserved heterogeneity generated by motivation, family traditions, and ancestry-related behaviour may be related to explanatory variables such as education. The Hausman test concludes in favour of the fixed effects model, therefore the random effects model would not be consistent. The Chamberlain-Mundlak random effects Probit model (see Chamberlain, 1984; Woolridge, 2002, chapter 15.8) allows an estimate of the probability to become self-employed (or stay in self-employment afterwards) of individuals  $1, 2, \dots, i, \dots, N$  in periods  $2003, \dots, t, \dots, 2016$ :

$$P(y_{it} = 1 | x_{i1}, \dots, x_{iT}, c_i) = \Phi(x_{it}\beta + c_i) = \Phi[(\psi + x_{it}\beta + \bar{x}_i\xi)(1 + \sigma_a^2)^{-\frac{1}{2}}]$$

Where the crucial parameter is  $c_i$ . This allows a relaxation of the assumption of strict exogeneity and accounts for the presence of unobserved heterogeneity that is correlated with observed characteristics  $x_{it}$ .  $\sigma_a^2$  represents the variance for the part of the random effect  $c_i$  not captured by  $\bar{x}_i$ . The full specification of the model includes both explanatory variables and their average within each individual. Furthermore, the presence of time fixed effects in the pooled dataset is tested. The test rejects the null hypothesis that year dummies are jointly equal to zero. Hence, year dummies are added in the model specification. A dummy variable for the previous working status is also included. Since individual chooses to start a business based on previous information, one-year lag for time-changing explanatory variables is applied. Not to lose too much information, when the lagged value for most of the variables that are slowly changing over time (e.g. civil status, linguistic region, home ownership) is missing, the current value is used. In order to account for the possibility of a non-linear effect of net disposable household income on the outcome, the square of the proxy for nuclear family wealth is included. Following Fitzenberger et al. (2011), averages of time-varying regressors that rarely change within individuals over time are excluded: civil status, type of commune and interview language. Individual cluster robust standard errors are applied, in order to relax the independence assumption, i.e. observations are independent across individuals (clusters) but not necessarily within individuals. Marginal effects are calculated in STATA14 as a standard panel random effects Probit model, but assuming that the random effect of that observation's panel is zero (see Woolridge's discussion in the STATA forum <https://www.statalist.org/forums/forum/general-stata-discussion/general/1378004-xtreg>). Table 5 shows four model specifications. The first one includes social origin categories. The second model includes ancestry groups, as an alternative to social origin. The last two models are gender-specific.

**Table 5** Probit marginal effect estimates of the transition probability from wage-and-salary to self-employment or staying into self-employment afterwards, 2003-2016.

	(SO)	(AG)	(M)	(F)
Base: Native	-	-	-	-
Native with immigration background	0.00613** (2.33)	-	0.0152** (2.52)	0.00139 (0.66)
First-generation immigrant	-0.00426*** (-2.84)	-	-0.00927*** (-3.37)	-0.000938 (-0.55)
Second-generation immigrant	0.0148*** (2.86)	-	0.0228** (2.22)	0.00958* (1.89)
Language barrier	0.000346 (0.13)	-0.00180 (-0.79)	0.00880 (1.14)	-0.00303* (-1.92)
Self-employed father	0.00495** (3.08)	0.00446*** (2.91)	0.0126*** (3.54)	0.000571 (0.42)
Self-employed mother	-0.000251 (-0.11)	-0.000159 (-0.07)	-0.00611 (-1.57)	0.00420 (1.33)
Base: Switzerland	-	-	-	-
Germany/Austria	-	-0.00218 (-0.73)	-	-
France	-	0.00111 (0.15)	-	-
Italy	-	-0.00182 (-0.53)	-	-
Iberian Peninsula	-	-0.00271 (-0.55)	-	-
Eastern European countries	-	0.00274 (0.50)	-	-
Rest of the world	-	-0.00245 (-0.58)	-	-
Time FE	Yes	Yes	Yes	Yes
Previous year working status FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Individuals	7952	7952	3860	4092
Observations	42754	42754	20819	21935
Log-likelihood	-5291.3	-5306.3	-2901.7	-2333.7

*Marginal effects for Mundlak-chamberlain random effects Probit model with individual cluster robust standard errors.*

*Control variables: gender, age, civil status, years of education, number of persons in the household, industrial sector, linguistic region, type of commune, ln(net disposable household income), house owner/co-owner/non-paying tenant dummy, parental education, dummy for financial problems experience in youth. Time-changing variables are measured with one-year lag.*

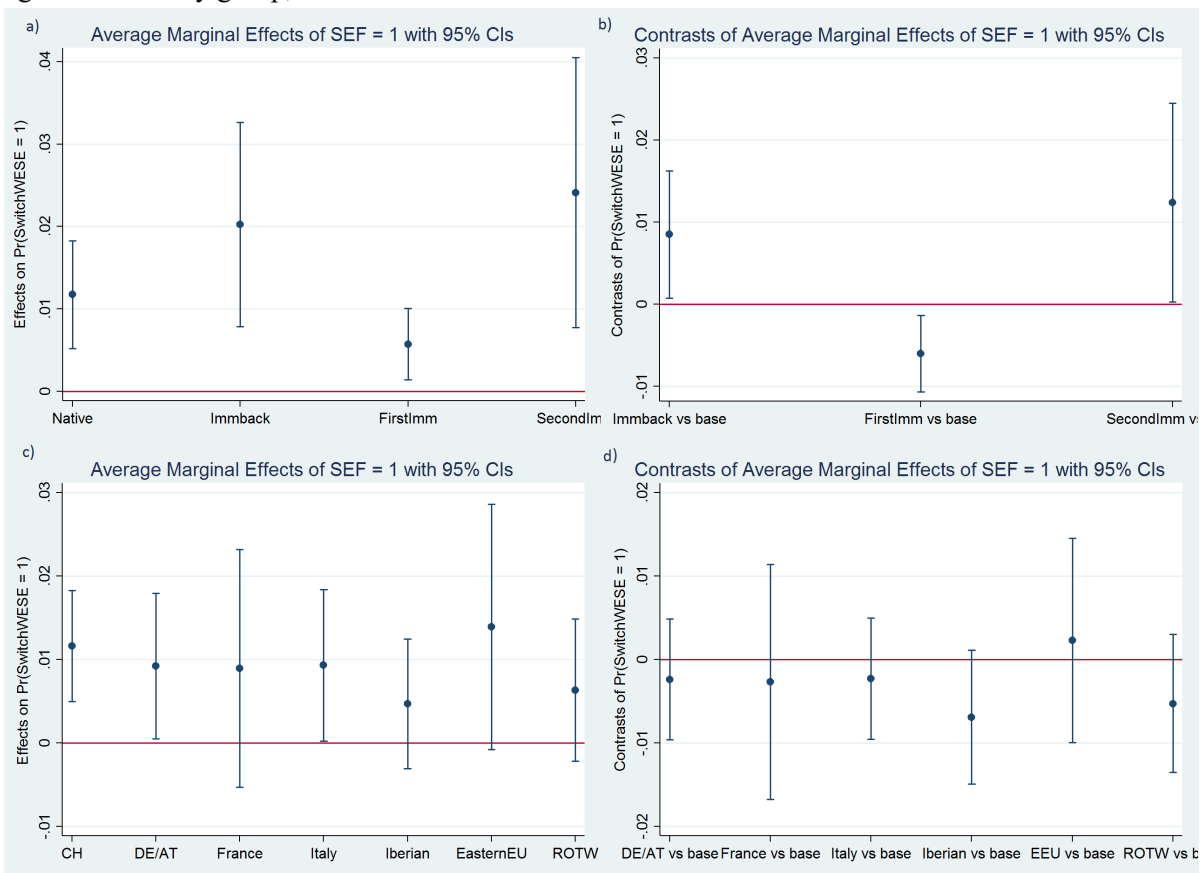
*t statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$*



The first column reports “Social Origin” (SO) model marginal effect estimates, their standard error and statistical significance level. The first-generation immigrant status has a negative effect on the probability of being self-employed. Vice versa, second-generation immigrants and individuals with an immigration background show a positive and statistically significant marginal effect at the 1% and 5% level. Considering natives as a base category, predicted probability of being self-employed for second-generation immigrants is 1.5% higher, on average, controlling for other covariates. Language barrier has no effect on the probability to start and conduct a business. Regarding the parental background, having a self-employed father has a significant positive effect on the propensity to choose entrepreneurship as an outside option to wage labour, whereas mothers’ effect is not significant. The second column shows estimates for the “Ancestry Group” (AG) model. It accounts for an influence of ethnic background on the entrepreneurial capacity, alternatively to social origin categories. Neighbouring countries related marginal effects are not statistically significant. Previous literature suggests a lower propensity in entrepreneurship for Spanish and Portuguese ancestry groups. The related coefficient shows a negative sign but it is not statistically significant. Regarding Eastern European countries, no effect is found. Following past research, Turkish and former Yugoslavian nationals enter into self-employment due to high unemployment. This phenomenon is deliberately omitted from this analysis. Marginal effects of residual nationalities are not statistically significant. Other results are very similar to the SO model. Gender-specific models show substantial differences. There is evidence of a higher entrepreneurial propensity of second-generation immigrant males (2.3% more compared to natives) and natives with an immigration background (1.5%). First-generation immigrant males experience a penalty in self-employment capacity (-0.9%). Second-generation immigrant females show a social origin effect smaller in magnitude, compared to males, but it is still statistically significant at 10% level. Having an immigrant background has no effect on the probability of being self-employed for females. A language barrier exists for females: individuals that do not speak the local language in the everyday life experience a penalisation in entrepreneurial propensity. The incidence of entrepreneurship is significantly higher for males with a self-employed father (1.3%), but not for females with a self-employed mother. In order to confirm or refute hypotheses 2.c and 2.d, a more in-depth analysis of SO model marginal effect estimates is carried out. Figure 1 shows interaction effects of having a self-employed father and social origin or ancestry group for males, i.e. the effect of having a self-employed father according to social origin, or alternatively, ancestry group. Figure 1.a shows that marginal effect of having a self-employed father for males is positive and statistically significant for all social origins. In particular, it is larger for natives with immigration background and second-generation immigrants. In order to assess the differences in social origins, confidence intervals of point estimates cannot be compared because they do not account for the covariance between the differences. Figure 1.b accounts for this covariance. The differences between natives (reference category) and the other social origin categories are compared. Conditional on having a self-employed father,

second-generation immigrant males and natives with an immigration background exhibit a higher entrepreneurial capacity, compared to natives. Vice versa, the difference between first-generation immigrants and natives is significantly negative. Figures 1.c and 1.d show marginal effects and contrasts for ancestry groups. Males' subsample shows a heterogeneous average marginal effect of paternal entrepreneurship across ancestry groups. Only being Swiss, German/Austrian and Italian and having a self-employed father has a positive and statistically significant effect on the probability to start and carry out a business. In other cases, the joint influence of paternal entrepreneurship and ancestry group is not significant. Finally, no statistically significant difference between Swiss and other ancestry groups is found.

**Figure 1** Average marginal effects and contrasts of having a self-employed father (SEF = 1) by social origin and ancestry group, males.



Chamberlain-Mundlak model specification aims to deal with the presence of omitted variables and unobserved heterogeneity. The robustness of these results is tested by estimating alternative models that do not consider this issue. Alternative specifications confirm the main findings of this study. Social origin related coefficients and marginal effects have the same sign and are statistically significant, but are larger in magnitude with respect to the Chamberlain-Mundlak models. Furthermore, in order to confirm one of the crucial findings in this study, second-generation immigrants and natives' entrepreneurial capacities are

compared using Propensity Score Matching (PSM) technique. The Average Treatments for the Treated (ATTs) shown in Table 4 in the Appendix, are positive, statistically significant for most of the matching methods. They are also larger in magnitude vis-à-vis Chamberlain-Mundlak marginal effects, supposedly because observations in the PSM empirical model are pooled.

## 2.6 Final remarks

The first group of hypotheses of this paper aims to shed some light on the entrepreneurial propensity of immigrants. Regarding hypothesis 1.a, empirical model shows that first-generation immigrants are less inclined to be self-employed, compared to natives. Vice versa, second-generation immigrants and individuals with an immigration background are more entrepreneurial than natives. Gender-specific models indicate that native males with an immigration background and second-generation immigrant males are more entrepreneurial, whereas females experience a positive effect only for the second-generation immigrant category. Somewhat surprisingly, empirical results contradict hypothesis 1.b: no ancestry group effect is found. Finally, hypothesis 1.c suppose that individuals speaking a different language with respect to local language for personal use are less entrepreneurial. It is only confirmed for females. The second set of hypotheses regards the transmission of self-employment capacities. Hypothesis 2.a is only valid for fathers. Having a self-employed father facilitates business ownership, whereas mothers' entrepreneurial attitudes do not affect offspring's self-employment. Hypothesis 2.b supposed the existence of a same-gender role model in the inheritance of entrepreneurial values. It is only confirmed for males. A more detailed analysis of males' subsample shows that the influence of self-employed fathers is not constant across social origins and ancestry groups (hypotheses 2.c and 2.d). The magnitude of this intergenerational transmission is bigger for second-generation immigrants and natives with immigration background, compared to natives. Males' subsample analysis shows that although ancestry groups do not affect entrepreneurial attitudes, the joint effect with paternal self-employment turns out to be positive for Swiss citizens, Germans/Austrians and Italians. Finally, no differences are found between Swiss and other ancestry groups. Policy measures should take into account differences between immigrant generations and their potential. For the first-generation, the key issue is to promote their entrepreneurial attitude. Access to self-employment could be correlated to integration, which reduces barriers and fosters immigrants' entry into entrepreneurship. The self-employment rate that is below that of natives will increase with integration and will then narrow the gap (Özcan and Seifert, 2000). Local authorities should develop policies aiming to increase the immigrants' potential with regard to business ownership by favouring professional education and language proficiency, especially for females. In conclusion, a notable drawback should be addressed in this research. Due to a lack of information, two poor proxies for parental assets and/or wealth are chosen. Nevertheless, this study has underlined the existence of strong dissimilarities in self-employment propensities and differences in intergenerational transmission of entrepreneurial values between social origins and ancestry groups, in

Switzerland. Furthermore, some determinants and barriers related to entrepreneurial attitude are revealed. Future research should better understand the mechanism of intergenerational transmission of entrepreneurial capacities and the different behaviour of natives and immigrants.

## 2.7 Appendix

Propensity Score Matching (PSM) is a well-known technique, especially in the evaluation literature. It allows dealing with non-randomised observational studies. In the seminal work by Rosenbaum and Rubin (1983), they used PSM to account for the bias in the estimation of treatment effects with observational data sets. Propensity score matching allows estimating treatment effects, thus reducing the bias that is due to non-random assignment to treatment and control group. The main feature of this technique is to control for the existence of confounding factors and to compare the outcomes of sub-groups of treated and control subjects with similar characteristics. Self-employment propensity of second-generation immigrants and natives are compared, assuming that Conditional Independence (CI) and other assumptions hold for the second-generation immigrant category. In order to obtain balancing property, some control variables that were not statistically significant were removed from the model specification and higher order terms of other variables were added. Table 6 shows the Average Treatments for the Treated (ATTs) for second-generation immigrants, compared to natives. PSM is estimated through four types of matching: nearest neighbour, radius with two different radii and kernel matching. In the full sample PSM estimates, ATTs are positive and larger in magnitude compared to Mundlak-Chamberlain marginal effect estimates. Bias corrected confidence interval does not contain the zero value. Hence, true value is greater than zero. Very similar results are found in the male sample. ATTs are larger in magnitude with respect to the full sample (except nearest neighbour matching) and the SO model. Finally, female sample shows a positive effect on the self-employment propensity, but this effect is statistically significant only for radius matching with a smaller radius.

**Table 6** Propensity score matching estimates: second-generation immigrants and natives.

Matching	treat.	contr.	Reps	ATT	Bias	Std. Err.	BC 95% CI	
Nearest Neighbour	2065	1886	100	0.040	-0.008	0.011	0.026	0.057
Radius (0.0001)	1841	25454	100	0.037	0.000	0.007	0.024	0.052
Radius (0.01)	2033	29553	100	0.030	0.001	0.006	0.017	0.040
Kernel	2065	29713	100	0.030	0.000	0.006	0.020	0.043
Males								
Nearest Neighbour	1098	982	100	0.031	0.014	0.016	0.011	0.052
Radius (0.0001)	942	8359	100	0.047	0.003	0.013	0.023	0.071
Radius (0.01)	1038	13935	100	0.042	0.001	0.010	0.020	0.058
Kernel	1098	14288	100	0.037	-0.001	0.010	0.023	0.060
Females								
Nearest Neighbour	978	859	100	0.017	0.003	0.013	-0.017	0.036
Radius (0.0001)	848	10457	100	0.021	-0.001	0.010	0.001	0.040
Radius (0.01)	939	15036	100	0.016	0.001	0.010	-0.003	0.030
Kernel	978	15192	100	0.016	0.001	0.009	-0.002	0.034

## 2.8 References

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### 3. Opportunity entrepreneurs and innovative ventures: are they really the fittest to survive?

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#### **Abstract**

Previous literature about entrepreneurship and human capital theory suggests that opportunity entrepreneurs are often individuals with a larger stock of knowledge, labour market experience and expertise. Thus, they are more willing to succeed as business owners. On the other hand, individuals that start a new venture for the sake of pursuing a business idea, in case of lower than expected monetary returns, might easily disengage from the start-up venture and choose a wage-earning job. Similarly, innovation is often described as a favourable factor for firm survival, but in some cases, the newness of the products could arise resistance to acceptance by the consumer, uncertainty and risk of failure. Most of the previous studies positively correlate opportunity self-employment and innovative behaviour with longer firm survival, but the results are ambiguous in some cases. Hence, this research aims to understand the differences in start-up survival, distinguishing between individuals that start a business in order to pursue an opportunity and individuals that are involved in a new venture because of necessity reasons. Additionally, the impact of different types of innovation on start-up survival is analysed. Furthermore, this study investigates other crucial individual and contextual features for firm survival, e.g. owner's previous start-up experience and team size. The data set used is the result of a harmonisation of five international data sets about start-up ventures located in the USA, China, Sweden and Australia. The projects screened a sample of adults to identify those active in business creation. The first screening started in 1998, the last in 2009. Results show that opportunity entrepreneurs are actually the fittest to survive, whereas results related to innovative start-up survival are mixed. From a policy maker's perspective, it should be a notable issue whether to support necessity or opportunity, imitative or innovative entrepreneurs through start-up tutoring or incubators. Moreover, understanding other survival features could improve the economic efficacy of entrepreneurial training programs. Finally, knowing more about firm survival might represent a useful tool for financial investors, banks or venture capitalists who want to calculate expected returns on their investment.

**Keywords:** *start-ups, entrepreneurship, firm survival, innovation, opportunity.*

### 3.1 Introduction

Starting from the beginning of the 20<sup>th</sup> century, Schumpeter laid the foundations for a better understanding of entrepreneurial behaviour and the mechanism of new venture creation (Schumpeter, 1912). Over the years, researchers' efforts to understand the mechanism behind the entrepreneurial ecosystem have been extensive. Especially starting from the end of the 1970s, entrepreneurship has become a major source of interest for researchers (Cooper, 2003). From the macroeconomic perspective, entrepreneurial activity has been proven to boost innovation, economic growth, and to hinder unemployment (Van Stel et al., 2005; Audretsch, 2006; Goetz et al. 2012). From the micro-economic point of view, starting a business represents a mean of economic integration of individuals that experience problems in the labour market, or in other cases, a successful alternative to wage-labour. Undoubtedly, entrepreneurship could be a valid option for individuals who seek for better working conditions, independency, flexible working hours and other lifestyle advantages that are related being self-employed (Benz and Frey, 2008; Dawson et al., 2009). However, easing the start of a business is not the only key factor in entrepreneurship policies, it should be a notable issue to understand whether new ventures are capable to survive or they suffer from early disengagement. The early months after start-up formation are the most difficult for a firm to enter in the market. Hence, it is a crucial period for determining future firm's performance and growth (Santarelli and Vivarelli, 2007). Previous literature took into account various socio-economic factors that influence entrepreneurial venture survival. The most common features highlighted by past research include nascent entrepreneurs' characteristics, e.g. gender, age and education, past experience and human capital accumulation (Simoes et al., 2016). Nevertheless, these factors are not the only important features determining business survival. The impact of individual's motivation to start the venture on its survival is still openly debated in the literature. It is well known, in fact, that an individual could choose the entrepreneurial option voluntarily (as an opportunity), or opts for the entrepreneurial venture due to the presence of a wage-labour barrier (out of necessity). The impact of opportunity entrepreneurship on firm survival is still uncertain and surely needs more attention (Baptista et al., 2014). Furthermore, another aspect that remains mixed and inconclusive in the existing literature regards the influence of different types of innovative behaviour on firm survival. Recent studies show that innovative start-ups have better chances to survive as a result to greater productivity, ability to make profits and a gain in market power (Cefis and Marsili, 2011; Aghion et al., 2014). However, it is useful to distinguish between different types of innovation, namely product innovators and advanced-technology-oriented businesses. In fact, the production and commercialisation of new products gives the firm a competitive advantage but in some cases, it could possibly carry some uncertainties derived by the unknown impact on the market and consumer behaviour and attitudes, eventually decreasing survival probability. On the other hand, a high-tech attitude and R&D spending should make a firm more competitive in the market and increase start-up life cycle. More generally, many results about the impact of

innovation on survival are mixed or non-existing, depending on the proxy used to account for innovative firm behaviour (Audretsch, 1991; Wilbon, 2002; Børing, 2015). Hence, this study wants to shed some light on the factors determining start-up survival, especially regarding the motivation to start the business and the innovation approach adopted by the start-up. The data set used in this analysis is the result of a harmonisation of five international longitudinal studies. It contains information about the date of entry into firm creation, start-up activities, and occurrence of major outcomes. The first “Panel Study of Entrepreneurial Dynamics” (PSED) protocol started in the United States in 1993, albeit the first screening of nascent entrepreneurs became in July 1998. The project was adopted internationally afterwards: data were collected in Sweden, Australia and China. Moreover, another US screening was implemented in October 2005. It was completed in January 2006. These cohorts are representative samples of business creation in their respective countries. Furthermore, all the projects utilised very similar procedures for identifying the occurrence and timing of start-up activities and determining the outcomes of business creation process. The data collected during these surveys have been harmonised, in order to build a worldwide spanning representative sample of nascent entrepreneurs. The resulting data set includes 2’390 entrepreneurial ventures, which comprise more than five million start-up days of activity. From a policy perspective, finding the determinants of self-employment survival should be a crucial issue for economic agents that are interested in fostering venture survival rates and their performance in the long-term. This is especially true with regard to the motivation that lies behind the choice of becoming an entrepreneur and innovative behaviour. It might be an important issue of interest for many stakeholders, e.g. policy-makers, educators, investors, and business founders. The contribution of this paper is threefold. Firstly, it allows shedding more light on the impact of the motivation to start the business on start-up success. Secondly, in the same vein, the innovative behaviour of start-ups is investigated. Thirdly and most important, using a worldwide spanning data set, this research aims to draw “universal” conclusions about the impact of the motivation to start a business and different types of innovation on firm survival. Moreover, analysing different cohorts separately, this paper should be able to disentangle the effect of these determinants in various market conditions, namely USA during the 2008 economic crisis, Sweden, Australia and emerging markets like China. Based on empirical results, three empirical findings stand out. First, as suggested by the previous literature, necessity entrepreneurs are less likely to survive compared to opportunity business owners. Second, firms that produce a good that was not available before are penalised, their chances of survival are worse than “imitative” ventures in the Schumpeterian sense. Third, start-ups that focus on R&D spending and innovative processes substantially increase their chances of survival. These results generally hold but might vary in particular economic and market conditions. This paper is organised as follows: section 3.2 discusses start-ups’ survival determinants detected by the previous literature. Section 3.3 describes the data set used in this analysis. Section 3.4 shows

descriptive statistics and raw survivor functions. In section 3.5, the survival function used is illustrated and model estimates are analysed. Finally, section 3.6 concludes and discusses possible drawbacks.

### **3.2 Literature review**

Previous research analysed many nascent entrepreneur's individual determinants and start-up features that might increase or decrease firm survival. The most trivial features taken into account are demographic characteristics of the founder, such as gender and age. Regarding the latter, previous literature concurs that older individuals are able to acquire more knowledge, experience, human capital, financial resources and business networks, thus increasing business' likelihood to survive (Gimeno-Gascon et al., 1997; Van Praag, 2003; Haapanen and Tervo, 2009). Gender-related research about start-up survival is mixed. Some studies show that notwithstanding the under-representation of females in entrepreneurship, after entering self-employment, there is no evidence of males experiencing longer entrepreneurial duration (Kalleberg and Leicht, 1991; Cooper et al., 1994; Brüderl and Preisendörfer, 1998). Other authors present opposite empirical findings, while Giannetti and Simonov (2004) conclude that women survival rate is higher, according to Millán et al. (2012) they experience survival difficulties, compared to males. Similarly, education might represent both a positive and negative force for start-up survival. According to human capital theory, entrepreneurial ability and firm success are related to higher levels of education (Becker, 1962; Boden and Nucci, 2000). However, highly educated individuals are more likely to find interesting alternatives to self-employment in wage-labour, hence in case of lower than expected returns of entrepreneurship they might switch to wage-employment. For example, Kangasharju and Pekkala (2002) find a higher exit probability for highly educated individuals during economic booms, whereas they find higher survival rates in the economic downturn. Immigrant origin of the founder is also a determinant influencing start-up survival rates. In most of the cases, immigrant entrepreneurs are found to be less likely to survive compared to natives (Cooper et al., 1994; Fertala, 2008; Joona, 2010). Other researchers find sensible differences between ethnicities (Bates, 1999) or among whites and other ancestry groups in the USA (Fairlie, 1999). Apart from founder's demographic characteristics, prior knowledge, work experience, abilities and expertise acquired in the past, play a role in start-up success too. Previous work experience is certainly an important factor shaping individual abilities. Indeed, job tenure shapes the capacity to detect opportunities and seek for financial resources, thus being able to start larger and better-organised firms (Colombo et al., 2004). Additionally, Brüderl et al. (1992) combining human capital theory and organisational ecology, distinguish between generic work experience and specific human capital related to firm survival. Entrepreneurial human capital increases with other self-employment experience and same-sector tenure. They found entrepreneurial specific human capital fostering firm survival, especially for same-industry experience. Helfat and Lieberman (2002) and Bosma et al. (2004) confirm this finding among others. Furthermore, McGrath and MacMillan (2000) assure that individuals whom acquired experience as

“serial entrepreneurs” have better managerial skills, access to a network of economic agents and market knowledge. Hence, they are better equipped to survive. Another aspect that potentially influences start-up survival is team size. Obviously, larger venture teams are capable to accomplish tasks speedily and increase the amount of human capital and access to information than smaller teams (Leonard and Sensiper, 1990; Klepper, 2001). Exporting products to foreign markets is also a factor influencing start-up survival. Exporters might have a competitive advantage in business survival than non-exporters. First, according to Hirsch and Lev (1971), being able to participate in both home and abroad implies a market diversification that might decrease risk of failure in case of a negative demand shock in one of the markets. Second, exporters are encouraged by international competition to be more efficient and achieve higher productivity and profit levels than non-exporters (Bridges and Guariglia, 2008). However, some studies find no effect or even a negative influence of export participation in the survival probability of new ventures (e.g. Giovannetti et al., 2011; Wagner, 2013). Finally, industrial sector and geographical area also have an impact on start-up success. Fritsch et al. (2006) find a decrease in firm survival in sectors with great market competition. Furthermore, economic crises, unemployment rates and labour market conditions affect regional areas differently and thus influence the survival probability (Fertala, 2008; Rissman, 2006). These determinants of business survival have been extensively discussed by the previous literature.

Nevertheless, other crucial survival factors emerged relatively recently in the past research. Firstly, further investigation is surely required, in order to shed some light on start-up survival rates distinguishing between necessity and opportunity entrepreneurship. As stated before, necessity entrepreneurs are those who are pushed into self-employment as an outside option, because they have limited chances in wage-labour. On the contrary, opportunity entrepreneurs are those who are pulled into self-employment, in order to exploit a business idea. Opportunity entrepreneurs are also willing to start a business as a choice to improve their work-life balance and to be more independent (Taylor 1996; Dalborg and Wincent, 2015). Amit and Muller (1995) using a Canadian data set, were the first to compare necessity and opportunity entrepreneurs and to empirically prove that the latter are more successful. Similarly, a recent paper by Belda and Cabrer-Borrás (2018) finds an advantage for Spanish opportunity entrepreneurs in terms of survival rates, compared to necessity entrepreneurs. However, Bourlès and Cozarenco (2018) discover that although French necessity entrepreneurs have trouble repaying debts, they do not experience a penalty in business survival. In the same vein, Block and Sandner (2009) find that after controlling for German entrepreneurs’ industrial-sector-related education, survival differences between opportunity and necessity entrepreneurs disappear. Secondly, the impact of innovative conducts on the likelihood to survive surely needs more attention. Intuitively, innovation is expected to be related with longer firm survival. Nevertheless, examining the existing literature, the picture remains unclear. A very recent paper by Zhang et al. (2018) concludes that patenting activity and innovation efficiency increase high-tech Chinese businesses’ survival chances.

Previously, other authors reached the same conclusion (Audretsch, 1991; Helmers and Rogers, 2010; Howell, 2015). Vice versa, Boyer and Blazy (2014) discover innovation to be an unfavourable factor for the survival of French micro-enterprises. Furthermore, Cefis and Marsili (2011) explored the mitigating effect of innovation on the “liability of newness”, defined by Stinchcombe (1965) as the risk of failure that is linked to the precarious conditions and organisation of new firms. They find a compensating effect of innovation for decreasing the liability of newness. Additionally distinguishing by type of innovation, product innovation unveils a higher survival premium, compared to process innovation. Nevertheless, in very dynamic markets, the introduction of a radical innovation may increase uncertainty and risk of failure for newly established ventures, thus decreasing the survival probability. In many other cases, the results are mixed, depending on the proxy used to measure innovation and market conditions (Buddelmeyer et al., 2010; Giovannetti et al., 2011; Fernandes and Paunov, 2015).

### **3.3 Dataset**

The data set used in this research is the result of the harmonisation of five Panel Study of Entrepreneurial Dynamics (PSED) cohorts (Australia, China, Sweden, USA I and USA II). These samples are representative of entrepreneurial ventures in their own countries. The Australian, Swedish, and two US cohorts screening procedures cover the entire country, whereas the Chinese screening regards eight cities, randomly selected to represent four major regions of China. The USPSEDI project was implemented in the United States in the 1990s, after a successful tentative of producing a representative sample of adults personally starting a business (Reynolds, 2004). Initial screening started in July 1998, it was completed in January 2000, and four subsequent interviews were collected. The second US panel (USPSEDI) screening was initiated in October 2005. Nascent entrepreneurs were interviewed for six waves. Simultaneously, other international projects took place, the Swedish project (SEPSSED) started in 1998 and individuals were followed for six waves. The Comprehensive Australian Study of Entrepreneurial Emergence (CAUSEE) screening lasted one year from April 2007 to April 2008, start-uppers were interviewed for five waves. Finally, the Chinese project (CHPSED) started in 2009 for only three waves. The harmonisation process aimed to uniformly collect detailed information about business creation, preliminary activity, first profits, and main start-up activities and outcomes (Reynolds et al., 2018). In order to deal with the different participation of certain groups of individuals in the interviews, e.g. young men are usually underrepresented, whereas old women are overrepresented in the adult population, sampling weights are applied. Additionally, other case weights were developed by the researchers to account for the size of the start-up team. Furthermore, a third adjustment was made to compensate for the fact that entrepreneurs that take longer to implement a new firm are more likely to be included in the initial screening. These case weights allow adjusting for the bias related to a longer time in time in the start-up process and its effect on the window of coverage. Researchers developing the data harmonisation suggest to not consider cases over 6 years (2'190 days), in order to avoid



a bias that is due to missing cases. As stated before, entrepreneurial activities are followed from the very beginning of the start-up process to nascent entrepreneur's disengagement. The definition of the point in time related to the entry into the start-up process is a difficult task and has been a source of debate as there is no general agreement neither on the theoretical definition nor on empirical definition of new firm birth (Reynolds, 2017). Not a uniform conceptual definition was used during the data collection procedures. Multiple criteria are used to identify new firm formation, based on information about start-up activities and their timing. Disengagement is defined as individually (SEPSSED, CHPSED and USPSSEDII), or in some cases unanimously (USPSSEDI and CAUSEE), quitting the start-up effort. For an overview about the criteria applied, see Reynolds et al., 2018 (pp. 7-9). The motivation for disengagement is not mentioned in this harmonisation. A further investigation of the data sets separately allows distinguishing between failures and disengagement due to selling the business. The Chinese data set is not in the public domain. The start-ups that are reported to be sold are 27 in the four remaining cohorts. This excludes 17 observations out of 2,390 from the harmonised data set. Hence, the missing information about the CHPSED is negligible, also considering that it is the smallest cohort.

### 3.4 Descriptive statistics

The theoretical background and the empirical findings discussed above suggest using independent variables related to nascent entrepreneurs' characteristics and experience, start-up's team size, sector and exporting decision. Furthermore, other key independent variables are related to entrepreneurial motivation (necessity vs. opportunity) and start-up's innovative performance. Regarding the latter, two binary variables were constructed. The first one is related to product innovation, the dummy variable equals to zero if the product or service that the start-up produces was available five years before. This makes the variable equal to one in case of the production of a "new" good. The second innovation-related-dummy relies on two survey questions about R&D spending as a major priority of the firm and about entrepreneurs considering their business high-tech. The binary variable takes value one if the respondent affirmatively answers to both questions. Based on these variables, product innovators and innovation-oriented businesses are defined. The harmonised data set lacks important information about nascent entrepreneurs' working status. In fact, it is unclear if individuals that declare to be starting the business because of "no better choice" are actually unemployed or, vice versa, if the ones that start a business out of opportunity are wage-employed. Analysing information from each data set singularly, an unemployment binary variable was created. As stated above, the Chinese data set is not publicly available. Another data related issue regards the motivation to start the business in the Swedish data set. This cohort shows 8% of opportunity entrepreneurs, this quota might not be fully reliable. According to Global Entrepreneurship Monitor (GEM) database, for example in 2002<sup>1</sup>, the

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<sup>1</sup> <https://www.gemconsortium.org/data/sets?id=aps>

percentage of individuals starting a business out of opportunity among the Swedish start-uppers was 83%. A further investigation of the Swedish longitudinal sample, provided by Mikael Samuelsson on ResearchGate<sup>2</sup>, allows distinguishing between entrepreneurs that chose to start the company before having a business idea or, vice versa, they had a business idea before or when starting the company. The percentage of individuals that started the venture for the sake of pursuing a business idea, arbitrarily defined as “opportunity entrepreneurs” is 77%. Table 1 shows descriptive statistics for the five cohorts.

**Table 1** Descriptive statistics and survival features, by PSED project.

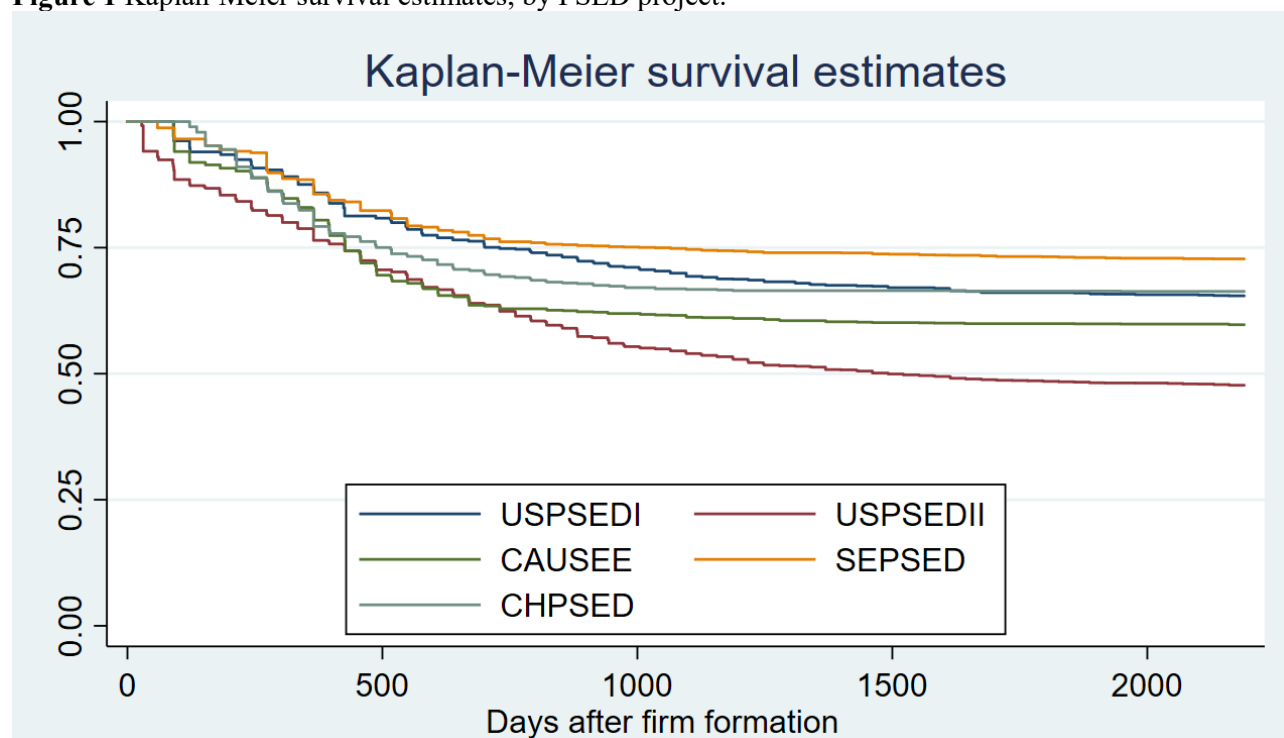
Variable	US PSED I		US PSED II		CAUSEE		SE PSED		CH PSED	
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Female	0.49	0.50	0.39	0.49	0.42	0.49	0.70	0.46	0.27	0.45
Born in the country	0.94	0.24	0.95	0.22	0.73	0.44	0.90	0.30	NA	NA
Age	40.1	11.2	43.8	12.6	43.1	11.7	38.1	9.6	31.3	10.3
Education: up to HS degree	0.16	0.37	0.20	0.40	0.32	0.47	0.34	0.47	0.35	0.48
post HS, pre college degree	0.41	0.49	0.39	0.49	0.30	0.46	0.23	0.42	0.27	0.44
college degree	0.24	0.43	0.24	0.42	0.21	0.41	0.21	0.41	0.35	0.48
graduate experience	0.18	0.38	0.17	0.38	0.17	0.37	0.23	0.42	0.03	0.18
Unemployed before starting business	0.03	0.17	0.24	0.43	0.02	0.15	0.09	0.29	NA	NA
Years of work experience	17.9	11.1	21.1	12.3	NA	NA	4.0	7.3	NA	NA
Years of same industry experience	8.56	9.46	9.45	10.75	NA	NA	NA	NA	NA	NA
Other start-ups experience	0.46	0.50	0.47	0.50	NA	NA	0.23	0.42	0.28	0.45
Team size: total owners	1.69	0.91	1.67	0.86	1.77	0.99	1.80	1.12	1.80	0.93
Sector: Agric., mining, constr., manuf.	0.13	0.34	0.21	0.41	0.30	0.46	0.24	0.43	0.16	0.36
wholesale, retail, transport, logistics	0.27	0.45	0.26	0.44	0.21	0.41	0.03	0.17	0.38	0.49
info., finance, real estate, profes.	0.29	0.45	0.31	0.46	0.17	0.38	0.15	0.35	0.25	0.43
educ., health, accom., consum. serv.	0.30	0.46	0.22	0.42	0.32	0.47	0.58	0.49	0.22	0.41
Customers outside country	0.19	0.40	0.18	0.39	0.33	0.47	0.17	0.38	NA	NA
Opportunity entrepreneurship	NA	NA	0.79	0.41	0.75	0.43	0.77	0.42	0.31	0.46
Product/service not avail. 5 years ago	0.34	0.48	0.21	0.41	0.32	0.47	0.37	0.48	0.25	0.43
R&D major prior. & consider bus. HT	0.15	0.35	0.10	0.30	0.16	0.37	0.18	0.38	0.20	0.40
Observations	535		836		367		372		263	

Sensible differences exist between the five cohorts. Starting from individual characteristics of nascent entrepreneurs, the percentage of female start-uppers in China is very low (27%) compared to other countries, especially to Sweden (70%). Additionally, Chinese nascent entrepreneurs are at least seven years younger, on average, compared to other cohorts. Other differences persist in the highest education achieved and immigrant origin, e.g. Australia excels for the percentage of immigrant entrepreneurs (27%). The USPSEDII cohort shows a sensibly larger unemployment rate, especially compared to USPSEDI and CAUSEE. Regarding the experience of the founder, on average, USPSEDII entrepreneurs have the highest tenure in

<sup>2</sup> <https://www.researchgate.net/project/Swedish-PSED>

terms of work, same-industry and other start-up experience. The cohorts also show substantial differences in team size and sectorial structure. Australian firms stand out as the most inclined to exporting products. Looking at opportunity entrepreneurship, major differences exist, ranging from a 31% of opportunity entrepreneurs in China to the 79% in USPSEDII. Finally, regarding innovate behaviour, albeit the highest percentage of innovation-oriented businesses is found in China, the percentage of product innovators is the second lowest. In general, product innovation and innovation-oriented business not always go hand in hand ( $\text{corr.} = 0.21$ ), conversely they seem to be very diverse start-up features. Figure 1 shows Kaplan-Meier survival functions by PSED project.

**Figure 1** Kaplan-Meier survival estimates, by PSED project.



It is clearly visible that the survival functions decrease at a very high rate until around 500 days after start-up formation, confirming the fact that the immediate period after start-up is crucial for firm success. This finding is in line with the previous studies in economic-related fields that detect higher exit probabilities for newly formed firms, compared to their older counterparts (Santarelli and Vivarelli, 2007). Afterwards, survival functions decrease at a lower rate until about 1'000 days. After about 3 years, the function turns almost constant for most of the longitudinal studies. Indeed, the first three years after firm formation are often considered the most critical for future start-up survival. The drastic decrease in the hazard after three years could be due to the gain in capacity of overcoming uncertainties, having improved the efficiency in coping with firm management, market challenges and conditions, therefore reducing the exit probability (Littunen et al. 1998). There are substantial differences between projects' survival functions, e.g. after 6

years, almost 75% of Swedish start-ups is still running, whereas less than 50% of USPSEDII firms has not failed. The USPSEDII shows the higher risk of exit, probably due to the adverse economic conditions that nascent entrepreneurs encountered in US during the 2007 financial crisis. Previous literature suggests that small and medium enterprises are negatively affected by economic crises and downturns, mainly because of the lack of financial resources and dependence on banks' funding (see for example Domac and Ferri, 1999).

### 3.5 Model and discussion

The dependent variable used in the empirical model is the survival time after start-up formation. Daily survival time is right-censored at 2'190 days in each longitudinal survey, assuming that the disengagement event is not observed for the start-ups that are still operating after 6 years. Previous literature about survival analysis suggests the use of hazard models. This methodology allows to correctly identifying the influence of independent variables on start-up survival, measured by the time interval between the start-up creation by nascent entrepreneurs and disengagement (Kiefer, 1988; Danacica and Babucea, 2010). The identification using hazard models is often the most precise when observations are right or left censored, in order to avoid a bias in statistical tests (Greene, 2003). Several semi-parametric and parametric techniques might be used, in order to adjust survivor functions for the effect of covariates. After an empirical evaluation of different survival distributions, the Gompertz parametrisation is chosen (see the Appendix for a detailed description of the process for model choice). Gompertz is a very flexible distribution used for modelling data with transition rates decreasing monotonically with time. Following Cleves et al. (2010), the hazard function for the Gompertz model written in the proportional hazards metric is:

$$h(t|x_j) = \exp(\gamma t) \exp(\beta_0 + x_j \beta_x)$$

where  $h(t|x_j)$  represents the risk of failure at time  $t$  knowing that the start-up was still active at time  $t-1$ , conditional to nascent entrepreneur and firm characteristics. Additionally,  $\exp(\gamma t) \exp(\beta_0)$  is the baseline hazard and the ancillary parameter  $\gamma$  gives the shape of the baseline hazard. If  $\gamma > 0$ , the hazard increases with time. If  $\gamma < 0$ , then the hazard function decreases every day. In the case  $\gamma = 0$ , the Gompertz distribution reduces to the exponential model. In this particular case, harmonised data set is originating from five different cohorts. One possible solution to account for the heterogeneity that is due to having different cohorts, is to estimate a completely stratified model by PSED project. This model allows both model's intercept and ancillary parameter to vary for each cohort. Completely stratified models insert stratum-specific dummy variables as covariates in the model and in the ancillary parameter. This procedure allows having entirely different baseline functions depending on the strata. The Gompertz model hazard ratios' estimates are shown in Table 2.

**Table 2** Gompertz survival model HR estimates, full sample and PSED sub-samples.

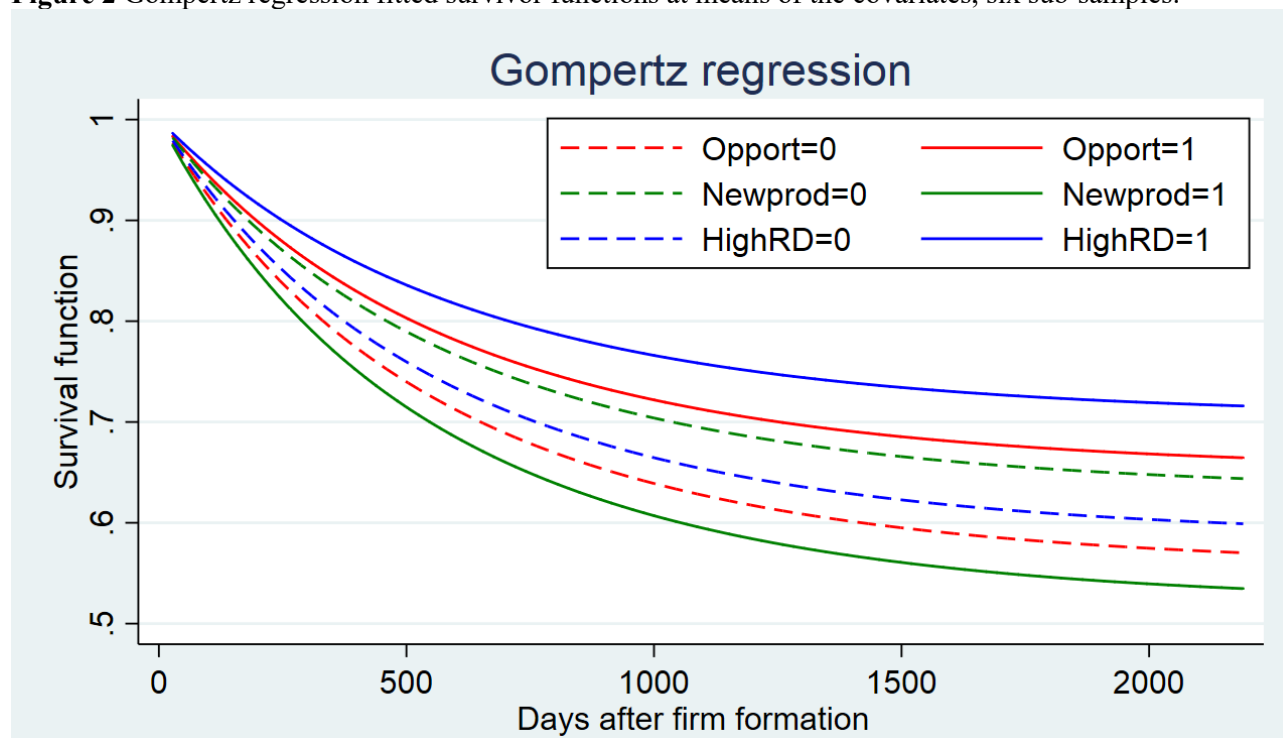
	FULL	USPSEDI	USPSEDI	CAUSEE	SEPSSED	CHPSED
Gender: female	0.950 (-0.71)	0.884 (-0.69)	0.778** (-2.31)	1.006 (0.03)	1.120 (0.47)	1.416 (1.44)
Born in the country	1.074 (0.57)	1.325 (0.77)	1.200 (0.82)	1.288 (1.25)	0.375*** (-3.06)	NA (2.22)
Age	1.004 (1.12)	1.030** (2.21)	1.017** (2.07)	1.009 (1.23)	0.991 (-0.93)	1.000 (-0.02)
Education: up to HS degree post HS, pre college degree	- 0.744*** (-3.36)	- 0.708* (-1.68)	- 0.756** (-1.97)	- 0.444*** (-3.67)	- 0.955 (-0.16)	- 1.511 (1.38)
college degree	1.125 (1.31)	0.770 (-1.15)	1.407** (2.44)	0.948 (-0.23)	0.743 (-0.97)	1.925** (2.22)
graduate experience	0.696*** (-2.93)	0.500** (-2.41)	1.009 (0.05)	0.361*** (-3.26)	0.573 (-1.45)	0.000002 (-0.02)
Unemployed before starting business	1.462*** (3.76)	0.709 (-0.55)	1.528*** (3.69)	1.393 (0.55)	3.193*** (3.98)	NA (NA)
Years of work experience	1.007 (1.40)	0.975* (-1.91)	0.998 (-0.27)	NA (NA)	1.015 (0.97)	NA (NA)
Years of same industry experience	0.979*** (-4.00)	0.981** (-2.06)	0.978*** (-3.45)	NA (NA)	NA (NA)	NA (NA)
Other start-ups experience	0.851** (-2.00)	0.780 (-1.48)	0.878 (-1.17)	NA (NA)	0.951 (-0.16)	0.566** (-2.13)
Team size: total owners	1.011 (0.29)	0.695*** (-3.58)	1.076 (1.23)	1.048 (0.55)	1.166 (1.22)	1.021 (0.15)
Customers outside country	1.482*** (4.63)	1.903*** (3.58)	1.230 (1.60)	1.967*** (3.85)	0.831 (-0.54)	NA (NA)
Opportunity entrepreneurship	0.803** (-2.51)	NA (NA)	1.055 (0.41)	0.396*** (-4.98)	0.605** (-2.11)	0.931 (-0.29)
Product/service not avail. 5 years ago	1.382*** (4.31)	1.848*** (3.91)	1.150 (1.14)	1.451* (1.83)	1.434 (1.45)	1.120 (0.42)
R&D major prior. & cons. bus. HT	0.652*** (-3.68)	0.504** (-2.50)	0.882 (-0.72)	0.589* (-1.84)	0.313** (-2.51)	1.071 (0.19)
Industrial sector fixed-effects	Y	Y	Y	Y	Y	Y
Stratified estimation by cohort	Y	N	N	N	N	N
Observations	2,373	535	836	367	372	263
Observations (weighted)	2332.5	519	816.9	367	366.7	263
Number of failures (weighted)	942.6	179.3	427.1	147.8	99.8	88.6
Right-censored observations	1,519	405	450	237	257	170
Log-likelihood	-2742.3	-528.2	-1158.6	-393.3	-311.1	-262.1
$\chi^2$	180.1***	77.48***	89.57***	80.95***	63.70***	21.35*
AIC	5540.6	1094.5	2357.3	820.5	660.2	554.2
BIC	5702.2	1175.9	2451.8	886.9	734.6	607.7
Ancillary parameter ( $\gamma$ )	-	-0.00117	-0.00117	-0.00170	-0.00162	-0.00203

Exponentiated coefficients; *t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

The estimated coefficients indicate the ratio of the hazard rates (HR), comparing the baseline of a categorical variable to other levels or measuring the effect of one unit change of discrete variables on survival probability. In general, a coefficient estimate that is lower than one indicates lower start-up death rates, compared to the reference category, hence longer survival times (*ceteris paribus*). Vice versa, a HR larger than one implies that a change from the base category accelerates nascent entrepreneurs' disengagement. According to HR estimates, females reduce the risk of death by 22% (HR=0.78), compared to males, only in the USPSEDII cohort. The coefficient is not statistically significant in other cases. Ancestry group related coefficient suggests that natives are more capable to survive in Sweden, although no effect is found in other cases. The influence of age on survival is not significant overall and is very small in magnitude in the US cohorts. Regarding educational attainment, obtaining an advanced degree (e.g. a master or a PhD) increases the survival rates (approximately 30% overall) but the effect is not significant in USPSEDII and CHPSED cohorts. Interestingly, estimates for these two cohorts suggest that having a college degree decreases survival chances, whereas no effect is found in other cases. Undoubtedly, American financial crisis that started in 2007 affected the Chinese economy, due to its heavy dependency on international trade. Hence, the global crisis increased the number of business failures in both countries (Ni et al., 2014). Thus, this result probably indicates that the influence of education on survival might vary in case of financial crises or economic downturns. Economic crises are usually associated with higher rates of unemployment and scarce wage-labour opportunities for low-skilled and poorly educated individuals. Therefore, the opportunity costs of staying in self-employment, even if the firm is performing poorly, are lower (Simón-Moya et al., 2016). This might explain why for USPSEDII and CHPSED cohorts, there is a survival penalty for nascent entrepreneurs that obtained a college degree, compared to the ones that only completed compulsory schooling. Being unemployed before starting the business sensibly decreases survival chances, particularly for Swedish entrepreneurs, although the coefficient is not statistically significant for American (USPSEDI) and Australian start-uppers. Regarding specific entrepreneurial abilities, although some data about nascent entrepreneurs' previous experience are missing, same-industry experience indicator suggests a survival premium for nascent entrepreneurs with ample tenure. Furthermore, the positive effect for other start-ups experience is even larger in magnitude, but it is not significant in US and Swedish panels. The positive influence related to general work experience is only valid for the first US cohort, whereas it is not significant in other cases. Working in a bigger start-up team only positively influences the survival chances of USPSEDI nascent entrepreneurs. Contrary to most of the previous literature empirical results, exporting decision seems to have a negative influence on survival. The estimates imply that, at each survival time, the hazard rate for those who are exporting products abroad is 48% more, compared to non-exporters, albeit Swedish and USPSEDII cohorts show no effect. Comparing hazards of opportunity and necessity entrepreneurship, a positive association between the opportunity motivation and survival rates is revealed:

nascent entrepreneurs that start a business out of necessity are more likely to disengage from start-up earlier. In fact, being an opportunity entrepreneur is associated with a 20% higher survival rate, the effect is even larger in magnitude in the Swedish and Australian cohorts, but it is not significant in other cases. In CHPSED and USPSEDII there seems to be no difference between opportunity and necessity entrepreneurs. Similarly to what stated before regarding educational attainment, in CHPSED and USPSEDII, a possible explanation could rely on the fact that economic crisis pushes individuals with a weak motivation to start a business to stay in self-employment, mainly due to the lack of chances in wage labour. Furthermore, the absence of better options or other alternatives to self-employment encourages them not to disengage from the start-up venture. Thus, the survival chances of necessity entrepreneurs increase during economic crisis and the gap in survival rates, with respect to opportunity entrepreneurs, is narrowed (Naudé and McGee, 2009). Regarding innovative behaviour, coefficient estimates indicate that those producing a new good have higher hazard rates than “imitative” ventures, *ceteris paribus*. This result is valid for the whole sample, but not for the second US, Swedish and Chinese cohorts singly. This finding concord with some of the previous literature pointing out that product-innovation might not have a positive impact on survival rates. Marketing a new product by a newly established firm surely carries some uncertainties and the venture could occur in some resistance by the consumer. In fact, only a small portion of new products launched succeeds in finding a persistent market niche (Buddelmeyer et al., 2010). Finally, innovation-oriented businesses experience a survival premium. Estimates imply that, at each survival time, the hazard rate of these ventures is only 65% of the hazard rate for non-innovators. Innovative-oriented businesses surely increase efficiency and give the start-up a competitive advantage, making other firm’s technology obsolete and thus improving innovation-oriented firms survival chances (Agarwal, 1998). Even in this case, USPSEDII and CHPSED cohorts show a different behaviour, compared to other nascent entrepreneurs’ panels. Being innovative does not affect new firm survival chances. In order to shed more light on the survival chances of opportunity and necessity entrepreneurs, and based on the innovative strategy adopted by the start-up, the fitted survivor functions are plotted. Figure 2 shows the survival curves after evaluating the fitted model at each time in the data, at the means of the covariates.

**Figure 2** Gompertz regression fitted survivor functions at means of the covariates, six sub-samples.



At first glance, can be noted that the six functions are decaying at a decreasing rate over time. Hence, the general conclusion is that the increase of start-up management experience leads to a declining rate of early disengagement from the start-up effort. Based on the survivor function of the Gompertz model, the survival experience of an “average-covariates” nascent entrepreneurs choosing self-employment out of necessity is clearly worse than the survival experience of a nascent entrepreneur with the same characteristics entering entrepreneurship due to an opportunity recognition. Only one month after starting the venture, in fact, the hazard related to opportunity entrepreneurship is about the 73%, compared to the hazard of necessity entrepreneurs. This implies that after three years, comparing an opportunity start-upper and a necessity entrepreneur, the predicted percentage that the second one will still be running the firm is about the 63%, whereas the percentage of survived opportunity entrepreneurs is 71%. After 6 years, the gap between the two categories is even wider (9.5 p.p.). In the same vein, sensible differences exist between product innovators and their opposite category. At the end of the observation period, the total amount of risk that has been accumulated by product-innovators is the 42% more than “imitative” start-ups. This difference is even bigger comparing firms with an innovative imprint and low-tech based industries (53%). Thus, only the 28% of the former suffer from start-up failure, while the 40% of the latter runs out of business at the end of the observation period. Finally, key survival factors related to these six sub-samples might be investigated, evaluating the impact of individual and start-up conditions for survival in the case of necessity or opportunity-driven entrepreneurship, product innovators or “imitative” ventures, high-technology-



oriented start-ups or “non-innovators”. Table 3 shows estimated ratio of the hazard ratios for these six sub-samples.

**Table 3** Gompertz survival model HR estimates, six sub-samples.

	FULL Opport=0	FULL Opport=1	FULL Newprod=0	FULL Newprod=1	FULL HighRD=0	FULL HighRD=1
Gender: female	1.080 (0.68)	0.925 (-0.82)	0.950 (-0.59)	0.927 (-0.52)	0.923 (-1.07)	1.768** (2.14)
Born in the country	1.336 (1.33)	0.938 (-0.41)	0.909 (-0.64)	1.431 (1.58)	0.947 (-0.42)	2.355 (1.64)
Age	0.999 (-0.18)	1.007 (1.35)	1.012** (2.44)	0.994 (-0.74)	1.000 (0.06)	1.034*** (2.76)
Education: up to HS degree post HS, pre college degree	- 0.745** (-2.24)	- 0.743** (-2.45)	- 0.860 (-1.46)	- 0.534*** (-3.67)	- 0.742*** (-3.23)	- 1.006 (0.02)
college degree	0.873 (-0.95)	1.369*** (2.68)	1.196* (1.68)	0.843 (-0.95)	1.124 (1.24)	1.100 (0.28)
graduate experience	0.483*** (-3.40)	0.841 (-1.11)	0.830 (-1.22)	0.476*** (-3.40)	0.829 (-1.45)	0.338*** (-2.60)
Unemployed before starting bus.	1.630** (2.54)	1.567*** (3.66)	1.377*** (2.73)	1.636** (2.29)	1.524*** (4.03)	0.405** (-2.13)
Years of work experience	0.996 (-0.50)	1.013* (1.86)	1.002 (0.27)	1.013 (1.32)	1.008 (1.46)	1.021 (1.23)
Years of same industry exp.	0.994 (-0.79)	0.970** (-3.98)	0.971*** (-4.40)	1.001 (0.07)	0.981*** (-3.43)	0.956*** (-2.58)
Other start-ups experience	0.822 (-1.63)	0.882 (-1.12)	0.775*** (-2.58)	0.977 (-0.15)	0.822** (-2.30)	1.086 (0.31)
Team size: total owners	0.965 (-0.56)	1.050 (1.02)	1.052 (1.03)	0.941 (-0.97)	1.003 (0.08)	0.992 (-0.08)
Customers outside country	1.032 (0.21)	1.818*** (5.68)	1.408*** (3.15)	1.571*** (3.19)	1.427*** (3.88)	1.672** (1.99)
Opportunity entrepreneurship	- (-3.66)	- (-1.25)	0.746*** (-2.96)	1.116 (0.56)	0.761*** (-3.02)	1.222 (0.55)
Product/service not avail. 5 y. ago	1.516*** (3.68)	1.286** (2.41)	- (-3.66)	- (-1.64)	1.355*** (3.79)	2.123*** (3.05)
R&D major prior. & cons. bus. HT	0.490*** (-3.66)	0.831 (-1.25)	0.604*** (-2.93)	0.762 (-1.64)	- (-3.66)	- (-1.64)
Industrial sector fixed-effects	Y	Y	Y	Y	Y	Y
Stratified estimation by cohort	Y	Y	Y	Y	Y	Y
Observations	1340	1050	1706	684	2052	338
Observations (weighted)	1264.3	1090.7	1711.2	643.8	2049	306
Number of failures (weighted)	467.3	486.8	664.3	289.8	864.9	89.2
Right-censored observations	424	435	620	239	758	101
Log-likelihood	-1133.1	-1570.1	-1942.4	-771.8	-2460.7	-245.9
$\chi^2$	96.05***	148.7***	138.7***	87.37***	130.5***	99.15***
AIC	2320.2	3190.1	3938.7	1597.7	4975.3	545.7
BIC	2454.7	3319.4	4085.5	1719.7	5127.0	649.0
Ancillary parameter ( $\gamma$ )	-	-	-	-	-	-

Exponentiated coefficients; *t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Survival rates of necessity entrepreneurs are mainly positively affected by nascent entrepreneurs' education, especially graduate experience. Another factor extending the survival chances of necessity entrepreneurs is having a high-tech approach and focusing on R&D spending. Conversely, the survival penalty that was found in the full sample specification for being unemployed and a product innovator is confirmed for necessity businesses and it is bigger in magnitude. General tenure and entrepreneurial specific experience seem to have no effect for individuals who start a business out of necessity. Vice versa, the sub-sample of opportunity entrepreneurs shows survival penalties in nascent entrepreneurs with higher general work experience (at 10% level significance) and that own a college degree. However, increases in same-industry experience are found to positively affect start-up duration. This result is in line with the findings of past research. As stated before, in case of lower than expected start-up success, a worker with a large tenure or college education might be induced to go back to wage-labour, whereas specific entrepreneurial experience fosters the motivation to continue the start-up tentative and discourages early disengagement. Product innovators' longer survival is associated with higher education, especially graduate experience. Interestingly, analysing the sub-samples of "imitative" and "non-innovative" ventures, very similar results are obtained. In both cases, specific competencies, namely same-sector tenure and entrepreneurial experience, are associated with higher survival chances. Additionally, the opportunity motivation for starting a business has a sensible positive effect on survival in both cases. This result could imply that a strong determination in pursuing of business idea could hinder the disengagement of "non-innovative" and "imitative" firms and increase their survival rates. Innovation-focused enterprises sub-sample's estimates indicate that being male and obtaining an advanced degree enhances firm survival, while being a product innovator represents a strong and negative influence on their survival chances. Contrary to all the previous model specifications, being unemployed before starting the business seems to be a favourable factor for firm survival.

### 3.6 Conclusions and drawbacks

The aim of this study is to analyse the effect of nascent entrepreneur and start-up characteristics on business survival. In particular, this research focuses on the validity of the hypothesis found in most the previous literature that starting a business out of opportunity and being innovative increase start-up survival chances in the long term. Actually, some authors went deeper into this debate and found empirical evidences that differ from this findings. For example, necessity entrepreneurs do not always lack in determination to continue running their venture, compared to opportunity entrepreneurs (Block and Sandner, 2009; Bourlès and Cozarenco, 2018). This paper shows that in peculiar cases, such as financial crises or economic downturns, there is no gap in survival rates of opportunity and necessity entrepreneurs. This result might be due the lack of alternatives to self-employment during economic crises and high unemployment rates. Hence, this shortage of alternatives could raise the endurance of necessity entrepreneurs and minimise the survival gap with opportunity ventures. Additional results show that the opportunity-driven motivation could mitigate the risk of failure of “imitative” and “non-innovative” ventures. Regarding the impact of innovation on start-up survival, this paper distinguishes between product innovators and nascent entrepreneurs that focus on R&D spending and consider their business as high-tech. Empirical models generally show a sensible survival penalty for enterprises that produce a good that was not available five years before. Vice versa, innovation-oriented ventures unveil a survival premium, apart from US after 2007 and China. In these particular economic and market conditions, having an innovative approach fails to increase survival chances. Additional results show that innovation oriented business that produce a new good sensibly increase the chances of early disengagement. The probability of survival of “imitative” and “non-innovative” firms increases with specific entrepreneurial experience and opportunity motivation. This study is a first attempt to use an international data set to draw “universal” findings related to the factors affecting early start-up survival, especially regarding the motivation to start the business and the innovative behaviour. This research has at least three limitations. First, the sample is the result of a complex harmonisation process that could contain some biases deriving from the different languages used in the surveys, the definition of the entry, disengagement from the start-up process, and other potential issues discussed in Reynolds et al. (2018). Second, key innovation variables are defined by an individual perception. Nascent entrepreneurs are asked to answer about the consideration of their firm as “high-tech” and R&D spending as a “major priority”. The answers to these questions can vary based on the individual perception and the level of innovativeness in the market in which the firm operates. Similarly, the categorisation of product-innovators might be biased by the partial knowledge of the nascent entrepreneur. Third, important information is missing or might have been wrongly collected or harmonised. In the case of the Australian dataset, information about job and entrepreneurial tenure of nascent entrepreneurs is missing. The same applies to the Swedish data set, but for only one of those variables. Similarly, the Chinese dataset

has no information about immigrant origin and export choice, besides individuals' experience. Furthermore, the data about first US cohort did not include crucial information about the entrepreneurial motivation. In all these cases, not to lose too much information when running the empirical models, regressors were put in the model as a one-level categorical variable showing zero variation, and hence do not contributing to the explanation of the dependent variable. In conclusion, this research highlights important features of firm survival. Policy makers should be interested in targeting start-ups that are more likely to survive and grow over time, supporting them through tutoring, incubators and entrepreneurial training programs. Moreover, knowing more about the impact of nascent entrepreneur's characteristics and start-up features on new venture's survival chances should be a guidance for business angels, investors and other economic agents who surely are willing to acquire more information about probability of early disengagement of a start-up they want to finance. Future research should focus on firm's survival determinants, preferably using a larger and more detailed data set, possibly exploring the differences in the impact of individual and firm determinants during economic crises and peculiar market conditions.

### 3.7 Appendix

The first step for the choice of the optimal survival model to fit the data implies choosing between a semi-parametric or fully parametric survivor function. Cox semi-parametric model assumes the hazard ratio to be constant over time. Hence, proportional-hazards (PH) assumption is fundamental for the validity of using Cox model. The validity of PH assumption is checked using statistical tests and graphical evaluations. Albeit the link test concludes in favour of proportional hazards, the test based on Schoenfeld residuals (Grambsch and Therneau, 1994) and other graphical tests find evidence that model specification violates the PH assumption. Having excluded the Cox model, the second step regards the choice of the correct parametrisation for the survival function. Five distributions are tested, namely Exponential, Gompertz, Weibull, Log-Normal and Log-Logistic. The choice of the appropriate parametric model should fit the underlying process generating failure times in the data and reflect the shape of the hazard function. The log-likelihood (LL), Akaike (1974) information criterion (AIC) and Bayesian information criterion (BIC) (Schwarz, 1978) are used evaluate model goodness of fit and parametric specification performances. Table 4 shows LL, AIC and BIC values for the five distributions stated before, calculated after estimating the full model and separate models for the five longitudinal surveys.

**Table 4** LL, AIC and BIC for exponential, Gompertz, Weibull, log-normal and log-logistic distributions.

FULL	EXP	GOM	WEI	LNR	LLG
LL	-3077.9	-2786.7	-2958.9	-2878.1	-2915.9
AIC	6199.7	5619.5	5963.8	5802.1	5877.8
BIC	6326.9	5752.4	6096.8	5935.0	6010.7
USPSEDI	EXP	GOM	WEI	LNR	LLG
LL	-568.6	-529.7	-557.3	-541.9	-550.2
AIC	1171.1	1095.3	1150.5	1119.8	1136.5
BIC	1244.2	1172.7	1227.9	1197.2	1213.8
USPSEDI	EXP	GOM	WEI	LNR	LLG
LL	-1284.6	-1188.2	-1232.4	-1197.3	-1209.5
AIC	2605.3	2414.4	2502.9	2432.6	2457.1
BIC	2690.5	2504.4	2592.8	2522.6	2547.0
CAUSEE	EXP	GOM	WEI	LNR	LLG
LL	-448.5	-393.4	-433.9	-416.5	-422.5
AIC	927.0	818.8	899.7	865.0	877.0
BIC	985.6	881.3	962.2	927.5	939.5
SEPSED	EXP	GOM	WEI	LNR	LLG
LL	-360.9	-321.4	-347.6	-339.7	-343.8
AIC	755.8	678.8	731.2	715.4	723.7
BIC	822.5	749.4	801.9	786.1	794.4
CHPSED	EXP	GOM	WEI	LNR	LLG
LL	-307.9	-262.1	-295.2	-285.0	-290.3
AIC	643.8	554.2	620.4	600.0	610.6
BIC	693.8	607.7	673.9	653.6	664.2

As a rule of thumb, a bigger log-likelihood, a smaller value of AIC and BIC criteria indicate a better goodness of fit of the model. The full sample specification suggests selecting the Gompertz distribution to fit the data, due to larger log-likelihood and smaller AIC and BIC. The same applies to all the other sub-samples. Hence, it is reasonable to use the Gompertz model to fit these survival functions.

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## Conclusions

The idea for this thesis came from the necessity of investigating more deeply the factors determining labour market trajectories, self-employment propensity and survival. Using empirical models that are not strictly related to economics, but to social sciences in a wider perspective, this thesis tries to produce a new point of view to issues to have partially been studied in the previous literature but surely need more attention. In order to provide more psycho-sociological insights, the three articles focus on the individual, looking at its social origin, family background, social status, behaviour and motivations. These factors should be considered as crucial aspects when studying labour market outcomes and transitions. Undoubtedly, macro-economic factors influence labour market outcomes but what primarily determines working status are individual will, choices and experiences. From the results of this thesis, the author tries to give some policy implications and additionally recognises some limitations and drawbacks that are due to data sources used, methodologies or researcher's arbitrary choices. Future research should be aimed to use these articles as a source of useful information to explore these topics more extensively and fill the gap in the past research.

In particular, the first chapter brings some findings about the determinants of different career paths, in order to prevent career failures such as chronic unemployment. The main finding regards social origin: immigrants or Swiss born with immigrant origin are more inclined towards long-term joblessness, compared to natives. There are differences distinguishing by gender too, females are less inclined towards entrepreneurial careers and more likely to experience fragmented careers. School grades and skills, childhood features and parental education and social status influence individuals' careers as well. This research represents an attempt to illustrate the determinants of career paths in the Swiss labour market. This should be a notable issue in the Swiss political agenda. In fact, a research shows that although Switzerland has a very low unemployment rate, the percentage of individuals that are jobless for more than twelve months (long-term unemployment) is higher than the OECD average. Further research should focus on career paths for policy evaluations, in order to act for an early prevention of unsuccessful careers.

The second chapter tries to confirm or deny some hypotheses that are derived from the previous literature. The hypothesis that social origin affects entrepreneurial propensity is certainly confirmed: first-generation immigrants in Switzerland are less inclined to be self-employed, compared to natives. Vice versa, second-generation immigrants and individuals with an immigration background are more entrepreneurial than natives. Similarly to the first chapter, family background is found to affect individual's career choices (e.g. having a self-employed father facilitates business ownership). This research gives some hints to policy makers regarding immigrant entrepreneurship: first-generation immigrants experience a barrier in self-employment. Access to self-employment could be correlated to integration, knowledge of the local language and professional education. Future research should aim to better understand the mechanism of

intergenerational transmission of entrepreneurial capacities and find solution to integrate social categories that are hindered in self-employment.

The third chapter aims to understand the mechanism of firm survival in a “worldwide” perspective. Empirical results confirms that opportunity entrepreneurs are more likely to survive. Nevertheless, in the case of financial crises or economic downturns (US after 2007 and China), there seems to be no gap in survival rates between opportunity and necessity entrepreneurs. Innovation-oriented ventures unveil a survival premium, except in the particular economic conditions described before. There is also a sensible survival penalty for product innovators. Policy makers should be interested not only in fostering the rise of new businesses but to make these start-ups survive and grow over time. Hence, they should support start-ups that are more likely to survive through tutoring, incubators and entrepreneurial training programs. The same applies to investors and venture capitalists. In the future, it should be useful to explore the differences in the impact of individual and firm determinants on start-up survival between countries and during economic crises and particular market conditions.