ISCTE Business School
Instituto Universitário de Lisboa

THE JACKS-OF-ALL-TRADES THEORY: A SURVEY

Cintia Alexandra dos Santos Millan

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Supervisor:
Prof. Nuno Miguel Pascoal Simões Crespo, Vice-Reitor, Prof. Auxiliar com agregação, ISCTE Business School, Departamento de Economia

Co-supervisor:
Prof. Nádia Nogueira Simões Crespo, Prof. Auxiliar, ISCTE Business School, Departamento de Economia

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Abstract

The economic importance of entrepreneurship – impact on growth, job creation, innovation – is well-established in the literature. In recent decades, a vast field of research has emerged aimed to identify the determinants of entrepreneurial entry and success. One of the main objectives is, in fact, to answer the following question: what are the characteristics of the entrepreneurs? Despite the complexity of this question, the importance of human capital is one of the most debated issues. In this context, the study of Edward Lazear (2004, 2005) provides a critical contribution, namely through the definition of a link between a balanced set of skills and the probability of participation in entrepreneurial activities.

In this dissertation, we assume this work as starting point and develop a comprehensive review of the literature produced after (and linked to) the original contribution. In methodological terms, we concretize this objective through a mixed approach, combining a traditional survey (literature review) with bibliometric analysis.

More specifically, we select all the papers that cite the original studies by Lazear (in the Scopus database) and provide an organized overview of the following topics: (i) the basic ideas of the seminal contribution by Lazear; (ii) a bibliometric review of the studies that cite those studies; (iii) a comprehensive analysis of the empirical exercises conducted to test the basic propositions put forward by Lazear; (iv) the theoretical extensions produced; and (v) a short discussion of some vital alternative perspectives and complementary issues.

The research allows to conclude that this area is a very fruitful field of research, justifying additional (theoretical and empirical) analysis in order to shed light on some less robust results. The evidence produced in this field could define important guidelines concerning public policies to promote entrepreneurship.

JEL codes: J24; L26; M13

Keywords: Entrepreneurship; Jacks-of-all-trades; Human Capital; Employment choice; Survey

Resumo

A relevância económica do empreendedorismo – impacto no crescimento, criação de emprego, inovação – é um tema frequente na literatura. Nas últimas décadas, surgiu um vasto campo de pesquisa com o objetivo de identificar os determinantes da entrada e do sucesso empresarial. Sendo um dos principais objetivos a resposta à seguinte questão: quais as características dos empreendedores? E, apesar da complexidade deste tópico, a importância do capital humano destaca-se como um dos assuntos mais discutidos. Neste contexto, o estudo de Edward Lazear (2004, 2005) fornece um contributo crítico, nomeadamente através da definição duma relação entre um conjunto equilibrado de competências e a probabilidade de participação em atividades empreendedoras.

Nesta dissertação, assumimos esse estudo como ponto de partida e desenvolvemos uma revisão abrangente da literatura produzida após (e relacionada com) a contribuição original. Em termos metodológicos, concretizamos esse objetivo através duma abordagem mista, combinando um *survey* tradicional (revisão da literatura) com análise bibliométrica.

Mais especificamente, selecionámos todos os estudos que citam os artigos originais de Lazear (na base de dados Scopus) e fornecemos uma visão organizada dos seguintes tópicos: (i) ideias fundamentais da contribuição original de Lazear; (ii) revisão bibliométrica dos estudos que citam os seus artigos; (iii) análise abrangente dos exercícios empíricos realizados para testar as proposições apresentadas por Lazear; (iv) extensões teóricas produzidas; e (v) breve discussão de algumas perspectivas alternativas vitais e questões complementares.

A investigação desenvolvida permite concluir que esta área é um campo de pesquisa muito frutífero, justificando análises adicionais (teóricas e empíricas), a fim de esclarecer alguns resultados menos robustos. A evidência produzida neste campo poderá definir diretrizes importantes sobre políticas públicas para promover o empreendedorismo.

Códigos JEL: J24; L26; M13

Palavras-chave: Empreendedorismo; *Jacks-of-all-trades*; Capital Humano; Escolha ocupacional; *Survey*

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1. Introduction

Entrepreneurship has strong economic and social implications, directly contributing to economic growth, the creation of new jobs, technological development, and product and service innovation (Acs and Audretsch, 2003; Audretsch et al., 2006; van der Sluis et al., 2008; Ganotakis et al., 2012; Backes-Gellner, 2013).

Given this importance, there is a vast literature devoted to the analysis of the conditions that contribute or mitigate entry and success in entrepreneurship, published not only in generalist journals but also in several specialized journals. Particularly important, in this context, is the identification of the factors that determine entry and success in entrepreneurship. More specifically, a critical question is the identification of the characteristics of the entrepreneurs. One of the most studied factors is the influence of human capital following a tradition that started with the seminal work of Becker (1964). Since then many founding contributions emerged concerning the influence of formal education and different types of labor market experience (including different jobs, industries, employers, roles, or occupations) on building the portfolio of core skills for launching and managing new entrepreneurial ventures (Bates, 1985, 1990; Autio et al., 1989; Bruderl et al., 1992; Casson, 1995; Jo and Lee, 1996; Gimeno et al., 1997).

A critical and disruptive contribution in this area was put forward by Lazear (2004, 2005)[1], suggesting the importance of a balanced set of skills for entrepreneurship, i.e., "*because the entrepreneur must bring together many different resources, he or she must have knowledge, at least at a basic level, of a large number of business areas. An entrepreneur must possess the ability to combine talents and manage those of others*" (Lazear, 2005, p. 650). Therefore, entrepreneurs need to be *generalists* or *jacks-of-all-trades* instead of *specialists*. Obviously level and variety continued to be important but by introducing this concept, Lazear was able to put the composition of human capital at the center of the debate on entrepreneurial skills.

Going a step further, Lazear provides an answer to the question: "where does a balanced skill set come from?" According to his framework, "*investment can take a number of forms, the*

[1] Lazear's theory of entrepreneurship was published in two papers: (1) "Balanced Skills and Entrepreneurship" in the American Economic Review Papers and Proceedings in 2004; and (2) "Entrepreneurship" in the Journal of Labour Economics in 2005. However, although there are two papers, the main contribution can be found in Lazear (2005) that corresponds to the original work that the author developed in his working paper (Lazear, 2002). For this reason, in many cases, the discussion will mainly refer to Lazear (2005).

most important of which is formal schooling and on-the-job training. Thus, those who eventually become entrepreneurs should not specialize in skill acquisition, and this might be reflected in taking a wide variety of courses" (Lazear, 2005, p. 660-661).

After these studies, an important field of research has emerged, focusing both the empirical exercises that aim to test the basic propositions suggested and the discussion of new theoretical perspectives that complement the original idea. Twelve year after Lazear (2005), there is now a significant stock of knowledge – as well as a group of interesting and challenging ideas – that provides a rich background for the link between the composition of human capital and the probability of entry and success in entrepreneurial activities. During this period, according to the Scopus database, 160 paper articles cited Lazear (2004) while 265 cited Lazear (2005); and these papers have been cited more than 9026 times.

This dissertation aims to contribute to this field of research through a mixed methodology. We combine a traditional survey (literature review) with the use of bibliometric techniques, which are being applied, with growing emphasis, in recent years, in several areas of study. The main objective is to provide an integrated perspective, combining qualitative and quantitative methods, in order to obtain an overview of the stock of knowledge already produced on this specific question.

The dissertation is organized as follows. After these preliminary considerations (Introduction), we provide a short presentation of the model developed by Lazear (2005), with focus on the hypotheses assumed and the propositions derived. In Chapter 3, we start our main contribution through the application of bibliometric methods in order to have a more comprehensive perspective about the quantitative impact of the seminal study of Lazear on the literature and, more specifically, on the theoretical and empirical research on the determinants of entrepreneurship entry. To that end, we use Scopus database and select all the articles that cite Lazear (2004, 2005). Chapter 4 concentrates on the empirical evidence already produced in order to test the propositions put forward in Lazear's study. In this context, we provide a detailed review of the characteristics of each study and – more important – of the main results obtained. Chapter 5, on its turn, moves the attention to theoretical extensions that provide additional insights to our understanding of the link between human capital and entrepreneurship entry. Chapter 6 discusses some alternative critical perspectives, providing a larger overview about the main topic under consideration. And finally, Chapter 7 presents some final remarks.

2. "Entrepreneurship" by Edward Lazear

2.1 Hypotheses and main question

In his famous study, "Entrepreneurship", Edward Lazear presents a model in which an individual chooses to become entrepreneur or to specialize, working as employee. The rationale for the choice relies on the distribution of skills. The theoretical framework incorporates a set of hypotheses and derives some critical propositions. The basic hypotheses of the model are summarized in Table 1.

Table 1: Hypotheses assumed in Lazear's Jacks-of-all-trades (JAT) theory

Hypothesis	Description
H1	Entrepreneurs make many tasks, "*they must be good at many things*" (Lazear, 2005, p. 652).
H2	There are "*only two skills*" (Lazear, 2005, p. 652) denoted by x_1 and x_2 (x_1, $x_2 \geq 0$). Each individual knows the values of x_1 and x_2.
H3	The relevant skills to become entrepreneur are managerial skills. As stated by Lazear (2005, p. 650), "*the entrepreneur must have knowledge, at least at a basic level, of a large number of business areas*".
H4	The choice between to become entrepreneur or to specialize depends on income functions, i.e., the maximization of income returns is the only criterion for the choice.
H5	No risk. "*Risk preference is (…) ignored in this model where everything other than endowment of x_1 and x_2 is deterministic*" (Lazear, 2005, p. 652).
H6	Entry into entrepreneurship occurs through new venture creation.
H7	Occupational choice occurs in one period of time.

Based on these hypotheses, the main question addressed by the model is "who becomes an entrepreneur?" As stated above, the individual must compare the income obtained as specialist and as entrepreneur. Working as a specialist, the individual obtains an income that is associated with his best skill – max $[x_1, x_2]$ – while opting to be an entrepreneur he obtains an income that depends on his weakest skill – λ min $[x_1, x_2]$, where λ is a parameter that captures the value, obtained by market equilibrium, of entrepreneurial talent. Therefore, he decides to become entrepreneur when:

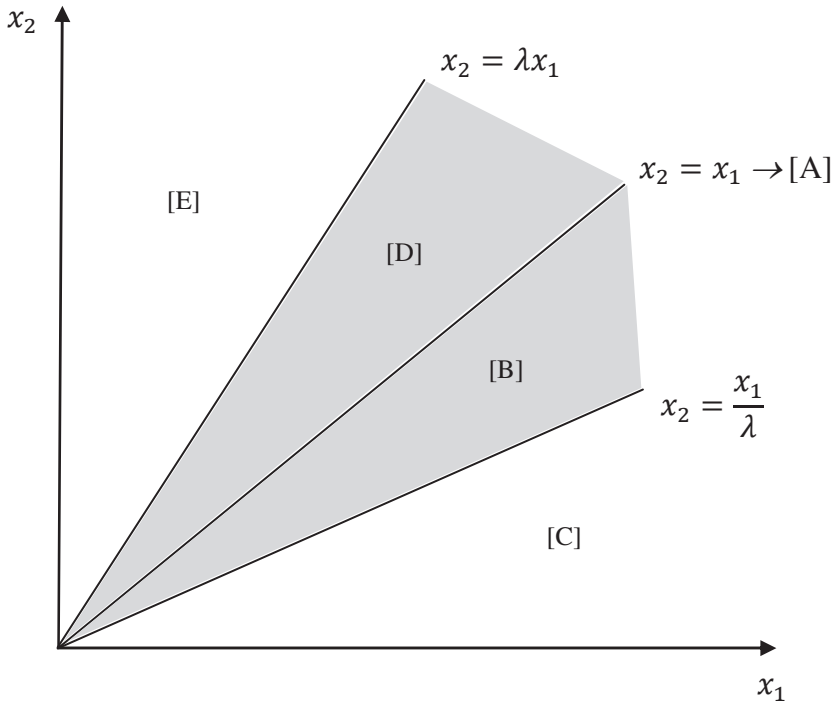
$$\lambda \min [x_1, x_2] > \max [x_1, x_2] \quad (1)$$

2.2 The model

Equation (1) makes clear that the critical choice between entrepreneurship or specialization depends on λ, x_1, and x_2. The value of λ (λ ≥ 1) determines the supply of entrepreneurs as follows. When λ = 1, no one chooses to become entrepreneur because min $[x_1, x_2]$ > max $[x_1, x_2]$ is an impossible condition. As λ increases, the supply of entrepreneurs rises since the market value of entrepreneurial talent increases.

For λ > 1 (the general case), we have five distinct cases, represented in Figure 1.

Figure 1: Occupational choice between entrepreneurship and paid employment – Lazear's Framework



The area [A] corresponds to all the points where $x_1 = x_2$ and, therefore, min $[x_1, x_2]$ = max $[x_1, x_2]$. In this case, corresponding to a perfect balance between x_1 and x_2, the optimal choice is to become entrepreneur.

In the remaining cases, $x_1 \neq x_2$. Points below the 45º line represent cases in which $x_1 > x_2$. If this the case, the choice is between to become entrepreneur or to be a specialist with income x_1. The individual will choose to become entrepreneur when $\lambda x_2 > x_1 \Leftrightarrow x_2 > \frac{x_1}{\lambda}$. This

occurs for all the points in area [B]. On its turn, when $x_2 \leq \frac{x_1}{\lambda}$ the individual opts to specialize, making use of his best skill (area [C]).

The same kind of considerations is valid for points above the 45º line. Here, $x_1 < x_2$ and, therefore, entrepreneurship is the best option when $x_2 < \lambda x_1$ (area [D] in Figure 1). In the opposite case, the adequate choice is, once again, to specialize, as in the case of points situated in area [C], but now exploring x_2 as best skill (area [E]).

The income obtained in each of the cases analyzed above are:

$$\text{Income} = \begin{cases} \lambda x_1 = \lambda x_2 \; if \; x_1 = x_2 \; \wedge \; \lambda > 1 \; (area\; [A]) \\ \lambda x_2 \; if \; \frac{x_1}{\lambda} < x_2 < \; x_1 \wedge \; \lambda > 1 \; (area\; [B]) \\ x_1 \; if \; x_2 \leq \frac{x_1}{\lambda} \wedge \; \lambda > 1 \; (area\; [C]) \\ \lambda x_1 \; if \; x_1 < x_2 < \; \lambda x_1 \wedge \; \lambda > 1 \; (area\; [D]) \\ x_2 \; if \; x_2 \geq \; \lambda x_1 \wedge \; \lambda > 1 \; (area\; [E]) \\ \dots\dots\dots\dots\dots\dots\dots\dots \\ x_1 \; if \; x_1 > x_2 \wedge \; \lambda = 1 \\ x_2 \; if \; x_1 < x_2 \wedge \; \lambda = 1 \end{cases} \qquad (2)$$

2.3 Propositions of the model

Based on the theoretical framework presented above, the study of Lazear derives some critical propositions. The first of them is that the choice to become entrepreneur requires a balanced set of skills. Lazear explains the relevance of having a skill set with these characteristics: "*because the entrepreneur must bring together many different resources, he or she must have knowledge, at least at a basic level, of a large number of business areas. An entrepreneur must possess the ability to combine talents and manage those of others*" (Lazear, 2005, p. 650).

The rationale for being entrepreneurs – "*they must be relatively good (or relatively bad) at everything*" (Lazear, 2005, p. 656) – is known as the jacks-of-all-trades (JAT) proposition and corresponds to the true core of Lazear's contribution. When this does not occur, i.e., when the difference between x_1 and x_2 is significant, the individual should specialize in order to capture the benefits of his strong level of qualification in a specific skill.

The second main proposition of the model directly derives from the first one. Since the entrepreneur must have, at least, some basic knowledge of a group of different skills while the specialist must be very good at one specific skill, the human capital investment strategy should be very different in these two cases. The specialist should only invest in his best skill, aiming to obtain the highest value for max $[x_1, x_2]$. On the contrary, those who eventually become entrepreneurs should adopt a diversified strategy, investing in more than one skill. In fact, since his income is given by the weakest skill, the correct strategy is to improve that skill, aiming to raise the value of min $[x_1, x_2]$. The most common and important forms that this investment can assume are formal schooling and on-the-job training. In short terms, if as stated in proposition 1, an entrepreneur have a more balanced set of skills, then the individual who aims to be an entrepreneur should adopt a skill acquisition strategy that allows the formation of that distribution of skills.

A final proposition concerns the link between the complexity of the production process and the supply of entrepreneurs. The basic idea is that while some production processes are very simple, only requiring a small number of different skills, others are much more demanding, requiring a solid knowledge in many areas. Therefore, the capacity of an individual to become entrepreneur decreases with this degree of complexity (expressed in a larger number of specific skills).

Summing up, Table 2 presents the three propositions put forward by Lazear (2005).

Table 2: Propositions of Lazear's JAT theory

Proposition	Description
P1	The probability of become entrepreneur increases with the balance of skills.
P2	Individuals who become entrepreneurs should adopt a more balanced human capital investment strategy than those who opt to work as specialists.
P3	The complexity of the production process, requiring more skills, reduces the supply of entrepreneurs.

3. A bibliometric analysis of the impact of the JAT theory on scientific literature

As a first step of our survey on the impact of the study of Lazear, we introduce some preliminary bibliometric research, aiming to provide some quantitative perspectives on the literature developed since the original contribution.

To develop this study, we have used the Scopus database to identify the list of papers citing the two articles in which Edward Lazear introduces the JAT theory of entrepreneurship: (1) "Balanced Skills and Entrepreneurship" published in the American Economic Review Papers and Proceedings in 2004; and (2) "Entrepreneurship" published in the Journal of Labour Economics in 2005.

The Scopus database was chosen for two main reasons. The first one emerges from the analysis of the advantages/disadvantages of using one of the following three options: the Web of Science, Scopus, or Google Scholar. Scopus and the Web of Science have high similarities in their overall content. Several studies indicate that, in areas such as Biomedical Research, Natural Sciences and Engineering, Social Sciences, Arts and Humanities, there is a high overlap between the articles in these two databases (Abrizah et al., 2013; Mongeon & Paul-Hus, 2016).

Nevertheless, for the more recent period, Scopus presents a more up-to-date and more comprehensive database (Abrizah et al., 2013; Harzing & Alakangas, 2016; Mongeon & Paul-Hus, 2016; Vieira & Gomes, 2009). On the other hand, Google Scholar is the database offering the highest number of entries, in particular in the field of social sciences (Harzing & Alakangas, 2016; Mongeon & Paul-Hus, 2016) but with several disadvantages. The average quality of the documents presented is lower due to a high ratio of conference papers and working papers to articles and because no quality metrics are used to account for the quality of journals (Ball & Tunger, 2006; Mongeon & Paul-Hus, 2016). In addition, there is evidence of some inaccuracy issues in the bibliometric data available for each document (Jacsó, 2005).

The second reason is that Scopus allows researchers to obtain a large set of information about each paper and author(s) (including updated data about the scientific impact of the publications), which is a critical factor when bibliometric analyses are developed.

In this study, only journal papers were used because this type of publication is the central piece of most bibliometric analysis (Bar-Ilan 2008; Hicks 2004). There are several reasons for this importance: the wide spread of journals (Hicks 2004; Nederhof 2006, 2011); the fact that the most important output indexes are based on articles (Mongeon and Paul-Hus 2016); and the existence of a peer review in the process of paper assessment (Callon et al. 1993).

Until July 2017, the number of citations obtained by Lazear (2004, 2005) was: 160 citations for the "Balanced Skills and Entrepreneurship" paper; and 265 for the "Entrepreneurship" paper. In the analysis that will be developed in this chapter, we consider the 366 articles that cite at least one of the Lazear's contributions.

In addition to these 366 papers, two important publications by Joachim Wagner were also included (Wagner, 2003, 2006). These studies were not captured in the search conducted in the Scopus database because they cite the initial version of Lazear (2005), which was a National Bureau of Economic Research Working Paper (Lazear, 2002).

A total of 170 peer reviewed journals published the 368 articles considered in our analysis. Table 3 presents the most active journals on this topic, publishing three or more citing papers, which account for 55.4% of the overall number of publications. Most of the journals have an Impact Factor and some of them have a high Impact Factor. The first ranked journal are Small Business Economics (42 articles) followed by Journal of Business Venturing and Research Policy (13 papers each), and Management Science (10 papers).

Table 3: Top journals publishing articles citing Lazear (2004) or Lazear (2005)

Journal	No. of articles	%	SJR 2016	IF 2016
Small Business Economics	42	11.41	2.150	2.421
Journal of Business Venturing	13	3.53	5.771	5.774
Research Policy	13	3.53	3.625	4.495
Management Science	10	2.45	3.885	2.822
Entrepreneurship: Theory and Practice	9	2.45	3.694	4.916
Industrial and Corporate Change	9	2.45	1.835	1.777
Journal of Economic Behavior and Organization	9	2.45	1.665	1.323
European Economic Review	6	1.63	2.009	1.259

Table 3: Top journals publishing articles citing Lazear (2004) or Lazear (2005) (cont.)

Journal	No. of articles	%	SJR 2016	IF 2016
Foundations and Trends in Entrepreneurs	6	1.63	1.760	N/A
International Entrepreneurship and Management Journal	6	1.63	0.685	1.312
Strategic Management Journal	6	1.63	7.651	N/A
Economics Letters	5	1.36	0.702	0.558
International Journal of Entrepreneurship and Small Business	5	1.36	0.380	N/A
Journal of Economics and Management Strategy	5	1.36	1.199	0.912
Journal of Evolutionary Economics	5	1.36	0.748	0.862
Journal of Small Business and Enterprise Development	5	1.36	0.478	N/A
Applied Economics	5	1.09	0.464	0.586
Entrepreneurship and Regional Development	4	1.09	1.500	1.776
International Small Business Journal	4	1.09	1.819	3.677
Labour Economics	4	1.09	1.151	1.036
Organization Science	4	1.09	5.870	2.691
International Journal of Manpower	3	0.82	0.338	0.641
Journal of Policy Modeling	3	0.82	0.716	0.993
Journal of Technology Transfer	3	0.82	1.254	2.631
Journal of Urban Economics	3	0.82	2.560	1.904
Local Economy	3	0.82	0.435	N/A
Management Decision	3	0.82	0.613	1.396
Strategic Change	3	0.82	0.142	N/A
Strategic Entrepreneurship Journal	3	0.82	2.732	N/A
Strategic Organization	3	0.82	2.078	1.941
Applied Economics Letters	3	0.82	0.354	0.336

Notes: SJR 2016 is the SCImago Journal Rank indicator from 2016. IF 2016 is the Impact Factor from 2016. N/A not applicable.

Table 4 shows the distribution of the total number of papers across the Scopus subject areas and categories. A large share of papers have been published in journals classified as belonging to the field of Business, Management and Accounting (% of top 30 journals: 76.7%). Furthermore, a significant share of the papers is published in journals classified as belonging to Economics, Econometrics, and Finance (% of top 30 journals: 60%).

Table 4: Subject areas of the journals publishing citing papers

Rank	Journal	Business, Management and Accounting	Economics, Econometrics and Finance	Decision Sciences	Social Sciences	Engineering
1	Small Business Economics	X	X			
2	Journal of Business Venturing	X				
3	Research Policy	X		X		X
4	Management Science	X		X		
5	Entrepreneurship: Theory and Practice	X	X			
6	Industrial and Corporate Change		X			
7	Journal of Economic Behavior and Organization	X	X			
8	European Economic Review		X			
9	Foundations and Trends in Entrepreneurship	X	X			
10	International Entrepreneurship and Management Journal	X				
11	Strategic Management Journal	X				
12	Economics Letters		X			
13	International Journal of Entrepreneurship and Small Business	X	X			
14	Journal of Economics and Management Strategy	X	X			
15	Journal of Evolutionary Economics	X	X			
16	Journal of Small Business and Enterprise Development	X				
17	Applied Economics		X			
18	Entrepreneurship and Regional Development	X	X			
19	International Small Business Journal	X				
20	Labour Economics	X	X			
21	Organization Science	X				
22	International Journal of Manpower	X				
23	Journal of Policy Modeling		X			
24	Journal of Technology Transfer	X				X
25	Journal of Urban Economics		X		X	
26	Local Economy		X			
27	Management Decision	X		X		
28	Strategic Change	X	X			
29	Strategic Entrepreneurship Journal	X	X			
30	Strategic Organization	X			X	
	Total	**23**	**18**	**3**	**2**	**2**

Note: Journals can be indexed in multiple subject areas.

The temporal analysis of the citations is presented in Figure 2. It is possible to see that the citing publications began to appear in a more substantial number in 2007 until nowadays. The steepest growth pattern was seen after 2010.

Figure 2: Frequency distribution of the 368 papers analyzed by year of publication

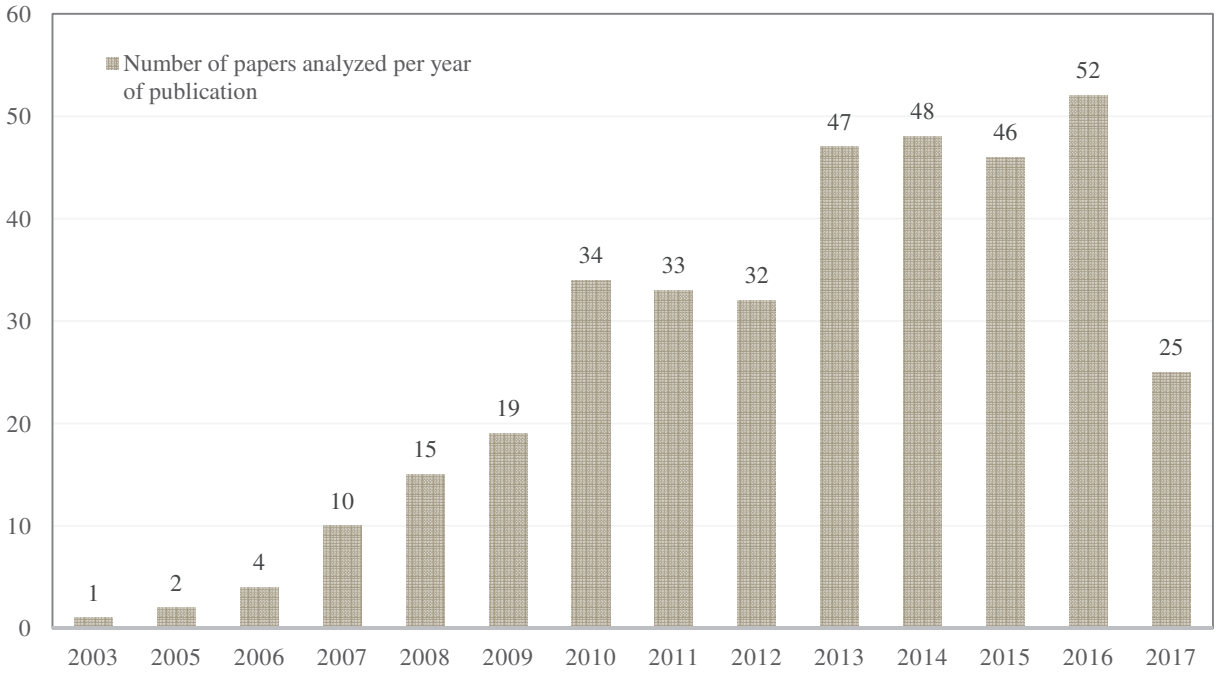


Table 5 presents the names of the most prolific authors on this topic. In this table, we present the name of the authors that published four or more papers citing Lazear (2004) or Lazear (2005), along with the identification of the institutions where they worked at the time they published these publications as well as the countries where these institutions are located. The authors with more studies published are David Audretsch, with 10 articles, followed by Martin Obschonka (8 papers), Thomas Åstebro (8 papers), and Michael Stuetzer (6 papers). According to Scopus database, the h-index of these authors is: 60 for David Audretsch; 12 for Martin Obschonka; 15 for Thomas Åstebro; and 8 for Michael Stuetzer.

Table 5: Top authors that published articles citing Lazear (2004) or Lazear (2005)

Name	Affiliation	Country	No. of affiliations	No. of articles
David Audretsch	Indiana University	U.S.	8	10
	King Saud University	Saudi Arabia	1	
	Max Planck Instiute of Economics	Germany	2	
Martin Obschonka	Queensland University of Technology (QUT)	Australia	1	8
	Universität des Saarlandes	Germany	4	
	Friedrich Schiller Universität Jena	Germany	4	
Thomas Åstebro	HEC Paris School of Management	France	8	8
	KU Leuven	Belgium	1	
Michael Stuetzer	Technische Universität Ilmenau	Germany	4	6
	Queensland University of Technology (QUT)	Australia	3	
Uschi Backes-Gellner	University of Zurich	Switzerland	5	5
Albert Link	University of North Carolina at Greensboro	U.S.	5	5
Nikolaj Malchow-Møller	University of Southern Denmark	Denmark	4	5
	Centre for Economic and Business Research (CEBR)	Denmark	2	
Simon Parker	Western University	Canada	4	5
	University of Durham	U.K.	1	
Mirjam van Praag	University of Amsterdam	The Netherlands	4	5
	Tinbergen Institute	The Netherlands	1	
	IZA	Germany	1	
Giuseppe Arbia	Università Cattolica del Sacro Cuore	Italy	4	4
Benjamin Campbell	Ohio State University	U.S.	4	4
Charles Eesley	Stanford University	U.S.	3	4
	MIT Sloan School of Management	U.S.	1	
Giuseppe Espa	University of Trento	Italy	4	4
Diego Giuliani	Università degli Studi di Trento	Italy	4	4
Esteban Lafuente	Universitat Politècnica de Catalunya	Spain	3	4
	Centre for Entrepreneurship and Business Research	Romania	1	
Peter Orazem	Iowa State University	U.S.	4	4
	IZA	Germany	1	
Rolf Sternberg	Gottfried Wilhelm Leibniz Universität	Germany	4	4
Jesper Sørensen	Stanford University	U.S.	4	4
Peter Thompson	Georgia Institute of Technology	U.S.	2	4
	Florida International University	U.S.	2	
	Emory University	U.S.	1	
Yancy Vaillant	ESC Rennes School of Business	France	4	4
	Universitat Autònoma de Barcelona	Spain	1	
Nick Williams	University of Sheffield	U.K.	4	4

Note: In many cases, authors have more than one affiliation.

In some extent anticipating some evidence we will present below concerning the countries for which empirical studies are available, Figure 3 shows that the majority of researchers publishing about this topic are located either in the United States or in Germany.

Figure 3: Geographical distribution of top authors' affiliations

Note: in this figure we represent the total number of publications linked to each institution.

Next, we selected a list of core papers (Table 6). In order to do so we defined as criterion that these papers should contain in the title, abstract, or keywords at least one of the following expressions: Lazear; JAT; and balanced skills. A total number of 33 papers was found. Small Business Economics is the most important outlet for publishing this research (8 papers), followed by Entrepreneurship: Theory and Practice (3 papers).

In this list we find the majority of the papers that propose theoretical extensions to the Edward Lazear theory of entrepreneurship, take these papers as departure point to study related topics, or that make the more targeted and specific empirical analysis to Lazear's hypothesis.

Table 6: Core papers

First author	Title	Journal	Year	Citations
Artz G.M.	Does the jack of all trades hold the winning hand? Comparing the role of specialized versus general skills in the returns to an agricultural degree	American Journal of Agricultural Economics	2013	2
Åstebro T.	Stars and misfits: Self-employment and labor market frictions	Management Science	2011	30
Åstebro T.	Entrepreneurs, jacks of all trades or hobos?	Research Policy	2011	53
Backes-Gellner U.	The disposition to become an entrepreneur and the jacks-of-all-trades in social and human capital	Journal of Socio-Economics	2013	8
Backes-Gellner U.	Differences in the educational paths of entrepreneurs and employees	Empirical Research in Vocational Education and Training	2010	8
Bublitz E.	Balanced Skills and the City: An Analysis of the Relationship between Entrepreneurial Skill Balance, Thickness, and Innovation	Economic Geography	2015	0
Bublitz E.	The skill balancing act: When does broad expertise pay off?	Small Business Economics	2014	12
Burer E.C.	Repatriates as entrepreneurs? - A theoretical analysis	International Journal of Entrepreneurial Venturing	2013	
Chen L.-W.	Skill Balance and Entrepreneurship Evidence from Online Career Histories	Entrepreneurship: Theory and Practice	2016	4
Cho I.	Are nonprofit entrepreneurs also Jacks-of-all-trades?	IZA Journal of Labor Economics	2014	0
Cumming D.	Entrepreneurial Spawning: Experience, Education, and Exit	Entrepreneurship: Theory and Practice	2016	0
Elfenbein D.W	The small firm effect and the entrepreneurial spawning of scientists and engineers	Management Science	2010	84
Giuri P.	Explaining leadership in virtual teams: The case of open source software	Information Economics and Policy	2008	34
Hartog J.	If You Are So Smart, Why Aren't You an Entrepreneur? Returns to Cognitive and Social Ability: Entrepreneurs Versus Employees	Journal of Economics and Management Strategy	2010	56
Helsley R.W.	Entrepreneurs and cities: Complexity, thickness and balance	Regional Science and Urban Economics	2011	11
Hsieh C.	Do the Self-Employed More Likely Emerge From Sequential or Parallel Work Experience in Business-Related Functions?	Entrepreneurship: Theory and Practice	2016	3
Hsieh C.	Risk, balanced skills and entrepreneurship	Small Business Economics	2017	0
Lazear E.P.	Leadership: A personnel economics approach	Labour Economics	2012	12
Lechmann D. S.	Are the self-employed really jacks-of-all-trades? Testing the assumptions and implications of Lazear's theory of entrepreneurship with German data	Small Business Economics	2014	17

Table 6: Core papers (cont.)

First author	Title	Journal	Year	Citations
Moog P.	The impact of skills, working time allocation and peer effects on the entrepreneurial intentions of scientists	Journal of Technology Transfer	2015	6
Oberschachtsiek D.	The experience of the founder and self-employment duration: A comparative advantage approach	Small Business Economics	2012	12
Obschonka M.	Entrepreneurship as a twenty-first century skill: entrepreneurial alertness and intention in the transition to adulthood	Small Business Economics	2017	0
Orazem P.F.	Once an entrepreneur, always an entrepreneur? The impacts of skills developed before, during and after college on firm start-ups	IZA Journal of Labor Economics	2015	1
Roberts P.W.	Balancing the skill sets of founders: Implications for the quality of organizational outputs	Strategic Organization	2013	3
Silva O.	The Jack-of-All-Trades entrepreneur: Innate talent or acquired skill?	Economics Letters	2007	43
Spanjer A.	The entrepreneur's experiential diversity and entrepreneurial performance	Small Business Economics	2017	0
Stuetzer M.	Do balanced skills help nascent entrepreneurs to make progress in the venture creation process?	Economics Letters	2012	10
Stuetzer M.	Balanced skills among nascent entrepreneurs	Small Business Economics	2013	20
Stuetzer M.	Where do entrepreneurial skills come from?	Applied Economics Letters	2013	8
Tegtmeier S.	Are women graduates jacquelines-of-all-trades? Challenging Lazear's view on entrepreneurship	Small Business Economics	2016	0
Tuor S.N.	Risk-return trade-offs to different educational paths: Vocational, academic and mixed	International Journal of Manpower	2010	1
Wagner, J.	Testing Lazear's jack-of-all-trades view of entrepreneurship with German micro data	Applied Economics Letters	2003	68
Wagner, J.	Are nascent entrepreneurs 'Jacks-of-all-trades'? A test of Lazear's theory of entrepreneurship with German data	Applied Economics	2006	46

Next we were interested in answering to two other questions: (1) what is the nature of the research developed after Lazear (2004, 2005)?; and (2) for what reasons are these core papers citing Lazear (2004, 2005)?

To answer to the first question, core papers were classified according to the main method of research (Table 7). To that end, we follow the proposal by Teixeira (2013), which separates papers into six categories: formal theorizing (F); formal theorizing and empirical (F+E); appreciative theorizing (A); appreciative theorizing and empirical (A+E); empirical (E); and survey papers (S). Based on the content of the research, Teixeira (2013, p. 7) describes each of these categories as follows:

> *"Articles classified as 'formal' develop analytical models, and the theoretical explanations are expressed in mathematical terms (through modelling) or simulation. When articles classified as formal include data tests, they are classified as 'formal and empirical'. The classifications referred to as 'empirical' involve econometric or statistical tests. Those considered 'appreciative' refer to theoretical articles, more discussion in nature. Whenever articles defined as 'appreciative' include appreciations or comments based on empirical data, they are classified as 'appreciative and empirical'. Finally, when the articles involve an overview of the literature, they are called 'surveys'."*

Among the core papers, most studies have a formal or appreciative theoretical contribution (10 papers do formal theorizing and 22 do appreciative theorizing). This means that, although taking Lazear (2004, 2005) as departure point, they improve or extend the seminal framework (e.g., Helsley and Strange, 2011; Cumming et al., 2016; Hsieh et al., 2017) or provide an alternative theoretical structure (e.g., Åstebro and Thompson, 2011; Stuetzer et al., 2013).

Another interesting finding is the fact that most papers develop an empirical exercise (31 out of the 33 papers), which probably derives from the relevance and pertinence of this topic. Figure 4 combines these two ideas with publishing journals.

To answer to the second question we raised above, Table 7 also presents the number of times Lazear (2004) or Lazear (2005) were cited in the core papers and the distribution of these citations per section (Abstract, Introduction, Literature review, Model, Methodology, Results, and Conclusion).

In average, each of these papers cite Lazear 8 times with the majority of these references occurring in the Literature review section and Introduction. In total, 93 and 62 citations were found in these sections, respectively. The papers that cite the most Lazear (2004) or Lazear (2005) are: Lechmann and Schnabel (2014) - 33 citations; Stuetzer et al. (2013) - 24; Spanjer and Witteloosstuijn (2017) - 17; and Hsieh et al. (2017) - 15.

Table 7: Number of references to Lazear (2004, 2005) in core papers

First author	Year	Title	Abstract	Introduction	Literature review	Model	Methodology	Results	Conclusion	Total	Type
Artz G.M.	2013	Does the jack of all trades hold the winning hand? Comparing the role of specialized versus general skills in the returns to an agricultural degree					1	1		2	F+E
Åstebro T.	2011	Stars and misfits: Self-employment and labor market frictions		5		4		1		10	F+E
Åstebro T.	2011	Entrepreneurs, jacks of all trades or hobos?	1	1	3		1		1	7	F+E
Backes-Gellner U.	2013	The disposition to become an entrepreneur and the jacks-of-all-trades in social and human capital	1		8		3	1	1	14	A+E
Backes-Gellner U.	2010	Differences in the educational paths of entrepreneurs and employees		1	3		5	4		13	A+E
Bublitz E.	2015	Balanced Skills and the City: An Analysis of the Relationship between Entrepreneurial Skill Balance, Thickness, and Innovation		2	2		1			5	A+E
Bublitz E.	2014	The skill balancing act: When does broad expertise pay off?		2	6			4	1	13	A+E
Burer E.C.	2013	Repatriates as entrepreneurs? - A theoretical analysis		1	6					7	A
Chen L.-W.	2016	Skill Balance and Entrepreneurship Evidence from Online Career Histories			5		1		1	7	A+E
Cho I.	2014	Are nonprofit entrepreneurs also Jacks-of-all-trades?		2		3		1	1	7	F+E
Cumming D.	2016	Entrepreneurial Spawning: Experience, Education, and Exit			1		1			2	A+E
Elfenbein D.W	2010	The small firm effect and the entrepreneurial spawning of scientists and engineers		1	1			2		4	A+E

Table 7: Number of references to Lazear (2004, 2005) in core papers (cont.)

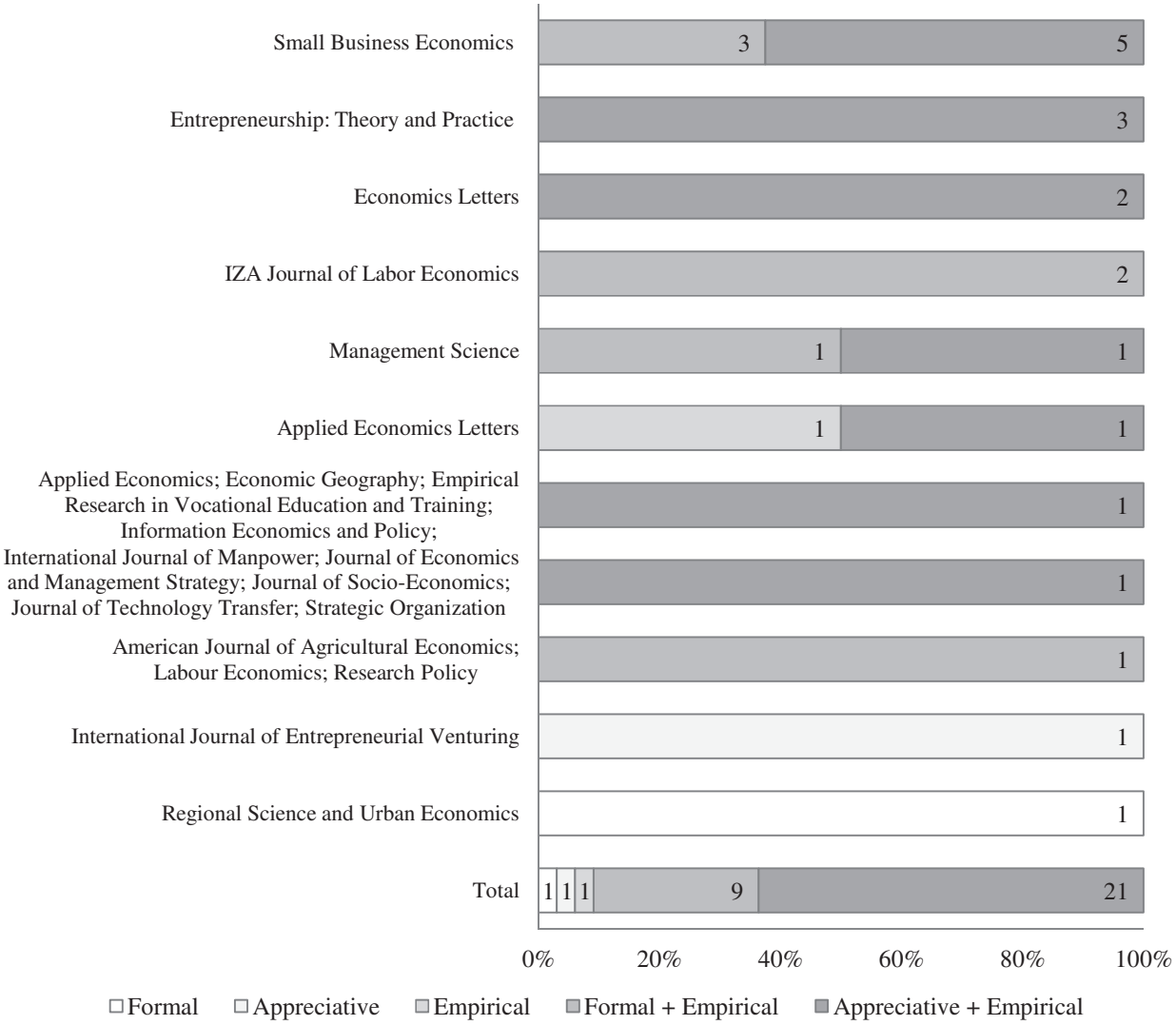
First author	Year	Title	Abstract	Introduction	Literature review	Model	Methodology	Results	Conclusion	Total	Type
Giuri P.	2008	Explaining leadership in virtual teams: The case of open source software	1	1	2					4	A+E
Hartog J.	2010	If You Are So Smart, Why Aren't You an Entrepreneur? Returns to Cognitive and Social Ability: Entrepreneurs Versus Employees		3	2			3		8	A+E
Helsley R.W.	2011	Entrepreneurs and cities: Complexity, thickness and balance	1	4		3				8	F
Hsieh C.	2016	Do the Self-Employed More Likely Emerge From Sequential or Parallel Work Experience in Business-Related Functions?		1			1			2	A+E
Hsieh C.	2017	Risk, balanced skills and entrepreneurship		6		4		4	1	15	F+E
Lazear E.P.	2012	Leadership: A personnel economics approach		1						1	F+E
Lechmann D.S.	2014	Are the self-employed really jacks-of-all-trades? Testing the assumptions and implications of Lazear's theory of entrepreneurship with German data	1	6	14		5	5	2	33	A+E
Moog P.	2015	The impact of skills, working time allocation and peer effects on the entrepreneurial intentions of scientists	1	4	1		3			9	A+E
Oberschachtsiek D.	2012	The experience of the founder and self-employment duration: A comparative advantage approach		3	3			1	1	8	F+E
Obschonka M.	2017	Entrepreneurship as a twenty-first century skill: entrepreneurial alertness and intention in the transition to adulthood			2		1	1		4	A+E

Table 7: Number of references to Lazear (2004, 2005) in core papers (cont.)

First author	Year	Title	Abstract	Introduction	Literature review	Model	Methodology	Results	Conclusion	Total	Type
Orazem P.F.	2015	Once an entrepreneur, always an entrepreneur? The impacts of skills developed before, during and after college on firm start-ups		2		1	3		1	7	F+E
Roberts P.W.	2013	Balancing the skill sets of founders: Implications for the quality of organizational outputs	1	1	3		1	1		7	A+E
Silva O.	2007	The Jack-of-All-Trades entrepreneur: Innate talent or acquired skill?		2			2			4	A+E
Spanjer A.	2017	The entrepreneur's experiential diversity and entrepreneurial performance		2	12		1	1	1	17	A+E
Stuetzer M.	2012	Do balanced skills help nascent entrepreneurs to make progress in the venture creation process?		2			1			3	A+E
Stuetzer M.	2013	Balanced skills among nascent entrepreneurs		4	16		1	3		24	F+E
Stuetzer, M.	2013	Where do entrepreneurial skills come from?		1						1	A+E
Tegtmeier S.	2016	Are women graduates jacquelines-of-all-trades? Challenging Lazear's view on entrepreneurship	1	2	3		1			7	A+E
Tuor S.N.	2010	Risk-return trade-offs to different educational paths: Vocational, academic and mixed						1		1	A+E
Wagner, J.	2003	Testing Lazear's jack-of-all-trades view of entrepreneurship with German micro data		1			1	1		3	E
Wagner, J.	2006	Are nascent entrepreneurs 'Jacks-of-all-trades'? A test of Lazear's theory of entrepreneurship with German data		1			2			3	A+E
		Total	**8**	**62**	**93**	**15**	**36**	**35**	**11**	**260**	

Notes: (F) formal; (F+E) formal and empirical; (A) appreciative; (A+E) appreciative and empirical; (E) empirical; (S) surveys.

Figure 4: Distribution (%) of core papers by type and journal



In order to complement the overview provided in Table 7, we have made a careful analysis of each of these citations with the objective of identifying the function of the citation to the citing paper. In the area of bibliometrics, there are several typologies for performing this type of analysis. However, the scheme more adequate for the area of social sciences is the proposal from Peritz (1983). In this case, a citation can have eight functions: (1) *setting the stage for the present study* – the citation is used to motivate the research questions; (2) *background information* - the citation provides the setting for the investigation, support methodological decisions, or is used to

identify literature that is closely related to the present one; (3) *methodological* – citation is used to justify the chosen methodology; (4) *comparative* – citation is made in order to compare the paper with previous studies; (5) *argumental, speculative, hypothetical* – citation is made to support new hypotheses, arguments, and future research avenues; (6) *documentary* - citation is linked to the sources of data; (7) *historical* - citations made to track the history of the subject; and (8) *casual/perfunctory* – the citation is peripheral to the present study. Peritz (1983) explains that the researcher may find it difficult to choose between the *historical* function and the *setting the stage for the present study* function, and suggests that "*whenever the citation is truly tied to the research question at hand one should put it into the latter category, regardless of its age*" (Peritz, 1983; p. 305).

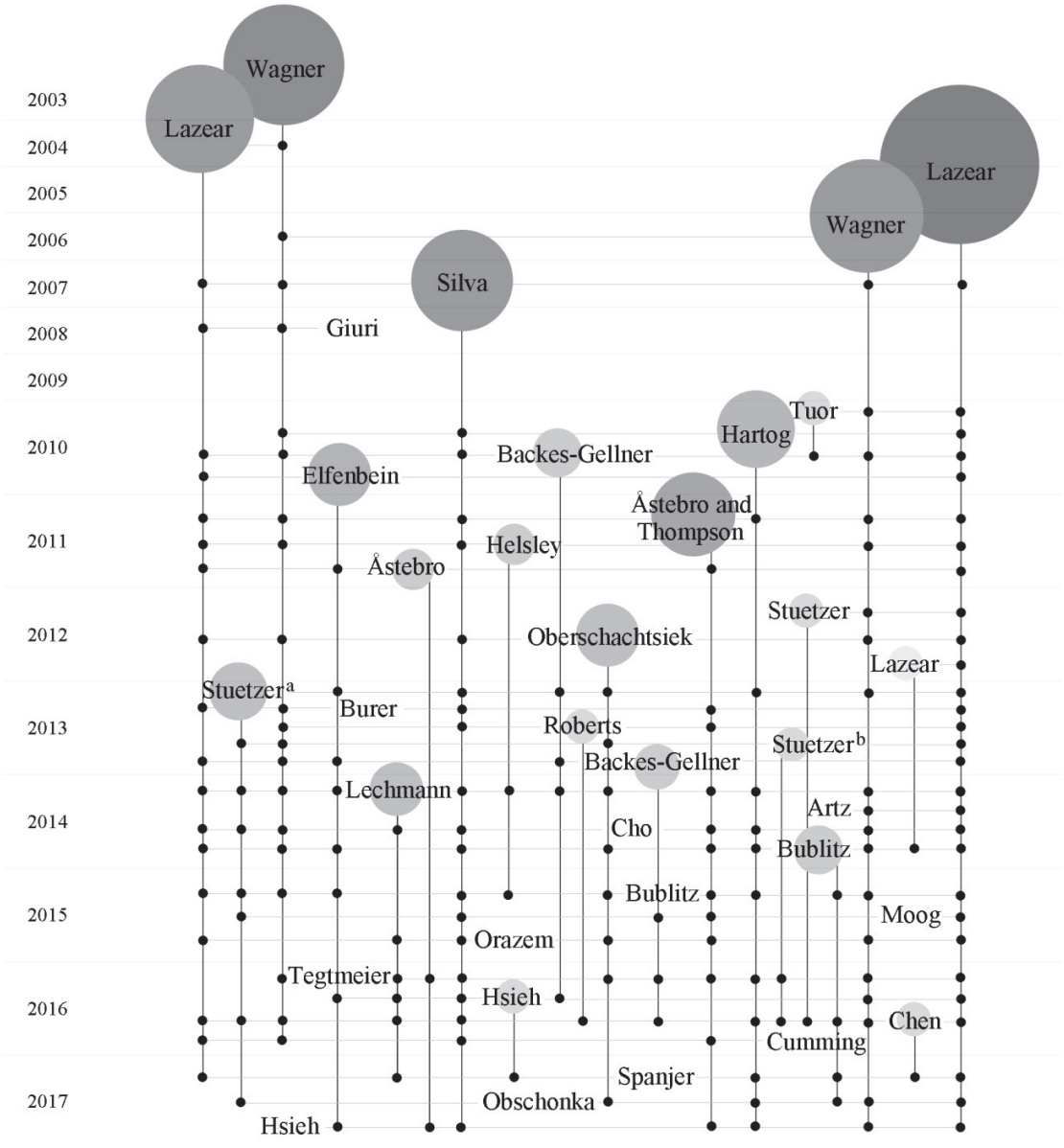
Table 8 provides the classification of the total number of citations to Lazear (2004, 2005) into these eight functions. From the results it becomes clear that for the core papers, the most common function of the JAT theory is *setting the stage for the present study*. This conclusion is in line with evidence obtained in Table 7 in which we found that most papers developed theoretical contributions. Since these papers were chosen from a set of keywords directly linked to the seminal papers of Lazear, we find that their research questions are motivated by the balanced skills idea.

Table 8: Core papers' citations by classification category and location

Category	Abstract	Introduction	Literature review	Model	Methodology	Results	Conclusion	Total
Setting stage	8	56	77					141
Background info.		6	16		8			30
Methodological				15	28			43
Comparative						19		19
Argumental						16	11	27
Documentary								0
Historical								0
Perfunctory								0
Total	**8**	**62**	**93**	**15**	**36**	**35**	**11**	**260**

The final element of this chapter shows visually how core papers cite one another (Figure 5).

Figure 5: Citation streams over time between core papers



Note: Stuetzer[a] (2013) refers to the paper "Balanced skills among nascent entrepreneurs" and Stuetzer[b] (2013) refers to "Where do entrepreneurial skills come from?".

The network is organized by year and, similar to what occurs with the total number of Lazear's citing papers, there is an increase in the number of core publications since 2010.

In each line of the figure we have a core paper and the vertical lines link that paper to the ones that cite it. The dots in each vertical line represent citations. For example, Hartog et al. (2010) was cited by Åstebro and Thompson (2011), Stuetzer[a] (2013), Lechmann (2014), Cho (2014), Bublitz (2014), Bublitz (2015), Tegtmeier (2016), Chen (2016), Spanjer (2017), Obschonka (2017), and Hsieh (2017).

The size of the circles around the papers is associated with the total number of citations received by the paper (larger circles are associated with more citations). The core papers that were most cited by the others are: Lazear (2005) - 29 citations; Wagner (2003) - 20; Wagner (2006) - 19; Lazear (2004) - 18; Silva (2007) - 17; and Åstebro and Thompson (2011) - 12;

Among those, the papers by Joachim Wagner occupy a very central position in the literature because his papers provide seminal empirical tests to the JAT theory. Another mark is Silva (2007) that openly questions the validity of the evidence produced until that moment for methodological issues.

Interestingly, the most influential papers published more recently, in addition to their empirical exercises, are also important due to their contributions to the framework that is used to analyze the entry into entrepreneurship. In this group, we find Hartog et al. (2010), Elfenbein et al. (2010), Åstebro and Thompson (2011), Oberschachtsiek (2012), among others. In the following chapters, many of the papers included in this figure will be discussed in detail.

4. Empirical studies about "Entrepreneurship" by Lazear (2004, 2005) – What do we know?

In this chapter, we provide an integrated and detailed view of the studies that tested Lazear's propositions.[2]

4.1 Lazear's seminal empirical analysis of the JAT proposition

Lazear (2004, 2005) provide the first empirical test to his own theory. Before we start analysing other papers, let us present this first exercise. Lazear uses a database of alumni from the Stanford Graduate School of Business (MBA graduates). The information available includes data about the academic curricula as well as the job history:

1) Concerning the academic pathway, there is information about the diversity/concentration of courses per scientific field taken by the student;

2) In terms of job history, the database contains data about different employers (and their characteristics), contract duration, wage, and roles performed during the job spell (up to a maximum of five).

The dependent variable of interest is a dummy variable with value 1 if the individual is a founder of his own business and 0 otherwise.

The main conclusions of the empirical test undertaken by Lazear (2005) can be summarized in three main ideas:

1) Those that held more roles in the past have a higher likelihood of becoming entrepreneurs. This result can be interpreted, as suggested by Lazear, according to two different logics. The first is that individuals who have more skills are able to undertake more roles, show a higher degree of broadness in their human capital, and therefore are JAT. The second is that individuals who want to become entrepreneurs deliberately chose to perform more roles to build a more balanced skill set. This second result is in line with the *investment*

[2] Tests to the theoretical extensions of the Lazear model that will be discussed in the following section will not be explored in this section.

hypothesis, i.e., individuals deliberately get the skills they need to prepare themselves for entrepreneurial activities. Both explanations fit within the balance skill approach;

2) Lazear (2005) introduces the question that was later explored by Åstebro and Thompson (2011) of whether the higher number of roles performed by entrepreneurs could result from their above average *taste for variety*. Lazear rejects this hypothesis. To find this result, the duration of prior employment spells was considered in the explanation of the decision to enter entrepreneurship. Evidence shows that entrepreneurs usually have longer employment spells;

3) Individuals choosing more diversified academic curriculum present a higher likelihood of entering entrepreneurship.

4.2 Databases and samples

The databases providing the samples for the studies covered in this section can be framed with the following typology:

1) *Broad general national databases* such as Employment Surveys or Linked Employee-Employer databases (Hyytinen and Ilmakunas, 2007a; Hartog et al., 2010; Backes-Gellner et al., 2010; Tuor and Backes-Gellner, 2010; Daghbashyan and Harsman, 2013; Lechmann and Schnabel, 2014);

2) *Specific databases about entrepreneurs* such as the Global Entrepreneurship Survey, the Regional Entrepreneurship, data from institutions supporting entrepreneurs with their projects, or databases built from online professional networking websites with CV information about entrepreneurs (e.g., Wagner, 2006; Brixy and Hessels, 2010; Stuetzer et al., 2012; Åstebro and Thompson, 2011);

3) *University based databases*. In this group we find a large set of studies that use alumni databases that include, in most cases, information about the academic pathway and professional experience of the individual (e.g., Dutta et al., 2011; Cho and Orazem, 2014; Orazem et al., 2015; Hsieh et al., 2017).

In terms of geographical distribution, there is a high concentration in two countries: the United States and Germany (see Figure 6). This is clearly in line with the evidence produced in Chapter 3 about the nationality of the most prolific authors publishing about Lazear's theory. In these two countries, in addition to general databases, we find not only university based databases but also a great interest from projects producing data about the entrepreneurs.

Figure 6: Geographical distribution of empirical studies

4.3 The dependent variable

The dependent variables of the papers testing Lazear's theory can be classified in one of two main categories: *occupational choice* and *entrepreneurial success*. Tables 9 and 10 present the distribution of empirical studies within each of these groups.[3]

[3] Some papers are included in both tables. This occurs whenever a study contains an empirical analysis that touches these two issues of interest.

Table 9: Findings from studies that have *occupational choice* as variable of interest concerning the JAT theory

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Entrepreneurial intentions/disposition								
Hyytinen and Ilmakunas (2007a)	Finnish Quality of Work Life Survey and Longitudinal Employer-Employee Data	3000 individuals	1997	Finland	Varied experience (> 3 occupations)	Probit	Having varied experience has a positive effect on entrepreneurial aspirations; these aspirations have a positive impact on entrepreneurship entry but varied experience has a negative impact	+/-
Hyytinen and Ilmakunas (2007b)	Finnish Quality of Work Life Survey	3000 individuals	1997	Finland	Varied experience (> 3 occupations)	Probit	Varied experience has a positive impact on entrepreneurial aspirations	√
Falck and Woessman (2013)	Programme for International Student Assessment (PISA)	192118 students from 28 countries	2006	OECD countries minus France and Switzerland[2]	Allocation of learning time between subjects	Two-stage least squares	Varied curriculum and a more general skill portfolio foster entrepreneurship intentions	√
Backes-Gellner and Moog (2013)	Cologne Founder Study	2000 individuals from 5 Cologne universities	1999-2000	Germany	Broadness of human capital: - Work experience - Academic skill portfolio	Ordinal probit	Broadness of human capital increases the disposition to entrepreneurship	√
Moog et al. (2015)	Project "Knowledge and Innovation Transfer from Academia into Industry"	480 life science researchers	2007	Switzerland and Germany	Skill diversity Work time balance	Ordered probit	Scientists with more skill variety and work time balance show higher entrepreneurial intentions	√
Muñoz-Fernández et al. (2016)	Students of the University of Cordoba	347 students of tourism	2014	Spain	Professional experience (dummy for yes/no)	Logit	Positive association between experience and entrepreneurial intentions	√

Table 9: Findings from studies that have *occupational choice* as variable of interest concerning the JAT theory (cont.)

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Obschonka et al. (2017)	Project "Mind the Gap between Digital Natives and Educational Practices"	523 individuals from high schools	2013-2015	Finland	Variety of entrepreneurial competencies (leadership, self-esteem, creativity, and proactivity motivation)	Direct effects Mediation models	Variety of skills is a mediator in the prediction of entrepreneurship alertness and intention	√
Decision to be entrepreneur								
Wagner (2003)	BIBB/IAB	33633 individuals	1998-1999	Germany	No. of types of professional training No. of prior occupations	Probit	Inversely u-shaped relation between experience and entrepreneurship entry; probability of entrepreneurship increases with the no. of professional training at a decreasing rate; probability of entrepreneurship increases with the no. of professions	+/-
Silva (2007)	Longitudinal Survey of Italian Families	5173 heads of households aged 18 to 60 with full-time education	1997	Italy	No. of prior roles	Linear probability with fixed effects	Skill balance has no impact on occupational choice	x
Douhan (2009)	Evaluation Through Follow-up (UGU) database	19858 individuals	1961, 1966	Sweden	Variance in the: - Narrow ability set - Broad ability set	Binary regression	A more balanced set of abilities increases chances of entry into entrepreneurship	√
Eesley (2009)	Alumni from Tsinghua University data	1821 alumni graduated from a technical university in China between 1947 and 2007	1947-2007	China	No. of prior positions	Cox hazard regression	Individuals that have occupied more positions are more likely to enter entrepreneurship	√

Table 9: Findings from studies that have *occupational choice* as variable of interest concerning the JAT theory (cont.)

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Backes-Gellner et al. (2010)	Swiss Labor Force Survey	15395 native full-time employees; aged 20 to 64	1999-2005	Switzerland	Educational paths (8 types) Work experience Work experience square	Probit	Individuals who change between types of education and have more balanced skills are more likely to be entrepreneurs	√
Elfenbein et al. (2010)	National Science Foundation's Scientists and Engineers Statistical Data System (SESTAT) database	120000 individuals with a science or engineering degree; aged at least 22 in 1995 and not more than 65 in 2001	1995-2001	U.S.	No. of commercial activities No. of research activities	Probit	Small firm employees do more activities than large firm workers and are more likely to enter entrepreneurship	√
Åstebro and Thompson (2011)	Canadian Innovation Centre	830 inventors using the Canadian Innovation Centre services	1995-2001	Canada	No. of fields of experience No. of industries of experience	Probit and Negative binomial (dep. var.: no. of businesses)	Inventor entrepreneurs have a more varied labor market experience	√
Åstebro et al. (2011)	Korean Labour and Income Panel Study	116974 individuals	1998-2007	South Korea	Job hopping history (no. of changes in occupation, employer, and both occupation and employer)	Logit	Job hopping patterns have positive impact on the likelihood of entry into entrepreneurship	√

Table 9: Findings from studies that have *occupational choice* as variable of interest concerning the JAT theory (cont.)

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Audretsch et al. (2011)	"Emerging Entrepreneurship Conference", Stanford University	71 participants in the 2 day workshop at Stanford University	2005	U.S.	Academic graduate degree	Probit	Science degrees are less likely to enter entrepreneurship than non-business, non-medical and non-science degrees. Therefore, entrepreneurs are more likely to be generalists than specialists.	√
Chen and Hu (2012)	China Return Migrant Survey	3026 return migrants in rural China	2007	China	No. of prior occupations Skills accumulated during the migration period	OLS and Instrument variables	Skill balance increases the likelihood of entrepreneurship; individuals with managerial and non-managerial skills are more likely to enter entrepreneurship	√
Diamond and Schaede (2013)	Keio Household Panel Survey	2555 individuals	1963-2007	Japan	Educational level Job hopping history	Linear probability	Less educated are more likely to switch to entrepreneurship; work experience has a negative impact on entrepreneurship entry.	x
Lechmann and Schnabel (2014)	BIBB/BAuA Employment Survey 2006	20000 individuals; aged more than 15; working at least 10 hours/ week	2006	Germany	Task variety = no. of tasks that occur sometimes at work Skill variety = no. of skills required at work	Probit	Entrepreneurs use more expert skills than employees	x
Chen and Thompson (2016)	Professional online networking website - CVs data	629 founders working in the venture capital and private equity industry	2012-2013	U.S. and Canada	No. of fields of experience No. of prior employers	Logit	Employer and job variety are positively associated with entrepreneurship entry	√

Table 9: Findings from studies that have *occupational choice* as variable of interest concerning the JAT theory (cont.)

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Orazem et al. (2015)	Alumni from Iowa State University data	5000 alumni graduating with a Bachelor's degree between 1982 and 2006	1982-2006	U.S.	Degree of specialization of the academic program Diversity in work experience: - No. of prior occupations - No. of prior industries	Trivariate probit of academic skill diversity, work experience diversity, entrepreneurship	More specialized programs decrease the likelihood of entrepreneurial activity; and more work experience increases the likelihood of entrepreneurial activity	√
Rocha et al. (2015)	Linked employer–employee dataset, Portuguese Ministry of Employment	27000000 employees	1992-2007	Portugal	No. of job shifts	Multinomial logit model	More of job shifts increase the likelihood entrepreneurship entry	√
Tegmeier et al. (2016)	Women graduates data by the TNS Emind institute	1384 women graduates aged 20 to 66	n.a.	Germany	Professional training Balanced industry experience (no. of industries) Balanced management experience (no. of fields of experience) Balanced entrepreneurship-based self-efficacy (ESE)	Logit	3 measures with expected sign (professional training, industry experience, balanced ESE); however balanced management experience presents a negative sign	+/-
Cumming et al. (2016)	CrunchBase online database, TechCrunch	243 founders were with 111 startup firms	2014	U.S.	- Degree in management, economics or finance (Dummy for yes/no) - Degrees in other subject plus management studies - Holding PhD	Logit	Non-specialists are more likely to found a new venture or become a business angel after having left the current startup	√
Hsieh et al. (2017)	Graduates from Dutch universities data, Dutch research institute SEO	3002 graduates in 2002 with a master degree	1999	The Netherlands	Skill balance indicator is the product of 2 measures: a) generality; b) grade variance	Probit	Positive effect of skill balance on entrepreneurial choice	√

Table 9: Findings from studies that have *occupational choice* as variable of interest concerning the JAT theory (cont.)

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Occupational choice – more than 2 choices								
Martiarena (2013)	Spanish Global Entrepreneurship Monitor	1760 individuals	2008	Spain	Training in business creation	Multinomial logit	Training in business creation is more associated with intrapreneurship than with entrepreneurship	x
Cho and Orazem (2014)	Alumni from Iowa State University data	5000 alumni graduating with a Bachelor's degree between 1982 and 2006	1982-2006	U.S.	No. of prior occupations No. of prior industries Course specialization	Trivariate probit model of the joint choices of wage work, for-profit and non-profit entrepreneurship	Skill balance increases the likelihood of entrepreneurship	√
Being a nascent entrepreneur								
Krabel and Mueller (2009)	Scientific community data, the Max Planck Society	2604 academic scientists working for the Max Planck Society	2007	Germany	Entrepreneurial experience (dummy for yes/no)	Logistic regression for rare events	Entrepreneurial experience increases the likelihood of entrepreneurship	√
Wagner (2006)	Regional Entrepreneurship Monitor (REM)	12000 individuals aged 18 to 64	2003	Germany	- No. of fields of experience - No. of professional degrees after school	Rare events logit regression	No. of fields of experience and no. of professional degrees have positive effect on the likelihood of being a nascent entrepreneur	√

Notes: 1) Concerning the jacks-of-all-trades theory: √ - the study supports the theory; +/- - the study has mixed findings; x – the study does not support the theory; 2) Countries included: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak, Spain, Sweden, Turkey, United Kingdom, United States.

Table 10: Findings from studies that have *entrepreneurial success* as variable of interest concerning the JAT theory

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Progress in the venture creation process								
Brixy and Hessles (2010)	Global Entrepreneurship Survey	189 nascent entrepreneurs	2006-2007	Germany and the Neteherlands	Broadness of human capital - No. of fields of experience - More than one founder	Multinomial probit	No. of fields of experience has no impact on success; and having partners has a negative effect on success	x
Stuetzer et al. (2012)	Thuringian Founder Study	95 start-up processes		Germany	No. of fields of experience prior to the first gestation activities	Zero truncated Poisson (count model)	Skill balance has positive effects in the venture creation process	√
Stuetzer et al. (2013)	Thuringian Founder Study	98 high-potential nascent projects		Germany	No. of fields of experience prior to the first gestation activities	Negative binomial	Skill balance has positive effects in the venture creation process	√
Hessels et al. (2014)	Global Entrepreneurship Survey	190 nascent entrepreneurs	2006-2008	Germany and the Neteherlands	Self-assessment of the individual about being a generalist or specialist	Mutinomial logit	Being a generalist has no impact on start-up success	x
Bublitz et al. (2015)	Establishment History Panel, Institute for Employment Research of the German Federal Employment Agency	1105 founders of firms in the manufacturing and knowledge intensive business services	2010-2011	Germany	No. of fields of experience before entrepeneurship	Negative binomial	Skill balance has a negative impact on the time to first hire; however, older entrepreneurs with more balanced skills benefit less from balance than younger founders.	√

Table 10: Findings from studies that have *entrepreneurial success* as variable of interest concerning the JAT (cont.)

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Gicheva and Link (2016)	Data from the Phase II of the Small Business Innovation Research Program, U.S. National Research Council	6400 funded projects	2005	U.S.	Breadth of experience = sum across all founders of recent private, university, government, and other employment experiences	Two stage selection probit	Breadth of experience has a positive impact on entrepreneurial success	√
Earnings/profits								
Hartog et al. (2010)	National Longitudinal Survey of Youth (NLSY)	In average, 4500 employees/self-employed per year; total: 50000 observations.	1979-2000	U.S.	Coefficient of variation of individual scores in 5 specific abilities scores	Mincer equations	Entrepreneurs benefit from being JAT	√
Tuor and Backes-Gellner (2010)	Swiss Labor Force Survey	10606 native only; full-time employees only; aged 20 to 64	1999-2006	Switzerland	Educational paths (4 types) Work experience Work experience square	Mincer equations	Specialization generates high returns for employees but not for entrepreneurs	√
Åstebro et al. (2011)	Korean Labour and Income Panel Study	116974 individuals	1998-2207	South Korea	Job hopping history (no. of changes in occupation, employer, and both occupation and employer)	OLS	No. of prior occupations changes (same employer) and no. of employer changes (same occupations) have a positive impact on entrepreneurial earnings	√

Table 10: Findings from studies that have *entrepreneurial success* as variable of interest concerning the JAT theory (cont.)

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Dutta et al. (2011)	Alumni from University of Arizona' Berger Entrepreneurship Program data	220 alumni	1998-2008	U.S.	Specialized entrepreneurship education Diversity of educational initiatives	Hierarchical OLS	An ideal educational mix should combine entrepreneurship specialization with other educational experiences.	√
Bublitz and Noseleit (2014)	BIBB/BAuA Employment Survey 2006	5670 working persons in manufacturing industries with average income ≥ 1000€	2006	Germany	No. of expert skills	OLS	Skill balance is positively associated with wages in all business sizes classes and shows largest coefficient for the self-employed	√
Kolstad and Wiig (2015)	Malawi Integrated Household Survey	1900 enterprises	2004-2005	Malawi	Years of education	Three stage estimation procedure	Additional years of primary education has high impact on profits (primary education provides basic skills of literacy and numeracy critical to business strategies)	√
Orazem et al. (2015)	Alumni from Iowa State University data	5000 alumni graduating with a Bachelor's degree between 1982 and 2006	1982-2006	U.S.	Course specialization Diversity in work experience: - No. of prior occupations - No. of industries	Ordered logit	Entrepreneurs receive a significant positive return to academic skill diversity and work experience	√
Spanjer and Witteloosstuijn (2017)	National Longitudinal Survey of Youth	2120 individuals	1979-2010	U.S.	Experience diversity: - No. of skills (prior jobs) - No. of knowledge fields (prior jobs)	Generalized least squares random effects	An inverted U-shaped experience diversity performance relationship is predicted (inflexion point: 23-24 skills)	+/-

Table 10: Findings from studies that have *entrepreneurial success* as variable of interest concerning the JAT theory (cont.)

Paper	Database	Sample	Year	Country	Balanced Skills	Model	Result	JAT[1]
Firm survival								
Cauchie and Vaillant (2016)	Information System on New Businesses	200000 businesses of metropolitan France	1994, 1998, 2002	France	Different components of human capital (general and specific human capital)	Parametric Gamma Survival	No significant relationship is found between experience and formal education in terms of duration of new businesses	x
Self-employment duration								
Oberschachtsiek (2012)	Individuals applying for bridging allowances in the Northern region of the German Federal State of Lower Saxony	645 founded businesses	1998-2000	Germany	Founder's skills: - Higher education - Master craftsman/foreman - Management - Experience in sales/business - Broad experience - Experience with the service/product - Prior entrepreneurship experience	Competing risks	Entrepreneurship duration strongly (positively) relates to experience; knowledge in sales/business is associated with a comparative advantage for wage work; broad experience (no. of fields of operation) appears to be negatively related to self-employment duration.	+/-
Being a noted inventor/entrepreneur								
Baumol et al. (2009)	Biographies of noted inventors and entrepreneurs	514 inventors and entrepreneurs	1400-1985	38 countries (includes U.S., United Kingdom, Germany)	Educational attainment and educational fields	-	Supports the JAT theory of entrepreneurship	√

Notes: 1) Concerning the jacks-of-all-trades theory: √ - the study supports the theory; +/- - the study has mixed findings; x – the study does not support the theory

Most studies that focus on *occupational choice* use as dependent variable a dummy to capture the individual decision of working as an entrepreneur or wage employee. For that reason, the most frequent estimated econometric models are logit or probit regression models. Using a framework that takes this approach in a slightly different direction, Martiarena (2013) considers that individuals make their choice between four options - entrepreneurship, intrapreneurship, wage employment, or engaged intrapreneurship – while Cho and Orazem (2014) introduce the decision between wage employment and two different types of entrepreneurship (for-profit and non-profit entrepreneurship). Although less frequent, there are studies focusing on nascent entrepreneurship (Wagner, 2006; Krabel and Mueller, 2009), i.e., individuals that are in the process of creating a new venture (i.e., a process that is not yet completed). Due to the nature of this variable, the number of nascent entrepreneurs in the samples is very small, and for that reason studies estimate rare events models.

The last group of studies in the *occupational choice* group considers entrepreneurial intention or entrepreneurial disposition as dependent variable (e.g., Backes-Gellner and Moog, 2013; Muñoz-Férnandez et al., 2016; Obschonka et al., 2017). Entrepreneurial disposition measures the intention or predisposition towards entrepreneurship. This variable can be captured through a question such as "*Have you ever thought about starting your own business or becoming self-employed?*'' (Hyytinen and Ilmakunas, 2007b, p. 66). Empirical evidence suggests that not all those who ever thought of entering entrepreneurship will do so (e.g., Blanchflower, 2004; Reynolds, 2007). Nevertheless, as stated by Backes-Gellner and Moog (2013, p. 58) "*actual entrepreneurs are a sub-sample of so-called nascent entrepreneurs who intended or wished to become entrepreneurs*".

Among the studies that take *entrepreneurial success* related variables as dependent variable, we find five different groups, those that focus on: (i) the progress in the venture creation process (e.g., Stuetzer et al., 2013 Hessels, 2014; Bublitz et al., 2015); (ii) the income of the entrepreneur or entrepreneurial profits (e.g., Hartog et al., 2010; Kolstad and Wiig, 2015; Spanjer and Witteloosstuijn, 2017); (iii) firm survival (Cauchie and Vaillant, 2016); (iv) self-employment duration (Oberschachtsiek, 2012); and (v) the characteristics of noted inventors/entrepreneurs (Baumol et al., 2009).

These variables present a high degree of heterogeneity, which is reflected in the type of models estimated in each of these cases. Starting with studies about the progress of the venture creation process, Stuetzer at al. (2012) considers that an individual who wishes to start a business need to undertake 32 gestation activities and estimate a count model to analyse the determinants of the start-up process. Another example in this area is Bublitz et al. (2015). This study aims to explain completion time, measured as the time to hire the first employee, and therefore estimates a negative binomial regression.

The choice of income of the entrepreneur/entrepreneurial profits, firm survival, and self-employment duration are frequent in the study of entrepreneurial success. In methodological terms, firm survival and self-employment duration are studied through duration models and measures of monetary success (income or profits) are explored through OLS regressions or Mincer equations. Finally, Baumol et al. (2009) brings a very unique approach to the test of the JAT hypothesis. Aiming to identify the characteristics of the superstar inventors/entrepreneurs, the authors searched for biographical information in more than 500 sources and sought details concerning their level of educational attainment in order to establish trends over time and check whether there were signs of country-level differences.

4.4 Measuring skill balance

Measuring skill balance is a very complicated task. As summarized by Åstebro and Thompson (2011, p. 639) "*the degree to which an individual's skill set is balanced is not, in general, observable*". This raises a set of challenges for the research on this topic.

In most cases, proxies to capture balance of skills can be classified into one of two groups: (i) those related to the educational pathway; and (ii) those acquired after entry into the labor market. In the beginning of Chapter 4, we have described the contours of the empirical exercise carried out by Lazear (2005). From this overview it is possible to see that Lazear takes into consideration measures from both groups of realities when linking balance of skills with the decision to start a business. As emerges from Tables 9 and 10, the information available in the databases strongly constrains the proxies used to capture skill balance in each particular case.

Let us start by focusing on the proxies that have been used to capture whether the individual has a balanced educational path. Among the most frequent measures we find measures related to:

1) The level of educational attainment (Baumol et al., 2009; Diamond and Schaede, 2013; Kolstad and Wiig, 2015) or field of study (e.g., Baumol et al., 2009; Audrescht et al., 2011; Cumming et al., 2016);

2) The complete academic pathway which should be interpreted as a more comprehensive approach allowing a more detailed perspective on how the individual has gone through the educational ladder (Backes-Gellner et al., 2010; Tuor and Backes-Gellner, 2010).

3) Training in entrepreneurship or business creation programs (Dutta et al., 2011; Martiarena, 2013);

4) The degree of generality/specialization of the courses undertaken by the individual, namely in undergraduate or graduate programs (Cho and Orazem, 2014; Orazem et al., 2015; Hsieh et al., 2017).

5) The variance/dispersion indicators of grades/scores obtained by the individual (Hartog et al., 2010; Hsieh et al., 2017). The idea in this case is that lower variance among scores is synonym of skill balance.

Although each of the previous proxies can be considered to capture the spirit of the balance skill variable, there is probably a closer association with the fourth and fifth type in the sense that they have into consideration the diversity in the contents learned in schools and the variance in the degree of knowledge across subjects.

Skills can also be acquired in the labor market. Many studies use proxies related to these skills, since this type of information has a high likelihood of being available in the databases analyzed by many studies. Let us focus on the proxies that have been used to capture whether the individual has a balanced professional path. Among the most frequent measures, we find measures related to:

1) The number of fields of experience (Wagner, 2006; Brixy and Hessels, 2010; Stuetzer et al., 2012, 2013; Bublitz et al., 2015; Hsieh et al., 2017; Chen and Thompson, 2016; Tegtmeier et al., 2016). In most of the cases, researchers try to capture the portfolio of

managerial skills in which the individual has expertise. Although the classification system varies across databases, among the dimensions of interest we find: R&D/design/engineering; production; marketing; finance/accounting; law; human resources; general management; and consulting.

2) The number of occupations (Hyytinen and Ilmakunas, 2007a,b ; Cho and Orazem, 2014; Orazem et al., 2015), industries (Åstebro and Thompson, 2011; Cho and Orazem, 2014; Orazem et al., 2015; Tegtmeier et al., 2016), and/or employers (Chen and Thompson, 2016) in which the individual has experience.

3) The job hopping patterns (Åstebro et al., 2011; Diamond and Schaede, 2013). This approach has strong similarities with the idea of the complete academic pathway that we have seen above. In this case, researchers capture the history of occupation changes (same employer), employer changes (same occupations), and changes in both employer and occupation.

4) The number of prior roles (Silva, 2007; Åstebro and Thompson, 2011). In this case, roles have in consideration factors such as occupation, tasks, responsibilities, and industries.

5) Prior entrepreneurial experience (Krabel and Mueller, 2009);

6) The breadth of experience meaning that the objective is to assess the diversity of experiences across private, university, government, and other employment experiences (Gicheva and Link, 2016);

7) Professional training after completing school, including, for example, apprenticeships, traineeships, and degrees as a master craftsman (Wagner, 2003, 2006; Tegtmeier et al., 2016).

There are two other types of variables that do not fit in the two previous groups of variables. The first type is related to soft skills and psychological traits. Obschonka et al. (2017) takes into consideration entrepreneurial competencies (leadership, self-esteem, creativity, and proactivity motivation) while Tegtmeier et al. (2016) attends to the balanced entrepreneurship-based self-efficacy. Finally, Hessels et al. (2014) uses a subjective overall assessment answer to the question to whether the individual considers himself/herself as a *generalist* or *specialist*.

4.5 Evidence concerning Lazear's propositions

Three propositions emerge from Lazear's theory. Nevertheless, most empirical analysis carried out since Lazear (2004, 2005) focus on Proposition 1 (*entrepreneurs are JAT*). There is a very small number of tests to the other two propositions: the *investment hypothesis* (Proposition 2) and the negative relationship between the *complexity of the production process and the supply of entrepreneurs* (Proposition 3).

4.5.1 Proposition 1: JAT

Concerning Proposition 1 there is a wide list of studies validating the idea that those holding more balanced skills have a higher likelihood of entering self-employment or being successful entrepreneurs. Evidence in support of this idea is substantial. The result holds for papers using either proxies of balanced educational and/or professional skill set which can be interpreted as meaning that, in both types of human capital, entrepreneurs benefit from having diversified knowledge. Among the 29 studies about *occupational choice* (Table 9), 22 studies find evidence supporting the theory and among the 17 studies about *entrepreneurial success* (Table 10) there are 12 in support.

In both tables there are the studies finding mixed evidence (e.g., Wagner, 2003; Hyytinen and Ilmakunas, 2007a; Oberschachtsiek, 2012). This occurs when the broadness of human capital is measured through more than one variable and not all of them have the expected signs or there are findings in the empirical evidence that do not allow for a full support of the proposition (Spanjer and Witteloosstuijn, 2017). Let us focus, for example, on Oberschachtsiek (2012) which is a paper commonly cited for its results (see Figure 5 in Chapter 3). Using a very unique sample composed by individuals from the German Federal State of Lower Saxony who were unemployed before entering on entrepreneurship and received support when launching their projects, Oberschachtsiek (2012) analyses the duration of the entrepreneurial spells through a competing risks model. The human capital is measured through seven variables that include, among others, experience as master craftsman/foreman, management experience, experience in sales/business, experience with product/service, number of fields of experience, and prior self-

employment experience. Surprisingly, empirical results suggest that both management and prior self-employment experience have a negative impact on entrepreneurial duration. On the other hand, with the expected sign, product/service experience, craftsman/foreman experience, or having been in more occupations increases the duration of the spell.

There are also studies with results contradicting Proposition 1, including Silva (2007), Brixy and Hessles (2010), Diamond and Schaede (2013), Hessels et al. (2014), Lechmann and Schanbel (2014), and Cauchie and Vaillant (2016).

Silva (2007) is a very important study because it introduces a direct criticism about the empirical tests to Lazear's theory carried out until that moment (Figure 5 in Chapter 3 shows the importance of this contribution in the literature on this topic). Olmo Sliva in a study entitled "The Jack-of-all-trades entrepreneur: Innate talent of acquired skill?" raises a question about the methodology commonly used to test the JAT proposition. Most empirical analysis are based on cross-sectional datasets. Silva (2007) argues that with this type of data it is not possible to assess whether there are unobservable characteristics that determine both skill accumulation patterns and the labor market choice between entrepreneurship and wage employment. If unobservable characteristics play a role in linking these variables then both maybe determined by *innate ability*. With a sample composed by 5173 individuals drawn from the Longitudinal Survey of Italian Families, a survey representative of the Italian working population, Silva (2007) estimates a linear probability model and concludes that in a model with fixed effects (accounting for unobservables) skill balance does not matter for determining occupational choice. Nevertheless, estimating the same model without fixed effects the opposite result emerges. In conclusion, Silva (2007) argues that, for accuracy reasons, longitudinal is better than cross-sectional data to perform a test to this theory.

4.5.2 Proposition 2: Investment strategies

Proposition 2 is about the origins of the balance skill set. The rationale for this proposition is that entrepreneurs are JAT and make choices in school and after entering in the labor market in order to acquire the skills that are needed for the multi-dimensional nature of entrepreneurial ventures.

Lazear (2005) interprets the evidence about the educational and professional pathways of the Stanford graduates as validating the investment proposition. Although most empirical studies test whether or not individuals have a balanced skill set, very few embrace the challenge of finding its origins. The most important exception is the contribution by Stuetzer et al. (2013). This study confronts two alternative, although not exclusive, explanations for why entrepreneurs have on average a more varied set of skills than wage employees. On one hand, as suggested by Lazear (2005), the portfolio of skills can be rationally built (*investment hypothesis*), however, it is also possible that other factors such as *innate ability* (discussed above), *taste for variety* (i.e., being driven by the chance of experimenting new things and getting easily bored), or other psychological traits also play a role in these decisions. Due to the relevance of the theoretical framework proposed by Stuetzer et al. (2013), this approach will be discussed in detail in Chapter 6 "Alternative views".

Regarding Proposition 3, there is not a stock of empirical knowledge about the complexity of sectors and the supply of entrepreneurs. The exercise carried out by Lazear (2005) explicitly addresses Proposition 1 and 2 but not Proposition 3.

4.5.3 Testing the "more tasks" hypothesis

The paper published by Lechmann and Schanbel (2014) brings very interesting insights. In addition to testing Lazear's propositions, some of the hypotheses are also studied. The most important of these is the hypothesis that entrepreneurs do more things (H1). To answer to this question, using a database with a representative sample of the German working population, an OLS regression model was estimated to explain task variety. Results suggest that the number of tasks occurring sometimes or often at work is nearly 0.78 times higher for entrepreneurs than for wage employees, thereby validating Lazear's hypothesis. In addition, using a classification of skills required at work that separates these into basic and expert levels, Lechmann and Schanbel (2014) concludes that entrepreneurs use more, not only basic skills, but also more expert skills than employees. This last idea in some extent raises questions about entrepreneurs and employees having different acquisition skill patterns (as suggested by Lazear).

5. Theoretical Extensions

Since Lazear (2004, 2005) a vast amount of study has been devoted to enlarge the boundaries of the baseline model, exploring new perspectives and dimensions not included in the seminal contribution. In this chapter, we examine the main ideas emerging from seven groups of theoretical extensions. In all cases, we concentrate the analysis in three critical aspects: (i) the link with the study of Lazear, i.e., which hypothesis is relaxed; (ii) the new contribution under discussion; and (iii) its empirical test. Table 11 provides a preliminary overview of these contributions.

Table 11: Main theoretical extensions

Theoretical extension	Main idea	Relaxed hypothesis	Important contributions
Towards a more comprehensive definition of relevant resources (Section 5.1)	The distribution of social and financial capital also matters for entrepreneurship.	H2	Backes-Gellner and Moog (2013) Blumberg and Pfann (2016)
Beyond the solo entrepreneur – cities and teams (Section 5.2)	There are factors external to the individual that determine entrepreneurial entry and success: - The individual can benefit from expertise of other co-founders (teams); - The resources available in the geographical space where the venture operates can complement the founder's skills (cities).	H2	Helsley and Strange (2011) Bublitz et al. (2015) Åstebro and Serrano (2015) Hellmann and Thiele (2015)
Non-monetary motivations for entrepreneurship (Section 5.3)	For some individuals, critical returns from entrepreneurship include not only income but also non-monetary rewards.	H4	Benz (2009) Daghbashyan and Harsman (2013) Cho and Orazem (2014) Tegtmeier et al. (2016)
Risk attitudes and balanced skills (Section 5.4)	Risk aversion may induce human capital accumulation strategies that foster the diversity of skills therefore promoting entrepreneurship.	H5	Hsieh et al. (2017)
Multiple modes of entry into entrepreneurship (Section 5.5)	Entry into entrepreneurship can also occur through taking over established businesses.	H6	Parker and van Praag (2012)
Dynamic approach to the occupational choice model (Section 5.6)	The decision of entry into entrepreneurship can be reverted over the life cycle.	H7	Orazem et al. (2015)
Non-linear relationship between skill diversity and entrepreneurial performance (section 5.7)	After a given threshold, additional experience diversity has a negative impact on entrepreneurial performance.	H7	Spanjer and Witteloostuijn (2017)

5.1 Towards a more comprehensive definition of relevant resources

The basic proposition of Lazear (2005) is that a more balanced mix of skills (as measured by education and work experience) induce entrepreneurship entry. Backes-Gellner and Moog (2013) extend this link to social capital (Davidsson and Honig, 2003), more specifically, they put forward three main propositions. The first one links diversity in human capital and entrepreneurship entry (JAT proposition). The second establishes that "*the more balanced an individual's social contacts are, the higher his or her disposition to become entrepreneur*" (Backes-Gellner and Moog, 2013, p. 58). In fact, entrepreneurship is a social activity being its economic elements developed in a social web of individuals like parents, friends, customers, suppliers, lenders, employees, etc. Moreover, according with Backes-Gellner and Moog (2013) the disposition to become entrepreneur depends much more of the balancing between the different dimensions of social capital than of the level of each dimension itself. Finally, the third proposition aggregates the previous ones, arguing that the probability of entrepreneurship entry positively depends on the diversity of the overall portfolio of human and social capital.

In order to test to the Backes-Gellner and Moog (2013) hypothesis that both human and social capital are relevant to explain the disposition to become an entrepreneur, it is necessary to change the most common empirical approach to the occupational choice model. Using a sample of 2000 students from five universities in the metropolitan area of Cologne, Backes-Gellner and Moog (2013) develop measures of human and social capital imbalances as well as a measure of overall portfolio imbalance. Empirical results show that a more balanced portfolio of human and social capital increases the disposition to become entrepreneur. The same occurs with the overall resources balance.

Interestingly, in their final remarks section, Backes-Gellner and Moog (2013) suggest as next step the extension of the analysis to financial capital in order to consider an even broader concept (human, social, and financial capital). Blumberg and Pfann (2016) develop their theoretical and empirical research along these lines.

5.2 Beyond the solo entrepreneur – cities and teams

One of the basic hypothesis considered in the model developed by Lazear is that all that matters for the choice between entrepreneurship and wage employment is the distribution of x_1 and x_2 (H2). However, some other contributions provide additional inputs to this literature though the considerations of factors that are external to the individual. Two of the most interesting cases, in this context, are: (i) the relationship between balanced skills and cities; and (ii) the importance of teams. Let us consider each of them.

Regarding the first topic, Helsley and Strange (2011) put forward a model that aims to unify the approach developed by Lazear and the idea that the thickness of local markets promotes entrepreneurship since the availability of resources is larger in cities and that facilitates entrepreneurial innovation (Vernon, 1960). This framework establishes a theoretical link between the characteristics of the entrepreneur and the regional environment in which the activity occurs. The basic idea is that cities can be seen as *places-of-all-trades*, therefore complementing, as discussed by Bublitz et al. (2015), missing skills of *jacks-of-few-trades*. In other words, thick local input markets represent a substitute for entrepreneurial balance. Using data from 1,105 founders in Germany, Bublitz et al. (2015) obtain support to this view. In fact, they verify that "*the coefficient of balanced skills seems to depend on the regional context*" (Bublitz et al., 2015, p. 497). More specifically, the evidence show that: (i) entrepreneurs working in a city need less time until hire the first employee; (ii) the advantage mentioned in (i) is larger for entrepreneurs with lower skill balance; and (iii) in the context of cities, unbalanced entrepreneurs register a faster grow when compared with balanced ones.

Another fruitful stream of literature concentrate on the importance of teams, therefore challenging the idea of solo entrepreneurs, as considered in Lazear (2005), and, once again, suggesting that external factors, behind the individual characteristics, may be important and should be considered in the choice between to become entrepreneur and to work as employee.

Åstebro and Serrano (2015) indicate that "*projects run by partnerships were five times as likely to reach commercialization as those without business partners, and they had mean revenues approximately 10 times as great as projects run by solo entrepreneurs*" (Åstebro and Serrano, 2015, p. 228). In this context, what could we expect in terms of the impact of this new framework

(when compared with the hypothesis of solo entrepreneurs) on the main proposition establhished by Lazear (2005)? The article by Åstebro and Serrano (2015) evaluates the importance (in what regards commercializing an invention) for entrepreneurs of adding business partners with complementary assets. The results obtained provide strong support to the effect of partners' complementary assets, i.e., the existence of skilled partners contribute to success in entrepreneurial activities.

In a broader context, Hellmann and Thiele (2015) explore the importance of founding teams. Despite the existence of significant evidence suggesting that teams represent an important fraction of the total number of new ventures (Ruef et al., 2003; Wasserman, 2012), the issue still needs additional research. However, it is fair to say that the lack of consideration of founding teams as an alternative to solo entrepreneurs is a shortcoming of the approach developed by Lazear (2005).

5.3 Non-monetary motivations for entrepreneurship

In the model proposed by Lazear (2005), the occupational decision only depends on the maximization of income (H4). As this may not be true in some circumstances, a critical question arises: is the JAT proposition still valid when H5 is relaxed, also considering other motivations and determinants of occupational choice? Recent research has devoted some attention to the identification of potential cases in which the income maximization hypothesis is less acceptable, requiring alternative/complementary contexts of analysis. Let us consider two of them: (i) women entrepreneurship; and (ii) non-profit entrepreneurship. The first case is studied by Tegtmeier et al. (2016), starting from the well-established idea that among women maximizing income and growth is not the most important determinant of the decision to become entrepreneur (Clain, 2000; Georgellis and Wall, 2005; Terjensen et al., 2015). Tegtmeier et al. (2016) do not reject the JAT proposition. On the contrary, they argue that women should be *jacquelines-of-all-trades* to become entrepreneurs. The reasons behind this relationship is however different. Three main justifications can be consider. First, women prioritize self-fulfillment and it is reasonable to assume that in presence of a balanced set of skills, entrepreneurship is a better way to obtain higher levels of self-fulfillment since it implies to perform many different tasks. Second, as

highlighted by Brush (1992), women also want jobs with high social impact. As stated by Tegtmeier et al. (2016), individuals "*with a balanced set of skills can maximize their social impact through a socially conscious business* (…)" (Tegtmeier et al., 2016, p. 81). Third, occupational choice in the case of women is strongly motivated by the objective to combine professional and family responsibilities. The greater flexibility allowed by entrepreneurship can be the answer to this objective.

Using a sample of women (in this case, 1384 women graduates aged between 20 and 66), Tegtmeier et al. (2016) assessed whether despite differences in motivations between genders, Lazear's propositions remained valid. In order to capture skill balance, four complementary measures were considered: additional professional training, balanced industry experience, balanced management experience, and balanced entrepreneurship-based self-efficacy. The study concludes that no gender differences seem to exist regarding Proposition 1 of Lazear's theory (*skill balance increases the probability of entrepreneurship*). Tegtmeier et al. (2016) interpret this result as meaning that despite the fact that male and female have different motivations when entering entrepreneurship, they choose to invest in similar portfolios of human capital in order to be prepared to follow this pathway. The evidence obtained by Ettl and Welter (2010 a, b) confirms the validity of the JAT proposition for women. Based on in-depths interviews with women entrepreneurs and with experts, they find that women emphasize the importance of having previous experience in different fields.

Still regarding H4 – but also associated with H3 – Daghbashyan and Harsman (2013) aim to explain the high entrepreneurship rates among another group of individuals – the arts graduates. In fact, this evidence is not expected since, as stated by Lazear (2005), the critical skills for entrepreneurship are managerial skills (finance, accounting, human resources, marketing, operational skills, among others) and it is reasonable to assume that the correlation between artistic talent and business skills is low. The justification advanced by Daghbashyan and Harsman (2013) is, once again, as in the case of women described above, associated with the importance of the non-monetary rewards of entrepreneurship (Parker, 2009; Croson and Minniti, 2012).

The studies of Benz (2009) and Cho and Orazem (2014) belong to another research avenue. The main contribution of Benz (2009) is the idea that, contrary to H4, entrepreneurship does not depend only on monetary rewards. Rather, given the specific nature of entrepreneurial activities,

entrepreneurship is better characterized as a non-profit activity. The empirical analysis conducted by Benz (2009) confirms that entrepreneurship assures several other dimensions of reward such as autonomy, possibility to apply own ideas and make use of their skills.

The basic proposition of Benz (2009) is modelized through an adaptation of the returns obtained by the entrepreneur. Now, it is given by:

$$\text{Utility} = (\lambda + \mu)\min [x_1, x_2] \quad (3)$$

where μ represents a non-monetary factor that adds to the monetary return and is only obtained by entrepreneurs. Using the words of Benz (2009), it represents "*the non-monetary satisfaction that entrepreneurs enjoy from having more possibilities to exercise their skills and abilities*" (Benz, 2009, p. 32).[4] Thinking in the context of the graphical framework presented in Figure 1, it is straightforward to see that the shaded area – i.e., the area in which the optimal choice is to become entrepreneur – increases. Taking a different conceptual framework, Cho and Orazem (2014), also conclude that the same basic conditions that promote for-profit entrepreneurship – a balanced set of skills – also induce non-profit entrepreneurship.

To sum up, while several channels and mechanisms could be taken into account, the main proposition linking diversity of skills and entrepreneurship entry (JAT proposition) remains valid for the case of non-profit firms.

5.4 Risk attitudes and balanced skills

The model of Lazear (2005) does not incorporate risk (H5). However, since the seminal contribution of Kihlstrom and Laffont (1979), the negative link between risk aversion and entrepreneurship entry is a core issue in this field of research. The critical contribution of Hsieh et al. (2017) is to provide an extension of the theory of Lazear to a risky context, therefore

[4] See Benz and Frey (2007) for additional discussion on this topic.

combining the basic inputs which raises from risk aversion theory (Kihlstrom and Laffont, 1979) and balanced skills theory (Lazear, 2005). Hsieh et al. (2017) analyze the direct effect of risk aversion on entrepreneurship entry given by the standard proposition suggested by Kihlstrom and Laffont (1979) but alerts to the existence of a counter-effect linking risk aversion and balance skills. Based on the idea that risk-averse individuals prefer to diversify their human capital composition, we may expect that they opt for a more balanced set of skills, namely in presence of highly and growing uncertain environments. If this is true, the final implication may be that risk-averse individuals end up with the condition – a balanced mix of skills – that Lazear points to be vital for entrepreneurship entry. Even if this does not contradict the basic conclusion of the risk-aversion theory, it provides a new and important insight on the relationship between "risk, balanced skills and entrepreneurship" – the tittle of the paper by Hsieh et al. (2017).

The empirical results show that risk aversion has direct and indirect effects on entrepreneurship entry. On the one hand, using a regression to explain the decision to invest in a balanced skill set, Hsieh et al. (2017) find that risk averse individuals tend to choose more balanced skill sets. On the other hand, risk aversion has a negative impact on the entry to self-employment while holding a balanced skill set has a positive effect on this decision. In conclusion, risk aversion has a negative effect on entrepreneurial entry and a positive indirect effect through the skill balance decision.

5.5 Multiple modes of entry into entrepreneurship

Another interesting extension of the occupational choice model presented in Chapter 2 was recently proposed by Parker and van Praag (2012). As in most of the analyses, Lazear (2005) investigates entrepreneurship in terms of new venture creation (H7). Parker and van Praag (2012) contribute to the literature through the consideration of two entry modes: new ventures creation and taking over established businesses.[5] In this context, they distinguish between managerial experience (Cooper and Dunkelberg, 1986) and other types of experience, namely general labor market experience, industry experience, and previous business experience. Comparing with new

[5] The authors make the distinction between family firm takeover and outside firm takeover. The first one is available only for individuals from business owning families.

ventures, when the venture is obtained through takeover (already employing other people that need to be managed but with different forms of experience), managerial experience is more critical and generic experience less vital. This idea is expressed in two propositions: (i) *"(…) entrepreneurs with greater managerial experience are more likely to enter via an outside firm takeover (…) than a new venture start-up*"; and (ii) "*entrepreneurs with greater labor market experience, industry experience, and previous business experience are more likely to enter via a new venture start-up (…) than an outside firm takeover*". (Parker and van Praag, 2012, p. 37)

Using a random cross-section sample of Dutch entrepreneurs, Parker and van Praag (2012) obtain confirmation of the first proposition. Concerning the second one, there is no evidence of significant difference between the impacts of generic experience on the two entry modes considered.

5.6 Dynamic decision model of occupational choice

Orazem et al. (2015) significantly contribute to this field of research proposing a theoretical framework with multiple periods in which the occupational choice is considered. As mentioned by Orazem et al. (2015), this approach allows the evaluation of "*the variety of educational experiences, variety of working experiences, and entrepreneurial entry as joint decisions*" (Orazem et al., 2015, p. 3). The model proposed considers two periods and investigates in what conditions the original decision (first period) is reverted over the life cycle (second period).

Following the background provided by Lazear (2015), there are two relevant skills x_1 and x_2 (H2), and, while the income obtained by a specialist depends on his best skill, the income of the entrepreneur depends of his worst skill. Nevertheless, now we have to consider two periods ($t = 1, 2$). Therefore, the incomes obtained by the specialist (Y_S^t) and the entrepreneur (Y_E^t) at period t are:

$$Y_S^t = Max(x_1^t, x_2^t) \tag{4}$$

$$Y_E^t = \lambda_t Min(x_1^t, x_2^t) \tag{5}$$

with λ_t representing the entrepreneurial skill ($\lambda_t > 1$). It evolves over time such that $\lambda_t = \lambda_{t-1} + \epsilon_t$ with ϵ_t being determined by a white noise process. The probability of entry in entrepreneurship increases with λ_t meaning that there is a value λ^* that changes the optimal decision (reservation property). The level of human capital is given by $H_t = x_1^t + x_2^t$. Therefore, the individual choose the optimal mix of x_1^t and x_2^t in order to maximize income.

The problem at the start of period 1 relies on the maximization of lifetime income and is given by:

$$Max\ \{Y^1 + E(Y^2|x_1^1, x_2^1)\}\ \text{s.t.}\ H_t = x_1^t + x_2^t \tag{6}$$

with

$$Y^1 = Max\{Y_E^1, Y_S^1\} \tag{7}$$

$$Y^2 = Max\{\lambda_2 min(x_1^1 + x_1^2, x_2^1 + x_2^2), max(x_1^1 + x_1^2, x_2^1 + x_2^2)\} \tag{8}$$

According to the analysis developed by Orazem et al. (2015), when $\lambda_1 \geq 2$, the optimal choice is to become entrepreneur while the opposite occurs when $\lambda_1 < 2$.

When the choice in the first period is to become entrepreneur, the individual will invest in a balanced set of skills, i.e., $\hat{x}_1^1 = \hat{x}_2^1 = \frac{H_1}{2}$. Using this strategy, the expected earnings are $Y^1 = \lambda_1 \hat{x}_1^1 = \lambda_1 \hat{x}_2^1$. During the first period, the value of λ_2 is not known but $E(\lambda_2) = \lambda_1$. As a consequence, the individual will expect to set $\hat{x}_1^2 = \hat{x}_2^2 = \frac{H_2}{2}$, obtaining $E(Y^2) = \lambda_1(\hat{x}_1^1 + \hat{x}_1^2) = \lambda_1(\hat{x}_2^1 + \hat{x}_2^2) = \frac{H_1 + H_2}{2}$.

On the contrary, when $\lambda_1 < 2$, the individual will specialize and invest only in x_1^1 or x_2^1, obtaining $Y^1 = \hat{x}_1^1 = H_1$ or $Y^1 = \hat{x}_2^1 = H_1$. As in the first case, $E(\lambda_2) = \lambda_1$. Therefore, the optimal choice in $t = 2$ is to persist as specialist, continuing to invest in the skill he specialized in the previous period. His earning in $t = 2$ will be: $E(Y^2) = \hat{x}_j^1 + \hat{x}_j^2 = H_1 + H_2$ when he specialized in $\hat{x}_j^1$ in $t = 1$.

At the start of $t = 2$, the individual will know the true value of λ_2 and can, when adequate to maximize his income, to revert the initial occupational choice. The problem to be solved is:

$$Max\ \{\lambda_2 min(, \hat{x}_2^1 + x_2^2), max(\hat{x}_1^1 + x_1^2, \hat{x}_2^1 + x_2^2)\} \text{ s.t. } H_2 = x_1^2 + x_2^2 \quad (9)$$

Given this background, four combinations may emerge: (i) entrepreneur in both period 1 and 2; (ii) specialist in both period 1 and 2; (iii) entrepreneur in period 1 and specialist in period 2; and (iv) specialist in period 1 and entrepreneur in period 2. Orazem et al. (2015) analyze in detail the conditions for each one of these cases prevail.

The dynamic theoretical background developed by Orazem et al. (2015) was tested with data from the Iowa State alumni grading between 1982 and 2006. They obtain interesting results concerning the impact of educational and work diversity on the decisions over the life cycle. In the first period, when the individual must choose for the first time between to become entrepreneur and specialist, the diversity of academic paths raises the probability of become entrepreneur. In contrast, industry diversity is not significant for the decision to start a business 5 years after graduation (early entrepreneurship). However, when the time gap since graduation increases, academic diversity becomes less important while diversity in work experiences (meaning having performed additional occupations and having worked in more industries) becomes predominant.

5.7 Non-linear relationship between skill diversity and entrepreneurial performance

The basic implication of the JAT proposition (P1) is the idea that more skill diversity implies a better position to perform well in entrepreneurship activities. This proposition receives a wide empirical support as documented in Chapter 3 and is in line with the theoretical considerations put forward for example by Minniti and Bygrave (2001) and Unger et al. (2011). Both suggest that the critical knowledge for an entrepreneur is learned through experience. Therefore, as in Lazear (2005), we can posit a positive relationship between diversity of experiences and the probability of entrepreneurship entry. However, other strands of literature emphasize that there are limitations in terms of the number of skills that an individual can develop and perform well. Spanjer and Witteloostuijn (2017) summarize the main implications of two lines of research. First, there is a limited comparability of experiences gained in other jobs. This aspect is even more important when the range of experiences is wide, making the learning process from past experiences to the present work context harder to explore in its full dimension (Reed and Defilippi, 1990). Second, individuals have cognitive limitations in the sense that the capacity to correctly learn, process and use information is limited. When there is excess of information, a problem of knowledge overload may emerge (Baron, 1998). This may be the case of an individual with very different past experiences/skills. These lines of research accept the existence of a positive relationship between experience diversity and performance but only up to a given level. After that threshold, the negative effect dominates.

Trying to conciliate these opposite messages, Spanjer and Witteloostuijn (2017) perform an empirical exercise that aims to test the existence of an optimal degree of experiential diversity. Their critical proposition, summarizing the arguments above discussed, is that "*the relationship between experience diversity and (…) entrepreneur's performance is inverted U-shaped*" (Spanjer and Witteloostuijn, 2017, p. 146). Using data from the National Longitudinal Survey of Youth performed by the US Bureau of Labor Statistics, the authors find that experience diversity and performance are positively related up to 23-24 skills. After that limit, there is a negative association. This interesting result validates therefore the integrated approach developed by Spanjer and Witteloostuijn (2017).

6. Alternative views

In this chapter we discuss the main contributions that, in some degree, challenge or offer a different rationale for critical aspects of Lazear's theory.

6.1 *Taste for variety*

Let us start by exploring the rivalry between the JAT and *taste for variety* explanations. Åstebro and Thompson (2011) put forward the most important alternative view to Lazear's theoretical framework. In their model, *taste of variety* is the key determinant of their choices in the labour market. Both approaches say that entrepreneurs have a varied work history. The difference between them is that Lazear argues that the skill set of entrepreneurs result from a decision to learn skills through on-the-job training and that there is a positive association between skill balance and earnings in entrepreneurship. On the other hand, Åstebro and Thompson (2011) say that this varied work history suffer from the *hobos syndrome*, meaning that they are driven by a higher than average taste for switching activities, being this the reason behind their job hopping history characterized by a higher number of job and employer changes than wage employees.

There is not a lot of evidence about the *taste for variety* explanation, in great extent because it requires data not commonly available in most datasets. Orazem et al. (2015) is one of the exceptions. In this case, two proxies capture *taste for variety*: number of extracurricular activities and preference for non-conforming or unstructured activities or doing things differently. Since these two variables had no significant impact in explain occupational choice, the authors do not find support for this theory.

At this stage, it is important to explain how Silva (2007) relates to this discussion. Silva (2007) points out that the occupational choice and the definition of the entrepreneur skill set are driven by unobservable characteristics, in particular by *innate ability*. This is different from the Åstebro and Thompson (2011) argument that says that the driver is instead *taste for variety*. In this last paper, the authors test empirically if unobserved ability could explain their results and find no evidence of such influence on household income and occupational choice.

6.2 *Investment* versus *endowment hypothesis*

The *investment* versus *endowment hypothesis* is a second debate launched by Stuetzer et al. (2013) about Lazear's theory related to the origins of the balanced skill set of the entrepreneurs (we will see that this has links with the first one). In Proposition 2 "individuals who become entrepreneurs should adopt a more balanced human capital investment strategy than those who opt to work as specialists", Lazear assumes that individuals wanting to be entrepreneurs rationally make decisions about their school and labor market pathway with the goal of gathering the necessary set of skills. Stuetzer et al. (2013) designates this approach as the *investment hypothesis*. An alternative view about the origins of the balanced skill set is the *endowment hypothesis*. According to this perspective, "*individuals may possess entrepreneurial skills through unintentional, predetermined factors*" (Stuetzer et al., 2013, p. 98). Several factors can drive the process of skill acquisition: *innate ability* (Silva, 2007), *taste for variety* (Åstebro and Thompson, 2011), or *personality traits* (Hartog et al., 2010; Obschonka et al., 2010, 2017; Vinikainen et al., 2017). Using data for 521 entrepreneurs launching high-potential projects drawn from the Thuringian Founder Study, Stuetzer et al. (2013) analyze the origin of entrepreneurial skills as variable of interest (dependent variable) and conclude that "*regarding the origins of a balanced skill set, it seems that both innate talent and systematic investment play a role. (…) According to our study, future entrepreneurship models on balanced skills should consider an integrative view, combining talent and investment influences as well as entrepreneurship research and approaches of human development*" (Stuetzer et al., 2013, p. 111).

7. Conclusions

Entrepreneurship studies have been a very dynamic field of research over the last decades. Many scholars have contributed to the advance of knowledge about a wide range of topics in the sphere of the characteristics of entrepreneurs and the new ventures that they launch in one, or more than one economy. There are two main reasons for the interest about entrepreneurship. First, the economic relevance of entrepreneurship to economic growth, job creation, and technological progress is nowadays something that a very large number of studies have demonstrated. Second, the topic generates a broad scope of interest among different groups of economic agents (researchers, consultants, public policy makers, individuals with entrepreneurial aspirations and intentions, current entrepreneurs, and other institutions such as universities).

In the field of entrepreneurship, more particularly in what concerns the study of the characteristics of entrepreneurs and which of these characteristics are critical for entrepreneurial success, the papers published by Edward Lazear about the balanced skill set of entrepreneurs (Lazear, 2004, 2005), introducing the idea that entrepreneurs are JAT and to that end they need to make rational choices in order to acquire the skills that allow them to assume more roles, were clearly disruptive in the literature. The perception and understanding about the human capital of the entrepreneurs significantly changed after this moment. Since then the level of formal education and general and specific human capital continued to be important, but in addition the composition of that human capital also became an inevitable topic about entrepreneurial skills.

In this dissertation, Lazear's contribution is the departure point for an analysis using a diversified pallet of methodologies with the aim to provide a multidimensional overview of the impacts of this seminal theory. Using the Scopus database, the number of paper articles that cite at least one of the two Lazear's papers is 368. Taking these papers as primary source of knowledge, we were able to apply bibliometric methods to find the top journals publishing these citing papers and the journals' subject area, distribution over time, top authors, and authors' geographical distribution. In addition, based on a set of objective criteria, a subset of 33 core papers was identified. For these core papers, we classified them according to method of research and performed a study of why Lazear's work was being cited. In these 33 papers there were 260 citations to Lazear (2004) or Lazear (2005). Each of these citations was analysed and classified, leading to the conclusion

that, in most of this research, Lazear (2004, 2005) had a critical role in the definition of their research questions, therefore setting the stage for these studies.

Following, we were able to tell the story about the current state of the art in this field not only in terms of theoretical contributions but also empirical tests to the three propositions of Lazear's seminal theory.

By abandoning some of the hypothesis of the JAT framework, Backes-Gellner and Moog (2013) and Blumberg and Phann (2016) enlarge the concept of resources relevant to the entrepreneurs, bringing social capital and financial capital to the discussion; Helsey and Strange (2011) introduce, in their theoretical model, the idea that the geographical space in which the venture is located can complement the founder's skills; for Åstebro and Serrano (2015), Hellmann and Thiele (2015) founders, in many situations, launch their entrepreneurial projects with co-founders, and these can have skills that have a complementary nature; in Benz (2009), Daghbashyan and Harsman (2013), Cho and Orazem (2014), and Tegtmeier (2016) individuals can make their occupational choice maximizing their utility which can depend on non-monetary factors; for Parker and van Praag (2012) entry in entrepreneurship occurs through new venture creation or taking over established businesses; for Orazem et al. (2015) the decision on occupational choice takes place in multiple periods; among other theoretical developments. These extensions to the original Lazear's framework brought additional layers of complexity that expand its possibilities of offering a more in-depth understanding about how individuals make their choices, the contours of these choices, and whether or not there are factors that also need to be taken into account to contribute to what we know about this issue.

The relevance of these efforts seems to be amplified by the fact that empirical tests to the idea that entrepreneurs are JAT find, in the majority of the cases, support for the theory. For most samples and countries covered in the empirical exercises, entrepreneurs present a balanced skill set. This result holds for studies focusing on the decision between entrepreneurship and wage employment but also when the variable of interest is entrepreneurial success.

In the 12 years that have passed since Lazear (2005), alternative views have also been presented. Among the most important, Åstebro and Thompson (2011) argue that entrepreneurs can be JAT because they are taste for variety driven and Stuetzer et al. (2013) argue that the skill acquisition

process can be driven by factors that go beyond rational choice such as innate ability or psychological traits.

The critical question that follows is related to the future research pathways that can be foreseen and that can, in some extent, open avenues to be explored in the upcoming years. Two topics seem to be of particular interest.

The first is the enhancement of the databases used to study the human capital of entrepreneurs. Most proxies for balanced skills are convenience proxies and could be improved if other dimensions where covered in the most frequently analysed surveys. As summarized by Bublitz and Noseleit (2014) not all skill balance variables capture the spirit of the JAT theory. In addition, Proposition 2 (*investment hypothesis*) and Proposition 3 (*complexity of industries and the supply of entrepreneurs*) have been very scarcely tested due to lack of data on these topics. More discussion on Proposition 2 is critical since this is the area with more theoretical alternatives;

The second topic, which is more important but also more complex, is the implications of the seminal (plus extensions) framework to the contours of the national education system. There are very important issues being raised concerning: (i) the organization of the educational system, namely in what regards the permeability between vocational and academic pathways (Orazem et al., 2015); (ii) the relevance of entrepreneurial training in undergraduate programs; and (iii) whether entrepreneurial mind-sets can and/or should be stimulated in the years of adolescence (Obschonka, 2010; Obschonka et al., 2017). Another very interesting question is the equilibrium between the trend observed in most countries of steady increases in the level of educational attainment and the promotion of entrepreneurship. As stated by Backes-Gellner and Moog (2013, p. 71):

> "*to raise the entrepreneurship rate, other types of skills and individual resources, like for example social capital (…) would have to grow at the same rate. Thus, additional education may not raise the entrepreneurship rate but, in fact, bring about the opposite, namely more specialists and more individuals that are disposed to become employees. If an expansion in education is not flanked by additional social or financial capital, education will only lead to a rising share of employees*".

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