Age and Experience of High-tech Entrepreneurs

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Abstract: There has been a recurrent debate about the relative importance of age and experience in high-tech entrepreneurship where the uncertainty not to say non-existence of certain markets and products may render knowledge less critical than in established industries. Are the famous entrepreneurs in their early and mid-twenties exceptions? Some recent studies claim that the average age of entrepreneurs is closer to forty years old. We revisited the topic and analyzed not only the age of founders but also their roles when the company reached success and the links with geography, fields of business, value creation and venture capital.

Key words: age; experience; high-tech entrepreneurs

JEL codes: O30, L26

1. Introduction

When talking about high-tech entrepreneurship, ideas come naturally to mind: creativity, opportunity discovery, exploration and assessment, development of ideas into products and services, ability to sell, ability in convincing and attracting investors as well as growing globally. Clearly there are two important dimensions related to the qualities required to be an entrepreneur, one along energy, enthusiasm, often synonymous of youth and the other along experience, credibility and ability to build value, more synonymous of maturity. Leadership and charisma may be as important as the previous qualities but they are probably consequences of these two dimensions. Raw talent might be another important dimension tough it might be difficult to define and therefore link to age or experience.

It is well-known that famous successful entrepreneurs in technology and in particular a few founders based in Silicon Valley have launched their companies in their early to mid-twenties. Table 1 shows a short list of such charismatic icons of high-tech entrepreneurship. From Hewlett and Packard who founded HP in 1939 in their mid-twenties to Mark Zuckerberg who was twenty when he launched Facebook in 2004, the list is numerous of (very) young charismatic founders who stayed as leaders and often CEOs of their companies for decades, without much business experience at their inception. Gordon Moore and Robert Noyce look like exceptions in this list but it should be reminded that they founded Fairchild eleven years before they incorporated Intel in 1968.

As a reaction against a "myth of eternal youth" that would be a feature of Silicon Valley or of high-tech entrepreneurship, recent studies claimed that young entrepreneurs were mere exceptions and that serious statistical analysis showed a very different reality:"The average and median age of U.S.-born tech founders was thirty-nine when they started their companies. Twice as many were older than fifty as were younger than twenty-five." (Wadhwa et al., 2008).

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Table 1   A Short List of Famous Technology Entrepreneurs

Company	Year	Founder	Age	Company	Year	Founder	Age
HP	1939	W. Hewlett	26	HP	1939	D. Packard	27
Intel	1968	R. Noyce	40	Intel	1968	G. Moore	39
Intel	1968	A. Grove	32	Oracle	1977	L. Ellison	33
Microsoft	1975	B. Gates	20	Microsoft	1975	P. Allen	22
Apple	1976	S. Jobs	21	Apple	1976	S. Wozniak	26
Genentech	1976	R. Swanson	29	Genentech	1976	H. Boyer	40
Sun	1982	V. Khosla	27	Sun	1982	B. Bechtolsheim	26
Sun	1982	B. Joy	28	Sun	1982	S. McNealy	28
Cisco	1984	S. Lerner	29	Cisco	1984	L. Bosack	29
Amazon	1994	J. Bezos	33	Netscape	1994	M. Andreessen	23
eBay	1995	J. Skoll	30	eBay	1995	P. Omidyar	28
Yahoo	1995	D. Filo	29	Yahoo	1995	J. Yang	27
Google	1998	L. Page	25	Google	1998	S. Brin	25
Dell	1984	M. Dell	19	Facebook	2004	M. Zuckerberg	20

Intrigued by a debate which became fiercer and fiercer in the recent months and having to admit we stood more on the side of youth in the past (Lebret, 2007. p. 113), we decided to revisit the topic through the analysis of the ages of 577 founders of 258 technology companies. We also focused our interest in analyzing other features of these founders and companies, such as the activity field, the geographic location, the period during which these companies were founded as well as data about funding from venture capital and exit status and values.

1.1 Prior Work

There is surprisingly little serious academic work about the age of founders despite a rather long list of general statistical analyses. On the theoretical side, Levesque and Minniti (2006) studied the effect of aging on entrepreneurial behavior. They aimed at modeling the relationship between age and new firm creation and contributing to the understanding of the origins and causes of entrepreneurship. In particular the purpose of their paper was to understand why "the percentage of individuals attempting the creation of new firms is highest among people between the ages of 25 and 35 and to highlight the important theoretical and practical implications of this phenomenon for entrepreneurial activity". They added that "at any age, individuals allocate relatively more time to starting new firms and less time to waged labor when their risk aversion is low. This argument complements the existing literature showing that less risk-averse individuals are more likely to start new firms." They considered therefore as a given that youth had a positive impact on becoming an entrepreneur and tried to explain it, though this seems to be still debated today. At the other end of the spectrum, Stuart (1990) found that the entrepreneurial experience was by far the most significant factor related to performance in comparison to other experience factors such as age, years of business, management, and technical experience which were not significant. It should be noted that the study was based on interviews of 52 technical ventures from the East Coast of the USA.

Ucbasaran and his colleagues (2003) studied factors having an impact on new team member entry or exit, including the age of the founding team:"with the assumption that the average age of a team can be taken as a proxy for the accumulated human capital of the team, teams composed, on average, of younger individuals may possess fewer experience-related human capital resources provoking a need to bring in new team members who can fill such gaps." In their analysis based on 621 British companies, they interestingly found that subsequent team member entry is significantly positively associated with the average age of the team.

A few general studies about MIT and Stanford University gave additional reference points. A first analysis of MIT (Hsu, Roberts & Eesley, 2006) indicated that the median age of first time entrepreneurs has gradually declined from about age 40 (1950s) to about age 30 (1990s). This would "imply career pattern shifts from entrepreneurship as a mid-life career change to becoming an initial choice near the beginning of one's working career". In addition, their distributions showed that the more recent entrepreneurs include more from the younger age brackets as well as more from the late 40s and 50s age brackets. In a following analysis about MIT, some of the same authors (Roberts & Eesley, 2009) further refined the data with the example of entrepreneurs in the Software industry: "the majority of software founders over all the decades of our study are age thirty or younger and the majority of non-software industry founders are below age thirty-five the year they found their first firms. […] The increase in software entrepreneurship in recent years does not statistically account for the continuing decline in the average entrepreneurial age at time of first company formation". In a similar study about Stanford University Eesly (2012) did not specifically analyzed the age of founders but noticed that "more entrepreneurs emerge out of each successive Stanford graduating class, and they start their first companies sooner and at earlier ages". As a final illustration, a study analyzing the entrepreneurial traits of 685 entrepreneurs (Ernst & Young, 2011) similarly showed that "a large majority of the most successful embarked on their first ventures at a young age. Among [the survey], more than half started their first company before the age of 30".

1.2 Recent Opposite Trends

In contrast, studies with less academic focus have flourished in the recent years with a different message. Let us quote again Wadhwa and his colleagues:"The average and median age of U.S.-born tech founders was thirty-nine when they started their companies. Twice as many were older than fifty as were younger than twenty-five" (Wadhwa et al., 2008). In addition "the intermediate period between startup creation and degree completion was shortest for computer science and information technology graduates (14.3-year average) and longest for applied sciences graduates (20-year average)". Other general analyses showed a recent increase in entrepreneurial age:"The Founders Institute, a Mountain View-based startup incubator, says the average age of its 330 currently enrolled participants is 35; it was 29 when Founders Institute began in 2009. And at TechStars, another incubator that operates across the U.S., the average age of the founders in its current crop is around 32, up from about 25 several years ago." (Lessin, 2013) and "Older age has shown in the data to correlate with more successful entrepreneurs up to the age of 40, after which it has limited or no impact." (Rossi, 2011).

1.3 Objectives of This Work

Given the above contradictory messages about age and experience and also the emerging elements about the need for more fine-tuning of age relatively to fields of activities, periods of inceptions and maybe other unexplored attributes, we decided to revisit the topic. The objective of this analysis is not to assess if age or experience matters and how, but just to look at data which might be used by other researchers and experts who would know better about the relative importance of entrepreneurial qualities.

2. Data and Results

The author gathered data about 577 founders form 258 companies. Basic data are available online (Lebret, 2014). These data were initially compiled to study the equity stakes of founders, employees and investors and because this information is rather difficult to obtain, it was mostly built from public companies or companies which had filed to go public. Some highly visible private companies made these data available and were added to

the list. When the debate about the age of founders was revived, it was easy to use these data as the age of key officers is provided in the documents. When the ages were not available (mostly because the founders were not officers in the company), it was necessary to look for the information through various channels, mostly online. Wikipedia and LinkedIn were the main sources of information as well as personal pages of the founders when they exist. (In the case of 21 founders, the age could not be found, but information about years of graduation was known and the age was deducted from statistical averages.)
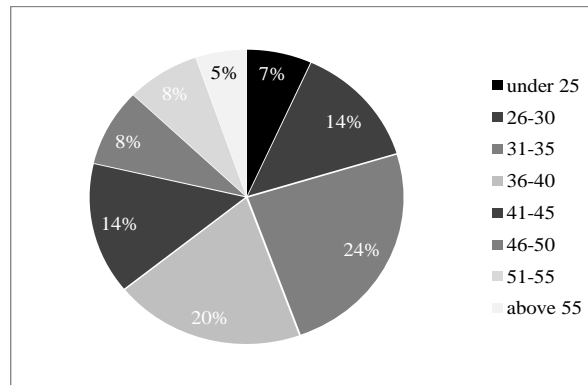

Figure 1   Founders by Age Groups

Note: Age group frequency of 577 founders from 278 high-tech companies (Lebret, 2014)

2.1 Initial Results

The basic result is that the average age of founders is 38. In terms of age groups, Figure1 shows that 21% of the founders are less than 30-year old and the same percentage are older than 45, or to parallel Wadhwa's results, 7% are less than 25 and 13% are more than 50. Table 2 further shows that the average age is not linked to the number of co-founders per firm. The series of Tables 3 show additionally the average ages in relation to (a) the field of activity, (b) the time of foundation, (c) the geographic location, (d) the relative presence of university of professors in the related technology field, (e) and (f) the value creation. The average age is the highest in the biotechnology field (45) and is the lowest in software (33) and Internet (32).

Table 2   Age of Founders and Number of Founders per Firm

Number of co-founders	#	Average age	Standard deviation
1	53	39.1	9.6
2	203	38.4	9.8
3	170	37.4	8.5
4	71	37.3	9.8
5	48	41.4	9.5
6	32	36.2	10.7

Professors increase the average age: it would be 1.5 year below without them and the average age of professors is close to 47. In biotech, it is 4 years higher than for non-professors. The reason why this is an important element is that most professors never abandon their academic career (with the possible exception of sabbaticals for a limited period of time) so that the risk taking profile is different. Silicon Valley entrepreneurs are younger than in most other US regions, but the French and British entrepreneurs are also young (though their number is smaller).

Another result of this first basic analysis is that the average age has increased in the last decades (Table 3-b),

being above 40 in the last ten years, between 35 and 40 in the previous decade and less than 35 before. Figure 2 further describes the relative size of the age groups evolution, and it appears clearly that the more senior entrepreneurs (above 45) are more frequent within recent years and the less experienced ones (less than 30) decrease in number.
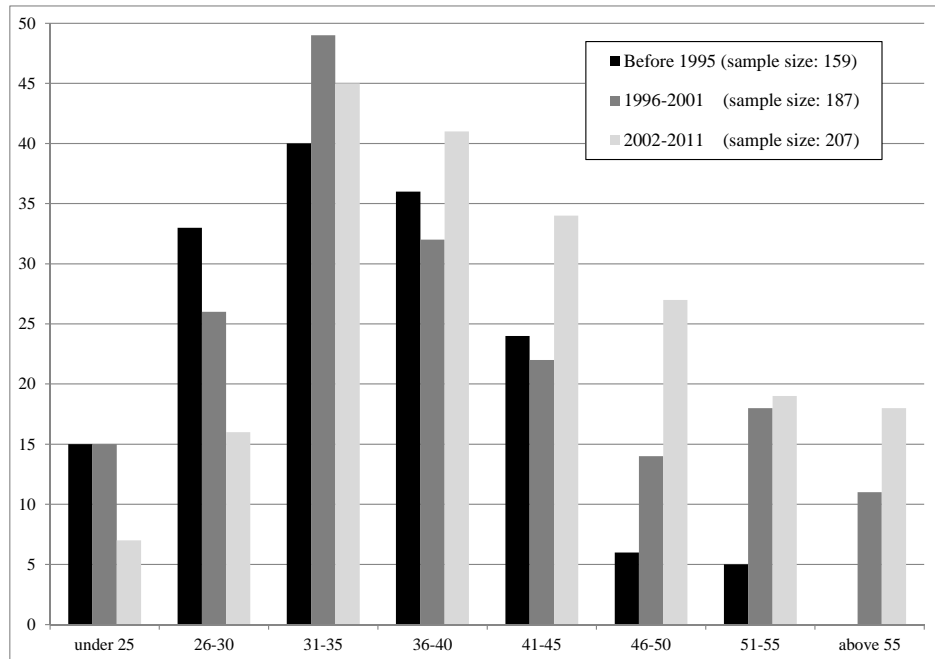

Figure 2   Age Group Size Evolution over Years

Becoming an entrepreneur may not be only a decision taken on the basis of the evaluation of opportunities. It might also be a state of mind, which is the reason studying the age at which the first entrepreneurial event occurs is also of interest. For each founder, we looked for past company foundation before the ones which were analyzed in our database. Table 3 include these data. The average ages in the second columns of the table give a new average value of 36. The difference is quite consistent for all fields, for recent years (but less for old periods) as well as for the geography.

Figure 3 describes further the age groups for our database of founders and for first-time foundation. First-time founders below 25 are 10% and above 50 are 9%. In addition, this figure shows information about the status of these founders in the companies they funded, in a manner which is related not only to age but to experience. The third series of columns shows the age repartition without the professors and biotech founders. They are still 9% below 25 but only 4% above 50. The results are consistent with results mentioned above. We also analyzed the link of the age repartition with the status of CEO, advisor or former employee. Advisors are individuals without a full time position in the company. They mostly include the founding professors who belong often to the technical advisory boards and sometimes are also board members. They also include investors who were at the origin of the company and were considered as founders. Being a CEO or an advisor appears to be linked with higher ages whereas being a former employee happened more often with young founders: only 4% of the CEOs and no advisor were below 25 whereas 9% of the CEOs and 33% of the advisors were above 50. At the other end of the spectrum, 20% of the former employees were below 25 and 9% above 50.

Tables 3   Average Age of Founders vs. Field of Activity, Period of Creation, Value Creation, Geography and Presence of University Professors

a-field of activities

Field	Nb. of founders	Age	Age at 1st start-up
Biotech	159	45.6	43.3
Medtech	18	38.0	33.9
Energy/Env.	24	39.9	39.0
Semiconductor	89	36.8	34.8
HW/Comp./Tel.	86	36.7	34.6
Software	62	32.2	31.3
Internet	129	33.3	30.8
Others	10	38.1	34.6
Total	577	38.2	36.0

b- period of creation

Period	Nb. of founders	Age	Age at 1st start-up
1965	10	35.4	32.3
1970	4	32.3	32.3
1975	11	28.8	28.8
1980	38	35.2	35.1
1985	13	36.1	36.1
1990	73	34.8	33.3
1995	141	38.1	35.9
2000	170	38.5	36.2
2005	105	42.6	39.2
2010	12	40.1	35.8
Total	577	38.2	36.0

c-geography

Geography	Nb. of founders	Age	Age at 1st start-up
Silicon Valley	243	36.5	34.1
Boston Area	77	42.9	39.5
East Coast.	51	42.9	41.6
California	52	42.4	41.0
West Coast	29	34.8	33.7
USA/Canada	20	37.2	35.9
So. America	4	35.7	35.7
China	16	34.0	32.4
India	4	46.0	43.0
Israel	3	27.7	26.0
France	44	34.1	32.5
Switzerland	9	41	37.9
UK	11	36.6	34.6
Other Europe	14	31.3	28.3
Total	577	38.2	36.0

d-professors

Presence (0/1) & age of professors	Nb. of founders	Age	Age at 1st start-up
Biotech (0)	99	44.0	42.1
(1)	60	48.1	45.2
Medtech(0)	16	38.1	33.6
(1)	2	37.0	37.0
Energy(0)	17	36.0	34.7
(1)	7	49.4	49.4
Semicon.(0)	83	36.7	34.7
(1)	6	38.7	35.8
HW/Comp.(0)	85	36.8	34.7
(1)	1	31.0	31.0
Software (0)	61	31.9	31.0
(1)	1	48.0	48.0
Internet (0)	128	33.2	30.7
(1)	1	41.0	41.0
Others(0)	9	38.0	34.1
(1)	1	39.0	39.0
Total (0)	498	36.7	34.6
(1)	79	46.8	44.3

e-value creation excluding M&A values

Value creation	Nb. of founders	Age	Age at 1st start-up
> $100B	18	27.2	26.0
> $10B	35	35.4	32.0
> $1B.	134	37.2	35.7
< $1B	205	41.3	38.8
M&A	105	33.3	31.8
Private	75	41.7	39.3
Ceased	5	43.0	34.6
Total	577	38.2	36.0

f-value creation including M&A values

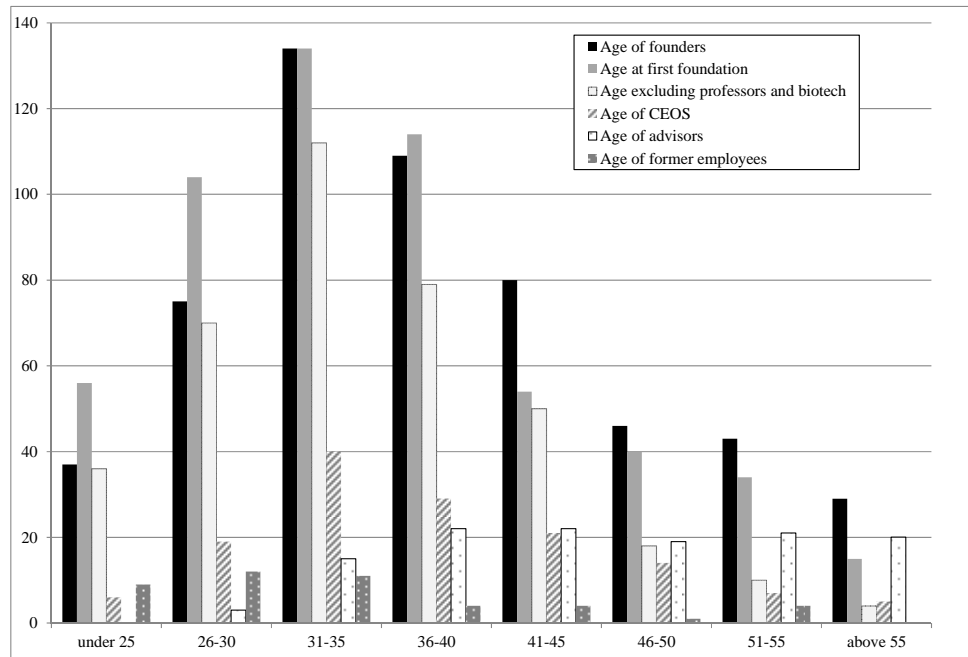| Value creation	Nb. of founders	Age	Age at 1st start-up
> $100B	20	28.0	26.9
> $10B	42	35.9	33.0
> $1B.	185	35.8	34.2
< $1B	250	40.0	37.6
Private	75	41.7	39.3
Ceased	5	43.0	34.6
Total	577	38.2	36.0

Figure 3　Age Group Related to Specific Status

Finally, we analyzed the value creation of the companies founded and how it was related to the age of the founders. Table 3-e gives values based on the market capitalization of the public companies as of Dec. 19, 2013 whereas Table 3-f adds to those values the value of the acquisitions of the companies at the time of the M&A. It is quite striking to read that the average founders' age decreases with the value creation and it is a first element to be discussed about the relative importance of age and experience in entrepreneurship.

2.2 Regression Analysis

We did very basic regression analyses to further explore the validity of our data, based on our preliminary results. The first set deals with the background of the founders in terms of periods, fields, geography, and professional status. Table 4a confirms that the age of the founders has increased slightly over the years. One more striking confirmation is that biotech founders are much older (by more than 5 years) and software and Internet ones are younger (by a little less than 5 years too). Not surprisingly professors are also much older (by 5 years again. The responsibility in the start-up (CEO or even any other officer position) is not correlated with age in the linear regression but the status of former employee has a negative impact on age (by nearly 4 years).

Table 4a　Age of Founders in Relations with Period, Field, Status, Geography

	beta	se	t	p	
	28.3543	1.6117	17.5932	0.0000	***
Year of foundation　(relatively to 1960)	0.2441	0.0398	6.1298	0.0000	***
Biotech (0/1)	5.3818	0.9337	5.7640	0.0000	***
Software/Internet (0/1)	-4.9262	0.7898	-6.2373	0.0000	***
Professor (0/1)	5.0013	1.0748	4.6533	0.0000	***
CEO (0/1)	0.4596	0.7816	0.5881	0.5567	
Former Employee (0/1)	-3.8122	1.6322	-2.3356	0.0199	*
Silicon Valley (0/1)	0.1380	0.7018	0.1967	0.8441	

Note: For this regression, the respective R-square statistic, the F statistic, p value for the full model, and the estimate of the error variance are 0.3538; 42.6341; 0.0000; 58.9342. DFE is 545.

We also studied the relation of age with value creation and access to venture capital. Value creation combines here the latest capitalization of the companies as well as the acquisition values. Access to venture capital is considered for the 1st round as well as in terms of the total amount received by the company. Table 4b shows a negative correlation between age and value creation ($26M) as well as smaller positive one between age and the 1st round of VC funding ($0.1M). The total amount of venture capital is not correlated with age.

Table 4b   Age of Founders in Relation with Venture Capital, Value Creation, and Status

	beta	se	t	p	
	28.9637	1.7600	16.4569	0.0000	***
Year of foundation (relatively to 1960)	0.1884	0.0470	4.0049	0.0001	***
Value creation ($10B)	-0.2627	0.0888	-2.9579	0.0033	***
VC 1st round ($M)	0.1179	0.0357	3.2993	0.0010	***
VC total amount ($M)	-0.0045	0.0003	-1.5009	0.1340	
CEO (0/1)	1.0430	0.8586	1.2147	0.2251	
Professor (0/1)	10.4935	1.1084	9.4674	0.0000	
Former Employee (0/1)	-3.9357	1.8840	-2.0890	0.0372	**

Note: For this regression, the respective R-square statistic, the F statistic, p value for the full model, and the estimate of the error variance are 0.2687; 24.5668; 0.0000; 63.8289. DFE is 468.

3. Discussion and Conclusion

Our analysis has shown a diversity of results about the age of start-up founders which do not contradict the apparent opposite results provided by recent studies. The average age of entrepreneurs when they launch their venture is higher than some myths may have induced the general public to believe in. Entrepreneurs are not in general young individual in their twenties, but on average more mature people in their late thirties. However, it should be immediately added that this average number hides a diversity of groups linked to the field of activities and status. People are younger in software and Internet and older in biotech. They are also older when they are university professors.

There is also a trend in recent years (and maybe decades) of older and older entrepreneurs, which may explain why studies seem to diverge in their results. Entrepreneurs were younger more than 20 years ago when they were incorporating their firms than their counterparts in the 1995-2005, themselves being younger than entrepreneurs from the last decade. Finally, the value creation seems to be negatively correlated with the age of founders with the extreme situation of individuals in their twenties for companies who reached the $100B value. Even in biotech, where the average age is above 40, one of the founders of Genentech was 29 in 1976.

We will only try to provide simple ideas about these diverse and (in appearance sometimes) contradictory results. One first important element is about the typology of innovation, which can be classified as incremental and disruptive. Galenson (2012) in a very interesting analysis identifies two distinct kinds of innovators: "The first is the conceptual innovator. […] They boldly break away from accepted standards, but after their early breakthroughs, tend to fade away, or at least their later work never attains the height of their early success. Take Picasso. He completed his most important work by the age of 26. He lived to be 91, but his later work never eclipsed the importance of Les Demoiselles d'Avignon, which Newsweek named the most influential work of art of the last 100 years. Experimental innovators create in a different manner. It takes time for them to hone their craft. They return to familiar ideas, trying to perfect them. […] They devote their life to learning, seeking answers

to their unsolved questions. In our society, we tend to glorify young prodigies at the expense of late bloomers." (Hansen, 2012). The idea that major (scientific, artistic) creators are young individuals is not new. It is not a myth only. In mathematics, the Field Medal, often considered as the greatest honor a mathematician can receive, is only awarded to less than 40-year old individuals. In science, the situation is different:"Comparing discoveries made before 1905 with after 1985, the average age at which physicists made their discoveries rose from 37 to 50. Chemists' average age rose from 36 to 46 and that of medical scientists from 38 to 45. Before 1905, 20% of prizewinning work was done before age 30, but by 2000, this fell to almost zero. […] The substantial shift toward youthful achievements in early 20th century physics occurs in a similar period as the development of quantum mechanics." (Jones & Weinberg, 2012).

If the maturity of a discipline is an explanation for the age of its major contributors in addition to its experimentation content, it is not surprising that the ones with a high content of experimentation such as health-related activities induce a higher age of inventors and maybe by consequence of innovators and entrepreneurs. Software and to a much higher degree the Internet are very recent fields of research and commercial development, with a much lower (not to say non-existent) level of experimentation. Many young computer and software entrepreneurs became familiar with their field while being teenagers whereas scientists in applied science need often to wait until they are young adults to master their discipline. The length of the medical studies further delays the entrance in professional activities. It should be noticed that the average age of software/Internet entrepreneurs has also increased in recent years from 30 before 1995 to 35 after 2005 (a linear regression gives a 1 year increase every 5-years.)

The maturity of a discipline coupled with its experimentation content is only one element of correlation between age and creativity and the related importance of experience. But it clearly helps in understanding why accepting to explore uncertain markets and technologies is also an attribute of youth. The examples of young entrepreneurs explaining this behavior are numerous. Marc Andreessen, who co-founded Netscape Communications Corp. in his 20s, says younger entrepreneurs "haven't learned any bad lessons" and are "fearless through ignorance". But he says his venture firm, Andreessen Horowitz, doesn't pay much attention to entrepreneurs' ages because venture is "so much an exception game" (quoted from Lessin, 2013).

3.1 An Exception Game?

In the debate of experience vs. youth, we will conclude that that the status of "exceptionalism" cannot be underestimated but we would like to add that the debate can also be linked to the topic of serial entrepreneurship which was not addressed here. In a previous article (Lebret, 2012), we had studied how experience matters in the success of high-tech entrepreneurship with mixed results: experience per se did not guarantee any success (serial entrepreneurs did worse on average with time) but entrepreneurs who were successful (respectively who failed) initially had a tendency to succeed (respectively fail) again in their new ventures. This would ask the question of raw talent more than experience, though "talent" is a difficult concept to quantify.

Whether we use the concept of Black Swans (Taleb, 2007) or of Super-Unicorns (Lee, 2013), the exceptional value creation in very short period of times of high-tech start-ups cannot be considered only as an outlier phenomenon. The billion-dollar and even hundred-billion-dollar companies might be considered as the *essence* of high-tech innovation whereas incremental value creation can be and is often achieved by established companies. It cannot be a pure coincidence that most of the entrepreneurs of Table 1 were much younger than the average. Quoting Wikipedia about Black Swans, "rare and improbable events do occur much more than we dare to think. Our thinking usually is limited in scope and we make assumptions based on what we see, know, and assume.

Reality, however, is much more complicated and unpredictable than we think. Also, assumptions relevant to average situations are less relevant to irregular situations; the effects of extreme events are even higher due to the fact that they are unexpected. The results of these were hardly thought of before but were tremendous." Apple Computer, Genentech, Google were such unpredictable events and they were founded by young "visionary people". This is another explanation of the diverging analysis between statistical analyses which are accurate in showing that experience matters on average in high-tech entrepreneurship and anecdotal stories creating mythical but still real entrepreneurs who founded the most successful technology firms in their first years of their professional activity.

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