



# Brave new firms

## High-tech entrepreneurship in the United States

December 9, 2009



The United States is one of the most entrepreneurial regions in the world. It has the highest share of early-stage entrepreneurial activity among all mature economies. Angel investors and venture capitalists have deep pockets, and a few startups even turn into big businesses. This gives the US an edge when it comes to transforming new ideas into successful products and helps to secure its place as a leader in high-tech amidst rising powers such as China or India.

Around 4% of all startups in the US are founded in high-technology industries. Over the last decade, the share of high-tech entrepreneurs in the US adult population has trended upwards – thanks to a steady supply of new ideas in combination with the entrepreneurial spirit to put them on the market.

Skills, resources and aspiration needed. A well-educated middle class, including skilled immigrants, is the best breeding ground for entrepreneurs. The propensity to start a business peaks at the age of 42, a time when youthful ambition and experience in the practicalities of life are evenly balanced.

Banks provide the bulk of startup money. According to a new survey, banks and credit-card companies contribute 39% of the initial capital injection – more than any other source provides. Equity injections are more frequent among innovative or high-tech firms, but even they draw on substantial credit lines.

Financial crisis underscores the case for high-tech entrepreneurship. Innovative startups may even thrive during turbulent times because otherwise powerful incumbents are vulnerable under such circumstances. It is no accident that well over half of the current Fortune 500 companies began during a recession.

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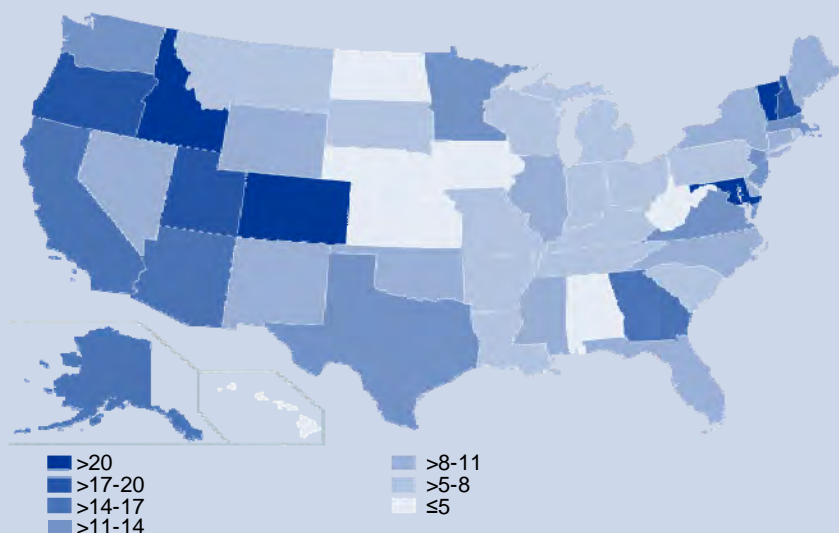
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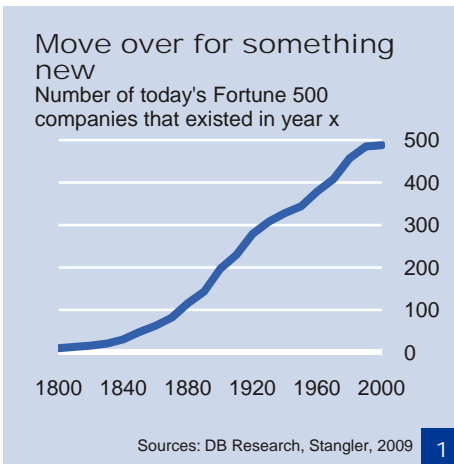
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The United States of high-tech entrepreneurship  
Monthly high-technology startups per 100,000 adults, average 1996-2006



Sources: DB Research, Fairlie, KIAA, 2009





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The strength of the US economy is not reflected in its big incumbent corporations but in the multitude of young and innovative entrepreneurs. Time and again, startups have shaken up the business landscape by pushing new products, new services, or new production methods. The rise of Google – from a Silicon Valley startup to the globally dominant search engine in less than 10 years – is arguably the best known example. Firms like these help to modernise and rejuvenate the economy by challenging and replacing sluggish incumbents.

The United States is on many accounts one of the most entrepreneurial regions. It has the highest share of early-stage entrepreneurial activity among all mature economies. Angel investors and venture capitalists have deep pockets, and the corporate landscape changes constantly due to new firms. More than a hundred companies that are now on the Fortune 500 list were founded after 1970 (see chart 1).

Why is this important? With millions of scientists and engineers in countries such as China or India, the production of new ideas and research will cease to be the domain of the US and other mature markets alone. But knowledge is not automatically put to commercial use. Entrepreneurs are needed to turn fresh ideas into new products and services. Hence, it is the entrepreneurial spirit that helps particularly the US to maintain a competitive edge when it comes to modern technologies – not because the US generates necessarily more ideas but because it makes better use of them.

### Scope of this paper

The underlying research aim of this study is to gain a better understanding of innovative or high-tech entrepreneurship in the United States and to see what other regions can learn from it. What are the trends and regional patterns? Which characteristics help to explain why, for instance, Colorado has the highest share of high-tech entrepreneurs and West Virginia the lowest?<sup>1</sup>

The **first part** of this paper explains the role of entrepreneurs in a dynamic economy and shows how entrepreneurs help to create innovation, growth and jobs.

In the **second part**, we only look at a small but very interesting subset of entrepreneurs – namely those in high-technology industries. The reason is that only a few startups actually do turn fresh ideas into new products and services, and that such startups are more likely to be found in high-technology industries. One of the main findings of this part is that high-technology entrepreneurship thrives when a knowledge-based economy meets entrepreneurial spirit.

This asks for a more detailed inquiry into the sources of entrepreneurial spirit in the US. To this end, the **third part** of this paper analyses individual characteristics that increase the probability of becoming an entrepreneur. Skills and risk tolerance are key drivers.

The **fourth part** presents new insights into the financing pattern of innovative startups. Often external investors are needed to provide young firms with capital. These investors do not only contribute resources, they also have an important role in selecting and promoting the most promising startups, thus allocating the funds to the most productive usage.

<sup>1</sup> I thank Alicia Robb for comments and Solvejg Wewel for research assistance.

What can Europe learn to become more entrepreneurial? Europe does have a vivid research landscape but it is not quite as good as the US in turning new ideas into commercially successful products. **Part five** sketches a few points that help to address these findings.

**Part six** draws conclusions and provides a brief outlook. The financial crisis appears to make the case for innovative entrepreneurship even stronger.

## 1. The direct and indirect value of entrepreneurship

### **Innovation drives growth**

One of the major insights of growth theory is that modern economies cannot raise living standards indefinitely by accumulating ever more capital or labour. Instead they need to find better ways of combining these production factors in order to lower costs and to create more desirable products.<sup>2</sup> Innovation is needed to spur technological progress and raise prosperity.

### **Knowledge needs to be put into practice**

Innovation is based on knowledge. Scientific breakthroughs, research and development and other forms of creativity add to the stock of knowledge. But knowledge in itself does not create new products.

### **Entrepreneurship is the link**

The missing link is entrepreneurship in the sense of Joseph Schumpeter.<sup>3</sup> He thought of the entrepreneur as an agent of economic change. Importantly, the entrepreneur is not necessarily a creator of knowledge but someone who transforms knowledge, wherever it may come from, into a successful business.

### **Incumbents are often too slow or complacent**

Not all innovation is done by new enterprises, of course. Incumbent firms work hard to update their product portfolios and improve efficiency. But they are often constrained in their ability to transform new knowledge into commercially successful innovations that deviate substantially from what they have done before. They do not see the potential, are unable to change, or even fear it might cannibalise existing products. Thus it took a daring entrepreneur to start developing and selling cars when everybody else was riding in horse carriages. But mass production in huge corporations and a steady flow of incremental improvements brought the car from its humble beginnings to its modern form.

### **It's not entrepreneurs against big business**

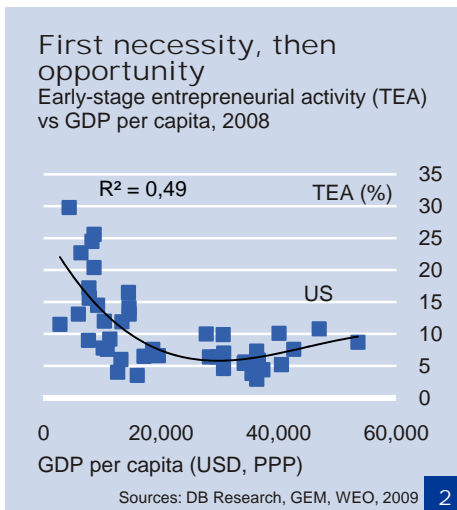
So, one should not pitch entrepreneurs against big business. Each has its role in the innovation process. Without entrepreneurs, big business gets too complacent and the economy loses dynamism. Yet, big business often delivers the economies of scale that lift innovations to full fruition.

### **Opportunities drive entrepreneurs**

For the purpose of this paper, we regard entrepreneurs as people who start a business as their main job. The United States is often considered the most entrepreneurial region in the world. That is correct only from a certain perspective. Many other countries, in fact, have a higher share of entrepreneurial activity than the US. Yet, new firms are often not founded to pursue a business opportunity but rather out of necessity, for instance, because regular

<sup>2</sup> See for instance Solow, Robert M. (1957). Technical change and the aggregate production function. *Review of Economics and Statistics* 39, pp. 312-320.

<sup>3</sup> See Schumpeter, Joseph (1911). *Theorie der wirtschaftlichen Entwicklung*. Berlin, and Schumpeter, Joseph (1942). *Capitalism, Socialism, and Democracy*. New York. Harper and Row.



**Create employment, commercialise innovation and boost growth**

**In the long run, labour supply limits employment growth**

**Venture capital boosts transformation from patent to productivity**

employment was unavailable. Such necessity-driven business formation is typically less innovative and thus less interesting for the purpose of this study.

Particularly in poorer countries, people start their own businesses for a lack of alternatives. This shows for instance in the index of early-stage entrepreneurial activity (TEA) from the Global Entrepreneurship Monitor (GEM), which measures the share of nascent entrepreneurs and owner-managers of businesses that are 42 months old or younger.

Chart 2 shows that entrepreneurial activity is highest in poor countries. The richer the country, the smaller the number of entrepreneurs because more regular jobs become available. Beyond a certain threshold, however, entrepreneurship picks up again. In these mature economies, more and more people voluntarily opt for entrepreneurship to pursue a business opportunity. The US occupies the pole position only among these mature economies.

### **Contribution to employment, innovation and growth**

A large body of literature now exists that empirically examines the contribution of entrepreneurs to employment, innovation and growth. A meta-analysis by C. Mirjam van Praag and Peter H. Versloot (2007) summarises the findings of 57 peer-reviewed studies published in highly-regarded academic journals.<sup>4</sup> They conclude that entrepreneurship contributes to employment creation, helps to commercialise innovation and bolsters economic growth. They also find that entrepreneurs are on average more satisfied than employees.

#### ***Employment gains are constrained by supply side***

A typical pattern is that startups first have a positive effect on employment by creating jobs directly on their own premises. But failures and the crowding-out of incumbent competitors subsequently impact negatively on employment. Startups increase competition, spur innovation and foster structural change. These indirect effects boost employment in the medium term. In the long run, however, the employment effects often fade away.<sup>5</sup> This is not surprising because employment growth is limited by supply side factors such as the size of the labour force – in the respective region and with the desired skills – or labour-market institutions.

#### ***Bridge between idea and innovation***

Entrepreneurs are crucial in bringing new ideas to the market – an activity that incumbent firms often shy away from. Previous studies by DB Research have focused on one particular sample of entrepreneurs, namely those that are financed by venture capitalists. Venture capital (VC) is typically invested only in a small subset of startups. VC-backed firms are among the most innovative and fastest growing companies. Evidence from an analysis of 15 European countries and the US suggests that countries with a higher share of VC investments tend to get a bigger productivity gain from each patent compared to those with fewer VC investments. This shows that VC-funded entrepreneurs are an important instrument for putting new ideas to commercial use which

<sup>4</sup> Van Praag, C. Mirjam and Peter H. Versloot (2007). What is the Value of Entrepreneurship? A Review of Recent Research. IZA Discussion Paper No. 3014.

<sup>5</sup> See Fritsch, Michael and Pamela Müller (2004). The Effect of New Firm Formation on Regional Development over Time. Freiberg Working Paper No. 1.

Crisis boosts start-up rate  
KIEA, %

Sources: Fairlie, KIEA, 2009

3

### High-technology industries

An industry is considered high-technology if employment in technology-oriented occupations is at least five times the average for all industries:

- Pharmaceutical and medicine manufacturing
- Computer and peripheral equipment manufacturing
- Communications equipment manufacturing
- Semiconductor & other electronic component manufacturing
- Navigational, measuring, electromedical, & control instruments
- Aerospace product and parts manufacturing
- Software publishers
- Internet publishing and broadcasting
- Other telecommunications
- Internet service providers and Web search portals
- Data processing, hosting, and related services
- Architectural, engineering, and related services
- Computer systems design and related services
- Scientific research and development services

Source: adopted from NSF, 2009

helps to boost growth.<sup>6</sup> In an earlier study on a sample of 20 European countries, we also find a positive correlation between VC investments and economic growth. The effect was stronger, the earlier venture capitalists invested in a startup.<sup>7</sup> The indirect effects count as well. Incumbent firms are compelled to stay alert and improve their performance by the presence of young, swashbuckling challengers.

## 2. The United States of high-tech entrepreneurship

This section draws on a special tabulation of the *Kauffman Index of Entrepreneurial Activity* (KIEA). The index measures business creation at the individual owner level, including employer and non-employer businesses. The KIEA is based on matched data from the Current Population Survey, a monthly survey conducted by the US Census. By comparing two consecutive surveys, those individuals can be identified who switched from being employed (or unemployed) in the first survey to owning a business as their main job in the second survey. To exclude casual businesses, only startups with a workload of at least fifteen hours per week count.

In 2008, an average of 0.32% of the adult US population each month decided to found a business (see chart 3). The number of entrepreneurs has gone up over the last few years. However, in 2008 more businesses were founded in low and medium-income industries and fewer in high-income industries compared to 2007. This may indicate a shift towards necessity entrepreneurship in the wake of the economic recession. Since the full brunt of the crisis hit in 2009, a further increase in startup activity appears likely.<sup>8</sup>

### High-tech is more interesting

The raw KIEA covers all kinds of entrepreneurs. Yet, for the purpose of this study, we are interested mainly in startups that operate in high-technology industries as they are the most promising in terms of innovation and growth.

Only a minority of industries is considered high-technology (see box). They include advanced manufacturers, for example in aerospace, as well as sophisticated service providers such as software publishing, internet services and scientific research. Those industries employ only close to 4% of the US adult population.

Overall, the micro-data behind the KIEA contains around 700,000 observations per year. We created a new measure from these samples in that we identified all startups in a high-technology industry and tabulated them according to year and US state. This allows us to study trends and regional patterns. We also merged this data with other state variables to test empirically which characteristics help to explain such patterns.

Each month in 2006, on average 11 out of 100,000 US adults started a high-tech business – either as being self-employed or with additional employees. This translates to almost 200,000 new high-

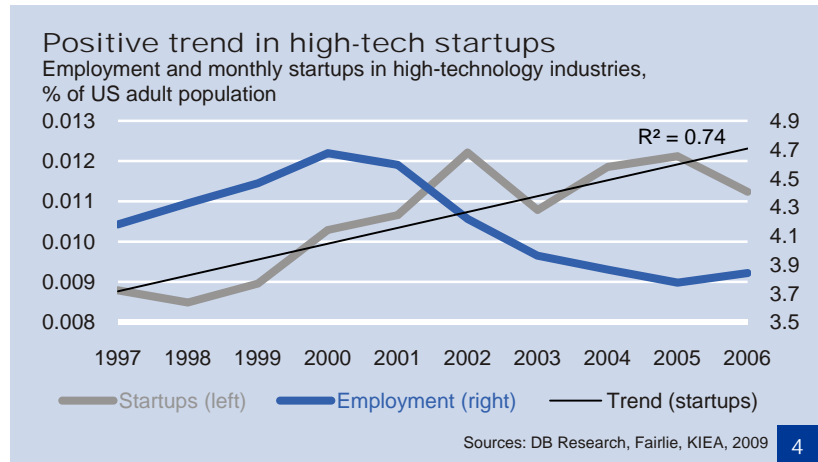
<sup>6</sup> See Meyer, Thomas (2008). *Venture Capital: Bridge between idea and innovation?* E-economics 65. Deutsche Bank Research.

<sup>7</sup> See Meyer, Thomas (2006). *Private Equity: Spice for European Economies.* Journal of Financial Transformation. Vol 18. November. pp 61-69.

<sup>8</sup> See Fairlie, Robert W. (2009). "Kauffman Index of Entrepreneurial Activity 1996-2007" Kauffman Foundation, for more details.

tech entrepreneurs over the course of this year. Moreover, the share in the adult population is on an uptrend (see chart 4).

This is not simply driven by a growing high-tech sector. On the contrary, the US employment share in high-technology industries peaked during the new-economy boom at the turn of the millennium and is now much lower. Thus, the positive trend in high-tech startups is taking place against the backdrop of a negative development in overall high-tech employment.

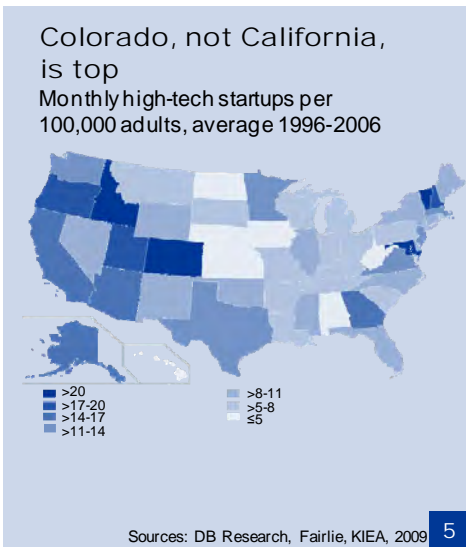


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**Strong variation across states**

There is a substantial variation across US states, with West Virginia having the lowest and Colorado having the highest rate of high-tech startups in relation to the adult population. California is in the upper quartile of states, but not at the very top of the list (see map 5).

Given its size and economic power, it is no surprise that California has the highest total number of high-technology entrepreneurs in the US. Yet, it is also a very populous state, so the rate of high-tech entrepreneurs to adult population slips from the top. That is despite the fact that two regions in California – Silicon Valley and Los Angeles/Orange County – are famous hotbeds for many of the most path-breaking startups. However, such super-fast growing ventures are the exception rather than the rule even among high-tech startups, so that their numbers do not carry too much weight.



5

**Supply of new ideas**

**Supply of new ideas meets entrepreneurship**

Which characteristics help to explain this regional pattern? Why does Colorado have so many more high-tech entrepreneurs than West Virginia? We use the special tabulation of the KIEA data and combine that with other US state-level data to empirically test a number of possible reasons.

**Empirical setup**

We divide the list of potential drivers into two main categories. Firstly, there are variables which capture the supply of new ideas. They include indicators on tertiary education (enrolment), patent applications (per million inhabitants) and overall employment in high-technology industries. The data comes from the US Department of Education, the US Patent Office, and the US Census. We expect a positive impact from these variables because high-technology supposedly thrives on knowledgeable workers and a prolific scientific community.

**Variables on entrepreneurship**

The second category includes variables on entrepreneurship. We use the overall KIEA indicator as a proxy for entrepreneurial spirit in the respective state. In addition – and to avoid relying on only one set of entrepreneurial measures – we also draw on the rate of establishment births provided by the US Census Bureau and the US Small Business Administration Office of Advocacy.<sup>9</sup> A stronger showing of entrepreneurial spirit should also boost the propensity to start a high-tech business.

**Silicon Valley receives most venture capital**

Moreover, we use the share of venture-capital investments as a percentage of state GDP as an indicator of the startup activity in the small sliver of super-promising companies. Some observers use venture capital also as a proxy for the capital supply to innovative startups. That is misleading, particularly in the US context. To see why, consider this example: California receives 50% of all US venture capital. By contrast, its neighbours Oregon (to the north) and Nevada (to the east) attract only less than 1% of VC each. It is not that venture capitalists would be inhibited from investing there – hence, there are no supply restrictions. Rather, the most promising startups flock to Silicon Valley or Los Angeles because those are good breeding grounds. This is what we want to capture with this variable.

Brave new firms  
 Dependent variable: High-technology startup rate  
 Sample: 1996-2005 (Panel OLS)

	(1)	(2)	(3)
C	-0.017	-0.019	-0.003
Venture Capital	0.488*** (0.18)	0.570*** (0.163)	0.117 (0.207)
Establishment births	0.0832** (0.033)	0.099*** (0.029)	
KIEA startup rate	0.033*** (0.006)	0.033*** (0.005)	
Patents	0.003** (0.001)	0.003*** (0.001)	0 (0.001)
Education	0.009** (0.004)	0.009*** (0.003)	-0.0001 (0.01)
Unemployment	0.0002 (0.0006)	0.0002 (0.0004)	0.001 (0.0001)
DLOG(GDP)	-0.012 (0.023)	-0.017 (0.022)	-0.004 (0.022)
Y2000	-0.0002 (0.002)	-0.0005 (0.001)	
High-tech employment*KIEA			0.803*** (0.161)
AR(1)	0.154*** (0.049)		
Fixed effects	No	No	Yes
R <sup>2</sup>	17%	16%	30%
DW	1.91	1.61	2.09
N	459	510	561

Standard errors in parentheses. Significance levels are 1%\*\*\*, 5%\*\* and 10%\*.

Source: DB Research, 2009 6

<sup>9</sup> New establishments are new firm locations with at least one employee. Hence, they do not include self-employment. New establishments must not be necessarily new firms but may also include secondary locations of incumbent enterprises. However there is a close correlation between new firms and new establishments. Moreover, new establishments may partly capture entrepreneurial change within established firms because a new establishment may be used to implement new business ideas.

**Control variables capture the business cycle**

We include a number of control variables to capture the business cycle and other influences: GDP per capita covers economic differences between the states; the unemployment rate is a proxy for the business cycle. Moreover, rising unemployment may encourage necessity-driven entrepreneurship. We also use a dummy for the year 2000 to control for exuberances during the new-economy boom. Overall the sample covers 50 US states and Washington DC for the period between 1996 and 2005. Table 6 on the previous page presents the results of three different specifications.

The results are robust to a variety of different specifications. In the first model, we included an AR(1) term to control for serial correlation. We used fixed effects to capture unobserved state-specific differences in the third model. The key findings remain largely unaffected.

***Empirical results*****Support for most hypotheses**

The empirical analysis confirms many of the proposed drivers of high-technology entrepreneurship. We find positive correlations for patent applications and education, which argues for a positive impact of the supply of new ideas and a knowledge-based economy. Moreover, all indicators measuring entrepreneurial spirit – i.e. KIEA, establishment births and venture-capital investments – correlate positively with the rate of high-tech startups. By contrast, the unemployment rate is not significant, suggesting that necessity-driven entrepreneurship plays no role in this segment.

**New ideas need entrepreneurial spirit - and vice versa**

A key conclusion that can be drawn from this exercise is that high-tech entrepreneurship thrives on the interaction between a knowledge-based economy, which creates the intellectual capacity for new ideas, and entrepreneurial spirit, which turns those ideas into successful businesses. This shows clearly in the third model which includes an interaction term between overall high-tech employment, as a proxy for the knowledge intensity, and the KIEA indicator. This interaction term has a strong positive impact. The main drive comes when a steady supply of new ideas meets entrepreneurial spirit.

Those US states excel in high-tech entrepreneurship where many new ideas emerge and where there are entrepreneurs who put those ideas to commercial use.

The major difference between the US and Europe is not so much in knowledge creation but in entrepreneurial spirit (see section 5 for more details). This raises the question of what motivates people in the US to become an entrepreneur in the first place. We follow this question in the next part.

### 3. What motivates entrepreneurship?

**Who wants to be his own boss?**

In this part, we look at the propensity of individuals to become entrepreneurs irrespective of the industry they operate in. We look not only at high-tech entrepreneurship but all kinds of startups because we are searching for more general roots of entrepreneurial spirit.

Which characteristics drive people to become their own boss? To identify such factors at the level of the individual, we analysed the micro-data behind the KIEA index. The KIEA micro-dataset contains close to 700,000 observations per year combined with demographic background information, such as gender, age, education, and

**Girls just wanna have fun**

income. We use a binary dependent variable model, a statistical method used for working with binary data (startup, yes or no?), to see which demographic characteristics help to explain the decision in favour of entrepreneurship.

**Skills and risk tolerance needed**

The key premise of this part is that the motivation for starting a business depends on skills, for they are necessary to succeed, and risk tolerance, since failure is a constant threat. Moreover, unemployment and the desire for upward mobility may motivate people to become entrepreneurs.

The level of education gives an idea of the skills an individual possesses. The gender provides some indication of the risk preference: typically, women are more risk averse than men.<sup>10</sup> Moreover, a solid family income and other assets encourage risk-taking because they provide would-be entrepreneurs with a backup if things go wrong.

Yet, we cannot expect a linear relation: Highly skilled people make good entrepreneurs but they may also earn high salaries in regular employment. By the same token, a high family income and rich assets may boost the risk tolerance but at the same time may kill the motivation to start a business in the first place.

**Results: no linear relation**

For brevity, we do not report the full results of the models here but concentrate on the most interesting findings.<sup>11</sup>

Thankfully, it is not possible to predict individual behaviour with only a handful of characteristics. People are much more complex than this. However, given a large pool of people, some patterns can be identified.

We find strong results for gender, age, education, income, employment status and homeownership. They lend support to the basic premise. Women, for instance, are much less likely to start a business, which confirms the importance of risk tolerance.

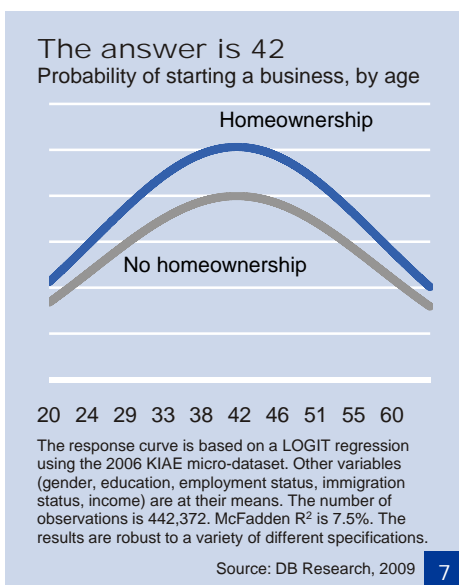
The results also show that the relations are not always linear. Tertiary education gives a boost to the propensity to start a business, but having a PhD is not correlated. Also a middle-class family income – between USD 35,000 and USD 75,000 – is associated with a larger startup probability; a higher income is not.

Age is another good illustration: risk tolerance and over-confidence, which many entrepreneurs boast, is often the domain of the young. But many skills and experience in the practicalities of life only come with age. Hence, there is a trade-off between youthful ambition and the business acumen of an old hand. In this sample, the probability of starting a business peaks at the age of 42 – controlling for other variables – and is generally higher for people who own a home (see chart 7).

Homeownership can be helpful in many respects. Firstly, the home can serve as a backup asset. Secondly, homeownership can signal a good personal credit history, which helps to secure external

**We cannot predict individual behaviour**

**Gender, education, and backup resources drive startups**

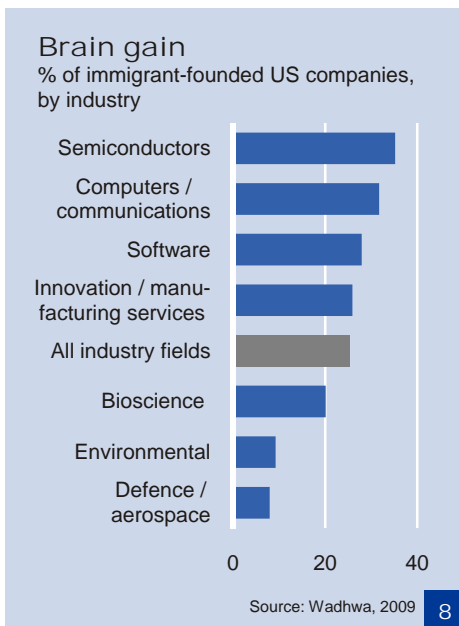


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<sup>10</sup> See also Sapienza, Paola, Luigi Zingales and Dario Maestripieri (2009). Gender differences in financial risk aversion and career choices are affected by testosterone. PNAS 2009 106:pp. 15268-15273.

<sup>11</sup> Detailed estimates are available from the author upon request.

**Unemployment may signal preparation as much as necessity**



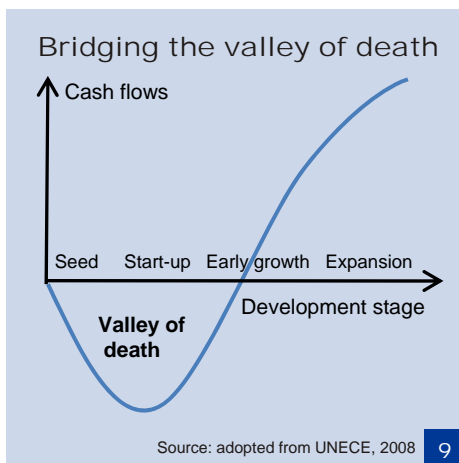
startup finance.<sup>12</sup> Thirdly, many businesses are started from home. True, those homes must not necessarily be owned by the entrepreneur, but it is arguably easier to start a business from one's own home or the home of a relative than from a rented apartment. Finally, homeowners may be more unwilling to relocate for a new job. In case of unemployment, they might prefer to start their own business rather than move to another region with better job prospects.

Lack of alternatives obviously plays a role. In our estimation, being unemployed has the strongest impact on the startup probability, suggesting that many businesses are created out of necessity.<sup>13</sup> However, that may overstate the true relation: many prospective business owners may have quit their regular jobs voluntarily in advance in order to prepare for the big step.

Even after controlling for education and the employment status, we find that immigrants are more likely to become entrepreneurs. Their role extends far beyond traditional low-end shops that only serve their own community. In fact, skilled immigrants, who have often studied and worked in the US, are the backbone of many high-technology startups, particularly in computer and IT-related industries (see chart 8). More than half of all startups in Silicon Valley's tech centres were founded by people not born in the US.<sup>14</sup>

In a nutshell, a mixture of skills, risk tolerance and desire for upward mobility motivates people to become entrepreneurs in the US. To be sure, individual decisions are more complex than that, but these characteristics are good indicators. Yet, entrepreneurship must always compete against alternatives. This means that people who can earn high salaries elsewhere or who are rich to begin with may be less motivated. Hence, the most fertile ground for entrepreneurship appears to be a well-educated and upwardly aspiring middle class – including skilled immigrants.

**4. Banks are the backbone of startup financing**



Financing a new business is difficult. During the starting period few businesses generate sufficient revenues to fund operations out of cash flows. At the same time, they often lack the creditworthiness to bridge this period with a traditional bank loan. Hence, this point in a business life cycle is often called the valley of death from which only few startups escape (see chart 9).

The conventional wisdom describes the financing of startups typically as a mixture of founder's money plus a roundup of informal investors: friends, family and fools. The most promising startups receive capital injections from business angels or venture capitalists, but that applies only to a small fraction of new businesses. Government grants and other forms of assistance also help.

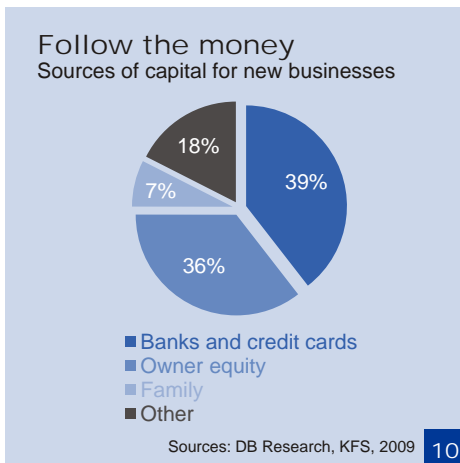
External debt is often believed to play only a minor role. According to this view, banks are reluctant to lend to new businesses for they lack collateral, a reassuring credit history, and are often considered

<sup>12</sup> Of course, exuberant mortgage lending during the run-up to the financial crisis has diluted this signal.

<sup>13</sup> In the previous part, unemployment had no effect because we only looked at high-tech entrepreneurship, which is unlikely to be necessity-driven.

<sup>14</sup> See Wadhwa, Vivek (2009). Foreign-Born Entrepreneurs: An Underestimated American Resource: Kauffman Thoughtbook 2009, pp 177-181.

**New data challenges conventional wisdom**



**Plastic money: use with caution**

**Get an outside opinion**

too risky. The high default probability would need to be covered by very high interest rates. Those cannot be charged because that would drive away the lower yielding but safer startups, making the remaining credit pool even riskier.<sup>15</sup>

However, new data challenges the traditional view. The Kauffman Firm Survey (KFS) collects data on an annual basis on a panel of almost 4,000 new businesses founded in the US in 2004 and tracks them up to 2011. Until now, results from the first four years (2004-2007) have been released and allow a unique glimpse at the financing patterns of very young firms.

Across the sample, new businesses started with a capital base of around USD 80,000 on average. Contrary to the conventional wisdom, banks and credit-card companies provided almost USD 32,000 – the biggest part of the initial capital injection. Of this amount, more than 80% comes from banks and the rest from credit-card companies. The owners themselves held about USD 28,500 as owner equity. The family contributed debt and equity worth USD 6,000 (see chart 10).<sup>16</sup>

In fact, many founders report that they used personal credit lines and credit-card limits to finance the baby steps of their new ventures. In this sense, some banks may be drawn into financing startups somewhat involuntarily. Yet, the KFS challenges this notion as well: it shows that a substantial part of the financing volume comes from loans and credit lines given directly to the businesses rather than to the person of the owner.

**Credit cards are better used temporarily**

Credit cards are an easy to get and widely accepted means of payment and finance. Hence, about 58% of startups in the KFS sample charged either personal or business credit cards to get started. That is not necessarily bad: Sergey Brin and Larry Page, for example, did it to kick off Google. Yet, research suggests that over time it is better to switch to other forms of credit.

Robert Scott (2009) analyses the KFS sample with regard to the impact of credit-card debt on the probability of survival. He finds no negative impact on chances of survival at the start of the company, but that a continuously high credit-card debt is associated with increases in the default probability.<sup>17</sup> One reason is that credit-card companies often charge high interest-rates and fees which can destabilise young businesses. But there is also a selection process. Less risky firms are able to secure other forms of credit leaving only the shakier ventures hooked on plastic money. As it appears, credit cards are a reasonable instrument to kick start the business but failure to replace them with other means of financing may indicate a higher default probability.

**If a bank says no, it probably has a reason**

Receiving capital from external investors is important. Firstly, it is the only way to leverage resources that go beyond what owners, friends

<sup>15</sup> The concept of adverse selection in credit markets was first described by Stiglitz, Joseph E. and Andrew Weiss (1981). Credit Rationing in Markets with Imperfect Information. The American Economic Review, Vol. 71, No. 3, pp. 393-410. Joseph Stiglitz, together with George Akerlof and Michael Spence, were awarded the 2001 Nobel Prize in economics for these and related insights.

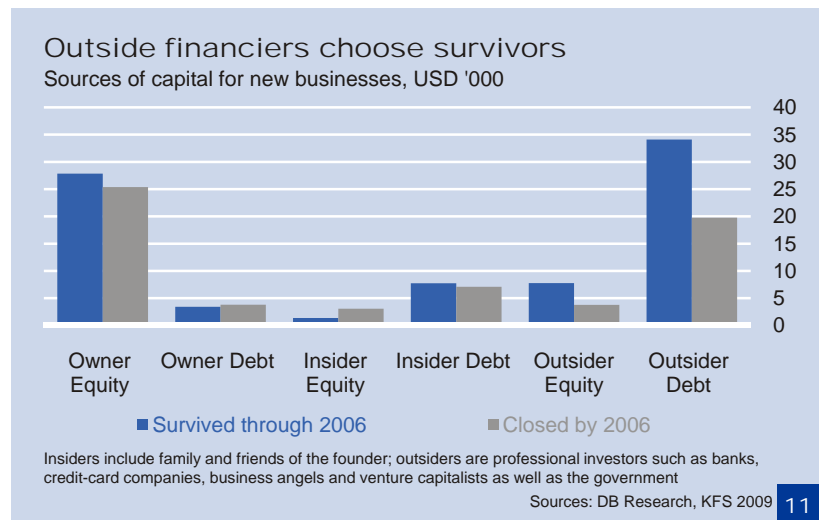
<sup>16</sup> These figures are taken from Robb, Alicia et al. (2009). An Overview of the Kauffman Firm Survey: Results from the 2004-2007 Data.

<sup>17</sup> See Scott, Robert H. III (2009). Plastic Capital: Credit Debt and New Small Business Survival. Working Paper.

and family can contribute. Those resources help to escape the valley of death. Secondly, it reflects a selection process. Entrepreneurs are often over-confident when thinking about their chances of prospering. Outside investors – banks, credit-card companies, venture capitalists etc. – are much more hard-nosed. That implies a reality-check. If an entrepreneur can convince outside investors to lend money or provide equity, then chances are that the business plan is on much more solid footing. To put it the other way round: if a bank or other outside investors say no, they probably see some serious flaw.

**Survivors have twice as much outside financing**

A look at the differences between firms that survived the first three years throughout 2006 and those that did not confirms this notion. It reveals a striking pattern (see chart 11). In a nutshell, surviving firms had on average more than twice as much outside financing and less than half as much inside equity than firms that failed. By contrast, the amounts of owner equity, owner debt and insider debt were quite similar in both groups.



This is an important point. Many policymakers smell market failure because young startups are often denied credit or equity injections. Yet, it appears that outside financiers simply shy away from business ventures with a too high default probability.

**Little help from Uncle Sam**

**Government contributes only 1.5%**

The government is arguably the outside financier with the least binding constraints. Hence, it could finance startups which other outside capital providers would avoid. However, in the KFS sample, the government contributes only 1.5% of the total initial capital injections. This money is highly concentrated in a few firms which receive on average USD 85,000 in the form of government equity stakes or government business loans. But for the overwhelming majority, public money injections play no role.

**Inside equity cannot compensate outside finance**

**Spouses give three times more equity to non-surviving firms**

Startups that did not survive did on average have a higher share of inside equity: founders' parents gave almost twice, spouses even three times more equity as compared to surviving firms. That money is needed to compensate for a lack of outside finance. Yet, it cannot make up because inside equity injects only an additional USD 1,700 on average, while outside finance is more than USD 18,000 lower compared to surviving firms. As a consequence, non-surviving firms started on average 20% smaller than surviving startups.

### Survival of the dullest

#### Survival is not everything

The previous analysis focused on the probability of survival of startup firms. But a high survival rate is not everything. From an economic point of view, an approach that maintains the highest survival rates may even be undesirable because it might weed out the most venturesome, radically innovative and out-of-the-box entrepreneurs. Such startups are often the riskiest, but the few successful can turn into the movers and shakers of the economy. Outside lenders reject the flimsy, unrealistic and misguided business plans but also those that are too extravagant, innovative, or daring to fit in a standard loan process. Both helps to keep default rates low. But while the former is helpful the latter may stifle the most innovative entrepreneurs.

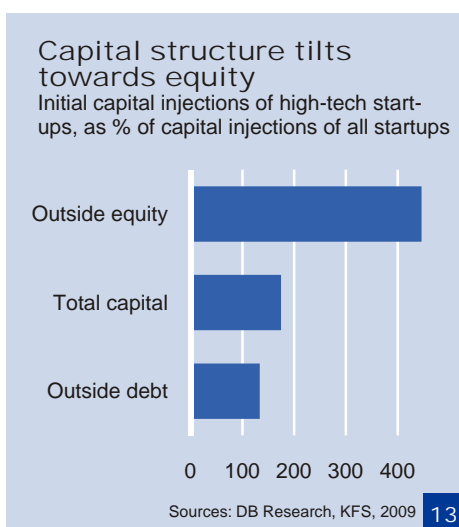
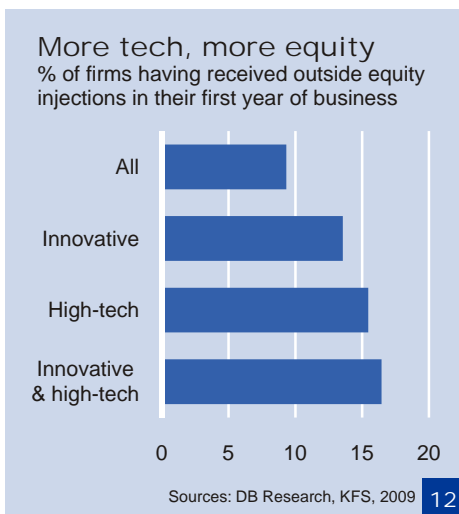
#### Innovative firms lean towards equity

Truly innovative business ventures are hard to judge for an outside financier. Innovative startups often involve highly owner-specific investments. Such investments have a high value to the original owner but little to none to anybody else. Thus they have no value as collateral. For instance, the half-baked results from early research are often inalienable from the person of the researcher and owner because nobody else could figure out what he or she has done and tie up the loose ends. Financing such an investment is an unfortunate position for outside lenders because they would have little leverage over their debtor.

Equity investors are in an easier position because ownership rights confer more control over the startup. Hence, a standard insight from finance theory: the higher the share of owner-specific investments, the more likely they will be financed by outside equity rather than debt. To test this view, we cut the KFS sample into three sub-samples: Firstly, we identified all startups that are innovative. In this context, we define innovative firms as those that filed a patent, copyright or trademark during the period 2004 to 2007. Secondly, we separated high-technology startups, meaning those firms that operate in an industry with a high average percentage of R&D employment.<sup>18</sup> Thirdly, we look at the overlap of the two sub-samples, i.e. startups that are both innovative and high-tech.

A glance at the outside equity injections for those firms corroborates the standard view: Only 9% of all firms in the KFS sample received such an injection during the first year of operations. Yet, among innovative startups this share is 14%, and even higher for high-technology firms (see chart 12).

More surprisingly, innovative or high-technology startups were also more strongly financed with outside debt. But this is more a reflection of the fact that such firms are bigger to begin with. The average high-technology firm, for instance, starts with a total financial capital of nearly USD 140,000 compared to around USD 80,000 in the overall sample. Although high-technology startups take on more outside debt, the capital structure clearly tilts towards outside equity. While a typical high-tech startup received one-third more outside debt than the average startup, it got even more than four times as much outside equity (see chart 13).



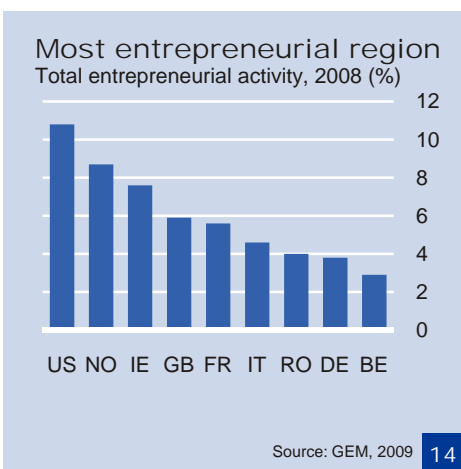
<sup>18</sup> These industries, based on the Standard Industrialization Classification (SIC), are: chemicals and allied products, industrial machinery and equipment, electrical and electronic equipment, and instruments and related products.

### Venture capital plays a large role for few firms

External equity providers, including angel investors and venture capitalists, only play a minor role in financing the average startup from the inception. But that is because such investors do not address the average startup but aim for the very top. Only 26 firms in the KFS sample received an initial capital injection by venture capitalists, but the average investment exceeded USD 350,000 in the first year.

Venture capital is typically disbursed in various financing rounds. To get another round, the target company has to meet certain milestones – e.g. delivering a working prototype, having sales above a certain threshold etc.

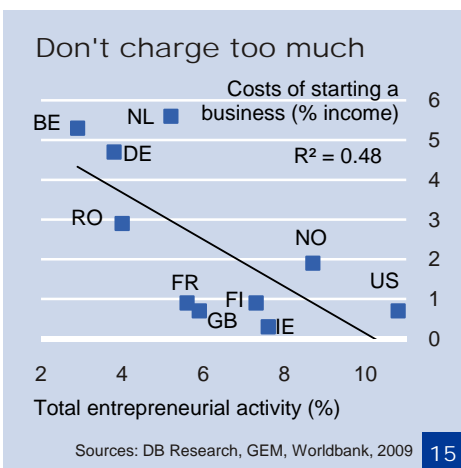
Last year, venture capitalists invested more than USD 28 bn in the US but less than USD 10 bn in Europe. The investments are highly concentrated in Silicon Valley (39% of all US VC), New England (12%), Los Angeles County (7%) and the New York Metropolitan Area (7%). Most investee companies have a background in ICT or biotechnology. Moreover, US venture capitalists typically invest more in each company than their European counterparts, leaving smaller allocations to business angels. According to the Center of Venture Research, angel investors injected almost USD 20 bn in 2008 – down 26% yoy due to the financial crisis – in more than 55,000 US startups. European angel investments amounted to only a quarter of the US activity.



### 5. What can Europe learn?

The US rate of nascent and early business owners (TEA) tops that of any European country (see chart 14). The IT revolution has produced a number of new, globally dominant high-tech firms, but most come from the US. Why is there no European equivalent to, say, Google, and what could Europe do to get it?

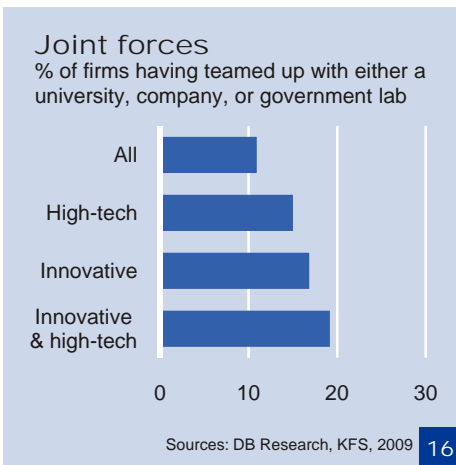
It is not that Europe lags behind in all respects. On the contrary, many European countries have more patent applications than the US, suggesting that knowledge creation is not a key problem. By the same token, Great Britain, Sweden and Denmark even have a higher share of venture-capital investments (as a percentage of GDP) than the US. Furthermore, few Europeans shy away from starting a business for fear of losing health insurance. Europe does have a knowledge based economy and it does have many business founders, but it is not as good as the US in bringing the two together.



The US scores with more business friendly regulation: for instance, it takes fewer days to register a company than in any European country, as evidence from the World Bank's Doing Business database shows. By the same token, the costs of starting a business are often higher in Europe than in the US and that appears to discourage potential startups (see chart 15).

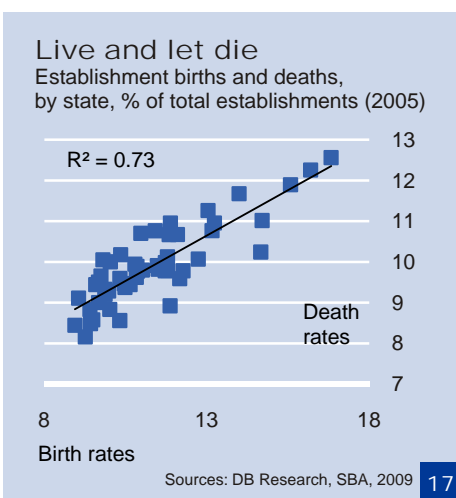
The treatment in case of failure is often more forgiving in the US than in Europe. This encourages risk-taking among the would-be entrepreneurs. A smaller tax burden also increases the reward to successful entrepreneurs.

Knowledge transfer between firms and universities plays a big role in the US. In fact, almost 20% of innovative high-technology startups in the KFS survey say that they derive a competitive advantage from



teaming up with a university, another firm or a government research centre (see chart 16).

The preferred partner is in most cases another firm. This highlights the importance of regional clusters such as Silicon Valley and the Greater Boston Area. Universities come second, yet that may understate the full impact of university research. After all, many high-tech startups that are founded out of academia might not maintain formal links to their alma mater henceforth. Research at American universities is often geared towards commercial application. Business incubators encourage students and professors to bring new research from the laboratories to the market. Government research only plays a minor role for most startups. Less than 1% of all, and only around 4% of innovative high-tech startups derive a competitive advantage from teaming up with Uncle Sam.

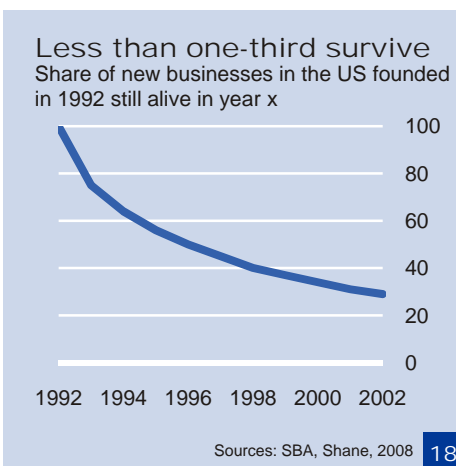


Talented immigrants often possess both, the motivation to climb the social ladder and the skills to succeed as an entrepreneur. They are the backbone of many high-tech startups in Silicon Valley, particularly in computer and software-related businesses. Europe should open its doors and welcome talented immigrants as well. In fact, it must not only allow immigration, it should actively compete for the best minds.

### No bed of roses

Entrepreneurial spirit comes at a price: failure rates among innovative entrepreneurs are high; jobs in new and small firms are often more precarious and incumbent enterprises may perish under the pressure from swashbuckling startups.

Most new businesses start small. Besides lower job security, employees of young and small startups face further disadvantages, too. For instance, small firms pay lower wages than big ones.<sup>19</sup> They also offer fewer benefits on average: only a quarter of the youngest and smallest firms in the US sponsor health plans, for instance, but almost all of the bigger companies do.

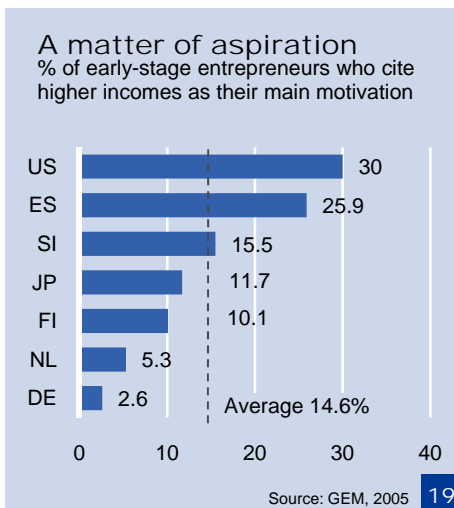


Birth and death rates of establishments are highly correlated across industries and regions in the US (see chart 17) suggesting that an increase in entrepreneurial activity (more births) also means more business closures. Founding a new firm is an inherently risky venture. Typically, less than 30% of the startups in the United States survive to see their 10th anniversary, with the first years being the most dangerous ones (see chart 18).<sup>20</sup>

With each failure, jobs are lost and business equipment is put out of use. True, sacked employees will find new jobs and other businesses will buy the equipment, but that is not a seamless process. While an entrepreneurial economy is better on balance, it is important not to ignore the fact that more dynamism results in less of the stability that many Europeans crave.

<sup>19</sup> A study by Kenneth Troske shows that the wage differences cannot be explained simply by the fact that bigger firms employ higher skilled people. See Troske, Kenneth R. (1999). Evidence on the Employer Size-Wage Premium from Worker-Establishment Matched Data. *The Review of Economics and Statistics*. 81 (1), pp. 15-26.

<sup>20</sup> Survival rates are remarkably stable irrespective of the founding year. See for instance Stangler, Dane (2009). *The economic future just happened*. Kauffman Foundation.



## Get rich or die trying

Helping entrepreneurs is not the same as helping small companies. True, most entrepreneurs start small. But some of them, such as Google, transform into big business. In the US, this transformation succeeds more often, particularly in high-technology industries. Motivation plays a big role: in fact, more entrepreneurs than in any other country say that they start a business to make more money (see chart 19).

The somewhat muted aspirations in Europe also show in the capital allocations towards promising startups. European firms get on average a much smaller venture-capital injection than US startups. But it is difficult to nurture and develop future super-star companies without providing the financial resources and the ambitions that go with them.

In the US, there is an attitude to “think big” even when it comes to small startups. This has delivered some smashing hits. Google received USD 25 m in venture capital very early in its business history. Of course, it also leverages risks in case things go wrong.

European policy has much to do: it could start by making regulation more business friendly, reforming immigration and encouraging universities to gear research also towards commercial application. There are also fields where activity could do more harm than good. More public money for startups is such an idea. Experiences from the US show that the government only has a small role in teaming up with or providing capital to innovative startups. Professional outside investors are often better suited to distinguish the promising from the flimsy ventures. There is a danger that those investors would be crowded out by too much public money.

## 6. Conclusions and outlook

### Nobody knows what comes next

What will be the next big thing? Another media revolution? Electric cars? Biotechnology? Nobody really knows, and it is quite likely that the next big thing will be something completely different from what we imagine today. It is the entrepreneurs, who thrive in such an environment because they try, fail and eventually succeed in finding a business application.

Over the last decade, the share of high-tech entrepreneurs in the US adult population has trended upwards. In 2006, more than 200,000 high-tech businesses were founded. This is a good sign.

### New ideas and entrepreneurship needed

Looking at differences between US states, we find that high-tech entrepreneurship thrives where many new ideas emerge and where there are entrepreneurs who bring those ideas to the market.

### Skills, resources and aspiration

The key difference between the US and Europe is not so much in knowledge creation but in entrepreneurial spirit. This raises the question of what motivates people in the US to become entrepreneurs in the first place. An analysis of close to 700,000 individuals in the US shows that skills, risk-tolerance and aspiration to climb the social ladder motivate many prospective entrepreneurs. Such characteristics are typically found in the middle class: education provides skills, back-up resources encourage risk-taking and there is potential and desire for upward mobility. This combination of traits is often found among well-educated immigrants who are behind many high-tech startups, particularly in IT and software.

Access to external investors is a major challenge for any new business. Firms that secure external financing have on average a lower default probability because they have passed a quality check and can draw on richer resources. Banks and credit-card companies are the biggest source of capital for startups – contrary to widely held beliefs. Yet, the capital structure tilts towards equity among high-tech or innovative firms.

Business angels and venture capitalists finance the small sliver of most promising startups. While fewer firms in the US receive venture capital than in Europe, the average disbursements to each US firm are substantially higher. This underlines the bolder, more growth-oriented approach many US investors and entrepreneurs follow. It also helps to explain why US startups more often than European ones have the chance to rise to the top of the corporate landscape.

### **Global research helps US**

Demand for high-tech entrepreneurship is likely to increase in the future. With millions of engineers in countries such as China or India, the production of new ideas and research will globalise. But the US economy excels in the creativity, audacity and pragmatism that is needed to seize the opportunities that arise from global research and to turn them into successful ventures.

### **Financial crisis underscores case for entrepreneurship**

If anything, the recent financial crisis and economic recession underscores the case for entrepreneurship. Innovative startups may even thrive during turbulent times because otherwise almighty incumbents are in tatters. It is no accident that well over half of the current *Fortune 500* companies began during a bear market. It is this ability to re-invent itself that will help the US to master the crisis and secure its position as a high-technology powerhouse.

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