



Venture capital adds economic spice

September 14, 2010

- **Venture capital injects economic dynamism: An increase in VC investments of 0.1% of GDP is statistically associated with an increase in real GDP growth of 0.30 pp. Early-stage investments have an even bigger impact of 0.96 pp.**
- **The direction of causality is not always easy to establish. Yet, tests for Granger-causality in the biggest market, the US, suggest that causality runs from VC-investments to growth. There is also substantial micro-evidence that supports this view.**
- **Exuberances drive much of the correlation. Taking account of the dotcom boom and bust as well as of the financial crisis leads to lower coefficients.**

Venture capital (VC) is an important professional source of financing for innovative startups. It backs some of the most interesting and daring business ventures. The importance of young innovative firms is undisputed. They are often first to embrace new technologies and to turn them into commercially successful products. It is no coincidence that many of today's leading IT and internet firms have been financed by venture capitalists. Currently, a number of VC funds invest in a list of innovative cleantech startups – one VC-backed startup, for instance, has been quicker to put an electric sports car on the road than most established auto makers.

Besides money, venture capitalists help with practical management know-how, business networks and sales expertise. The backing of a well-known VC fund is also a powerful endorsement that helps to sway business partners and attracts employees. The downside, in the view of many entrepreneurs, is the loss of control (the venture capitalists get a powerful voice) and a much stronger focus on implementation and profits.

By backing innovative startups, a vibrant VC market boosts aggregate productivity and thus economic growth. This is one of our previous results which were published first in 2006 in the *Journal of Financial Transformation* and refined later. In this Research Briefing, we will revisit some of these older estimates to see how they have stood the test of time. In particular, we are interested in how the investment period in the run-up to the financial and economic crisis and the crisis itself have affected the relation between VC and growth. Moreover, we draw on recent samples of the growing body of economic literature related to VC for supporting evidence.

VC investments in boom and bust

VC is a niche instrument that finances only a small sliver of most promising startups. In the US, typically 3.000 to 4.000 deals happen each year which covers only a tiny fraction of the overall startup activity. In 2009, US venture capitalists invested USD 18 bn; their European counterparts EUR 4 bn.

Investment volumes fluctuate widely by region and across time. They peaked during the dotcom boom at the turn of the millennium and crashed after the new economy fell from grace. Since then, investments recovered somewhat

www.
dbresearch.com

Author

Thomas Meyer
+49 69 910-46830
thomas-d.meyer@db.com

Editor

Antje Stobbe

Technical Assistant

Angelika Greiner

Deutsche Bank Research
Frankfurt am Main
Germany

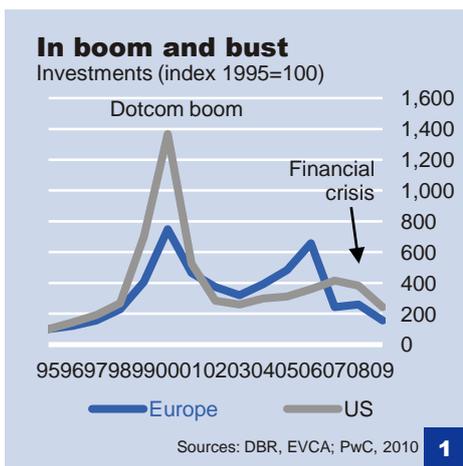
Internet: www.dbresearch.com

E-mail: marketing.dbr@db.com

Fax: +49 69 910-31877

Managing Director

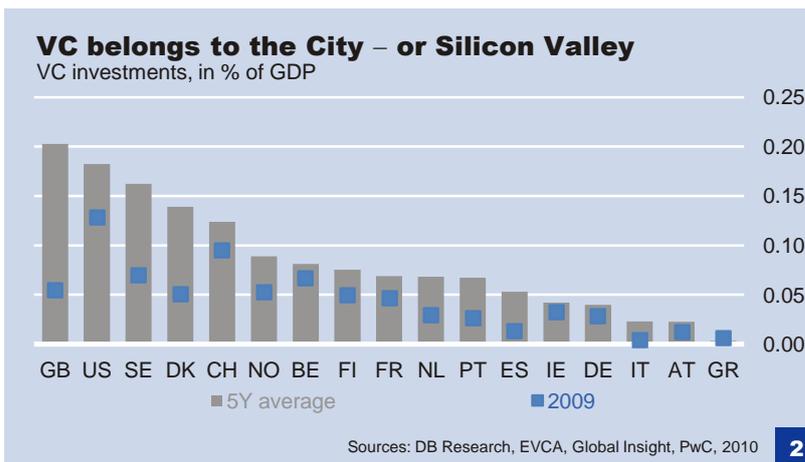
Thomas Mayer



1

until the recent financial crisis eroded confidence and slashed investment volumes once again (see chart 1). Silicon Valley is still the centre of VC activity worldwide: it represents almost 40% of all US investments and accounts for more investments than Europe as a whole (see box).

The UK has traditionally been a prominent residence for VC funds (the City of London being their prime habitat): VC investments have averaged around 0.2% of GDP over the last five years.¹ The US comes close. The Nordic countries and Switzerland also have substantial VC markets. Germany and Austria rank far behind (see chart 2).



2

VC activity worldwide

VC investments, 2009 (EUR bn)

United States	13 (USD 18 bn)
– Silicon Valley	5 (USD 7 bn)
Europe	4
– Germany	0.7

The financial crisis resulted in investment volumes being slashed by 20 to 83% in 2009 compared to the 5-year average. Particularly hard-hit were Italy (-83%), Spain (-74%) and the UK (-73%). US volumes declined by 30%; Switzerland held up relatively well (-23%). All this variation across time and across countries can be used statistically to test whether a large VC market actually has any economic benefits – and if so, how large they may be.

Venture capital boosts growth

The estimates presented in this Research Briefing are basically a re-run of previous models with new data. Please refer to Meyer (2006a, 2006b, 2008) for a more thorough description of the model specifications and the reasons for choosing them.²

The sample in this paper covers 15 countries (14 from Europe + the US) over the period 1989 to 2009. The dependent variable is real GDP growth; the explaining variables are VC investments (in relation to GDP) as well as a list of control variables that capture broader macro-economic trends: GDP per capita controls for β -convergence; the change in major national stock-market indices and the unemployment rate represent the business performance of established companies. In some specifications, we also include

¹ It is important to note that the European data used here allocates the investment volumes according to the country of residence of the VC fund (industry data) and not necessarily the country of investment (market data). While market data would be preferable because it would better reflect the economic impact of VC, EVCA has only begun to provide market data for the last few years. This is too short a period for our time series analysis.

² Meyer, Thomas (2006a). Private Equity: Spice for European Economies. *Journal of Financial Transformation*. Vol 18. November. pp 61-69; Meyer, Thomas (2006b). Venture capital in Europe: Spice for European Economies. *E-economics* 60. DB Research; and Meyer, Thomas (2008). Venture Capital: Bridge between idea and innovation? *E-economics* 65. DB-Research.



dummies for the year 2000 (dotcom boom) and 2009 (financial crisis) as well as fixed effects which control for country-specific differences.

In most specifications, we find a robust, positive correlation between VC investments and real economic growth. Investments at an early stage of the business venture (seed and startup investments) have an even bigger impact on growth. Much of the correlation is driven by the exuberances of the dotcom bubble and the crash in conjunction with the financial crisis. Using both fixed effects and dummies for 2000 and 2009 thus eliminates much of the variance in VC investments and leads to weaker, even insignificant results.

Killing noise, not signal

For our purposes, it may be more appropriate to use a specification without fixed effects and without a year 2000 dummy as they may kill more signal than noise (see bold columns in table below). All countries in the sample are drawn from a relatively homogeneous pool of rich western economies. This reduces the need for fixed effects because many characteristics are similar. Outliers such as Greece, which is much poorer than the average, are taken into account by controlling for GDP per capita. A more difficult question is whether to include a dummy for the year 2000. The dotcom boom clearly proved unsustainable but it was not an exogenously driven aberration. In fact, a recent paper argues that exuberances in VC investments are somewhat instrumental in getting extremely novel technologies to the market because a “hot” VC market reduces the risk of finding follow-up financing.³

New results corroborate previous models

According to these specifications, an increase in VC investments of 0.1% of GDP is statistically associated with an increase in real GDP growth of 0.30 pp. A similar increase in seed and startup investments is associated with an increase of as much as 0.96 pp. Using a dummy for the year 2000 leads to coefficients roughly half as big (see table below for details). The results are in the same ballpark as our previous estimates thus adding to the confidence in this relation.⁴

Coefficients most likely underrate effect

It is important to note that the measured coefficients most likely underestimate the full extent of the correlation because they only take into account contemporaneous effects but not long-running consequences. Using lagged variables could help capture longer-running effects but the more time passes, the harder it becomes to tell signal from noise. There are typically too many other factors bearing in on growth as to get statistically meaningful results over longer periods.

Which way runs causality?

So far, the correlation describes a co-movement of VC investments and real economic growth. As in all investment decisions, causality usually runs in both directions. A buoyant economy with strong growth rates also encourages investors to take risks and it is easier for new technologies to gain traction. This boosts VC investments. Yet, VC helps innovative startups to bring new technologies to the market and (indirectly) prevents incumbents from becoming too complacent. This boosts growth. All in all, there is evidence that the more relevant and interesting relation runs from VC to growth:

³ See Nanda, Ramada and Matthew Rhodes-Kropf (2010). Financing Risk and Bubbles of Innovation. Harvard Business School Working Paper 11-013.

⁴ The original coefficients in the 2006a paper were 0.37 (venture capital) and 0.81 (early stage), respectively.

Venture capital: Spice for economic performance

Dependent variable: Real GDP growth

Sample: 14 European countries and the US; 1989-2009

Method: GLS

Standard errors in parantheses (White heteroskedasticity-consistent)

C	4.370	1.828	1.917	4.252	1.795	1,856
Seed+startup	0.389** (0.199)	0.457** (0.193)	0.960*** (0.374)			
Venture Capital				0.085 (2.916)	0.145** (0.060)	0.302*** (0.088)
GDP per capita	-0.041 (0.075)	-0.005 (0.012)	0.002 (0.013)	-0.037 (0.076)	0.006 (0.012)	0.003 (0.012)
Unemployment rate	-0.076 (0.048)	0.026 (0.044)	0.020 (0.045)	-0.077 (0.049)	0.026 (0.043)	0.020 (0.044)
Stock-market performance	0.020*** (0.003)	0.018*** (0.004)	0.015*** (0.005)	0.020*** (0.003)	0.018*** (0.004)	0.015*** (0.005)
AR(1)	0.195	0.393	0.379	0.193	0.389	0.376
Y2000	1.752***	1.577***	–	1.812***	1.578***	–
Y2009	-6.369***	-6.313***	-6.196***	-6.349***	-6.270***	-6.102***
Fixed effects	Yes	No	No	Yes	No	No
DW	1.730	1.711	1.777	1.730	1.710	1.773
R ²	0.76	0.68	0.65	0.76	0.68	0.65
N	229	229	229	229	229	229

Countries in the sample are: Austria, Belgium, Germany, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Norway, Portugal, Sweden, the UK and the United States of America

Significance levels: ***1%, **5%, *10%

VC investments Granger-cause growth in the US

- Countries with high VC activity typically have stronger economic growth. The opposite is not true: not all high-growth countries have a vibrant VC market.
- Tests for Granger-causality, a statistical tool to establish the direction of causality, indicate that VC investments in the US Granger-cause real GDP growth. Since the US is host to the most developed and mature VC market, this is a highly representative finding.
- Evidence from US states shows that VC investments have a positive impact on hightech startup activity. This micro-economic evidence illustrates the workings of VC.⁵

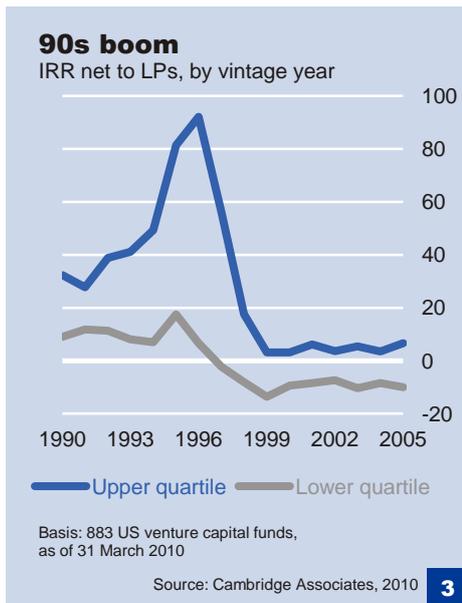
How to create a vibrant VC market?

Following the notion that a vibrant VC market boosts technological progress and economic growth, the next question is clear: how can this be achieved? Why is e.g. the German VC market so much smaller than its US, British or Nordic counterparts and what can be done about it? A full policy analysis is beyond the scope of this brief note, but a quick tour of the four most relevant policy arenas is in order:

Investors (Limited Partners): High returns necessary

The return on VC depends very much on timing and the quality of the partnership management. US data illustrates the big differences between VC returns by quality (lower quartile funds founded during the last decade never made it out of the red) and over time: stellar

⁵ See Meyer, Thomas (2009). Brave new firms: Hightech entrepreneurship in the United States. E-economics 75. DB Research.



3

returns during the 1990s had originally fuelled the boom (see chart 3). Lacklustre results ever since have also muted investors' (LPs) interest in VC.

Many European VC funds in particular bemoan the lack of fund-raising. Potential LPs are often unimpressed with the average returns and do not have access to the top-performing funds. Moreover, the pool of potential LPs is often smaller (there are, for instance, fewer pension funds in countries with pay-as-you-go systems) and overall familiarity with VC as an asset class is lower.

Special investment vehicles, such as funds-of-funds, offer easier and more liquid access to this asset class. They can often invest in the best VC funds for they are among the most sophisticated and senior LPs. Yet, they also add another layer of management fees.

VC funds (General Partners, GPs): Difficult to scale

Professional fund management is obviously critical in selecting and nurturing promising startups. Fund performance is usually persistent which means that a high-quality VC partnership delivers superior returns in a number of subsequent funds.⁶ During booms, lower quality VC partnerships tend to join the fray and dilute overall performance.

Moreover, the market can only digest so much government-sponsored VC: a moderate amount of government-sponsored VC per investment tends to improve the performance of portfolio companies whereas a high amount tends to weaken performance.⁷ This illustrates how difficult it is to scale up VC operations and shows the limits of government activism.

Deal flow: Entrepreneurial spirit needed

Obviously, successful ventures need both money and entrepreneurs. Without a steady supply of high-quality business ideas, there is little even the best GP could do. The entrepreneurial environment plays a big role: in a survey, 72% of German GPs and LPs bemoan a lack of entrepreneurial talent (the biggest hurdle on par with taxes). In the US that figure stands at only 6% (see chart 4).⁸

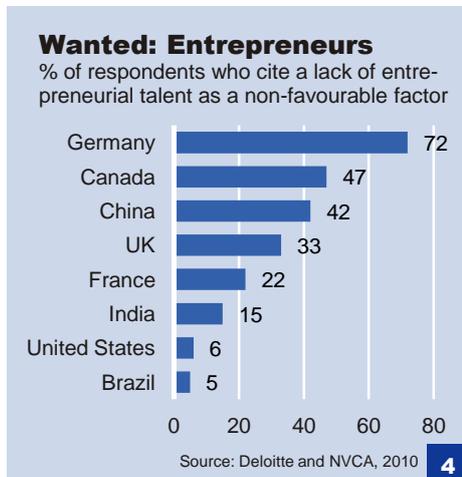
Particularly in Europe, lack of entrepreneurial zeal is a limiting factor.

Venture capitalists often need a convincing investment story. During the 1990s, the internet and telecommunications industries attracted most VC whereas the focus has shifted towards biotechnology, cleantech, and medical equipment over the last few years. Yet, investment fashions also bear the risk of over-investment in certain industries or at certain points in time (as seen during the dotcom boom).

Regulatory environment: Strike lightly

Public policies establish the playing field: they further or hinder VC activity on many levels:

- Entrepreneurship-friendly regulation (such as low taxes, little red tape, protection of property rights, a reasonable bankruptcy law) lowers entry barriers. High costs of starting a business, for instance, are a drag on entrepreneurial activity.



4

⁶ See for instance Kaplan, Steve and Antoinette Schoar (2005). Private Equity Performance: Returns, Persistence and Capital Flows. *Journal of Finance*. Vol. IX, No. 4.

⁷ See Brander, James; Qianqian Du and Thomas Hellmann (2010). The Effects of Government-Sponsored Venture Capital: International Evidence.

⁸ Deloitte and NVCA (2010). Results from the 2010 Global Venture Capital Survey

- A liberal immigration policy designed to attract the best talents from all over the world can spark entrepreneurial activity. Many founders of hightech startups in the US were born abroad.
- Research and technology policies: a high level of education and strong technological capabilities are the foundations on which the most interesting startups thrive. Co-operation with academic institutions are important sources of knowledge transfer.
- The tax and legal framework governing VC activity itself is a somewhat contentious issue – not least the new AIFM directive (for an industry perspective, see the statements by EVCA). Some rules appear to be geared towards bigger buyout or hedge funds and put disproportionate burdens on smaller VC funds.

Signs of recovery

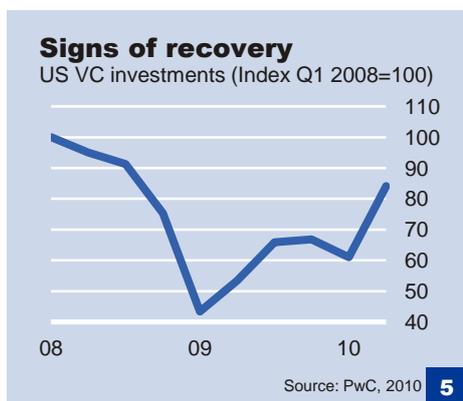
VC shows signs of recovery. Short-term returns have improved and investment volumes have increased to almost pre-crisis levels in the US (see chart 5). This is a good development because the analysis presented in this brief note supports the notion that a vibrant VC market is conducive to technological progress and thus growth.

This is not only a macro-economic issue but also of concern to the financial industry at large and banks in particular:

- VC funds and related products (e.g. fund-of-funds) demonstrate the usefulness of certain financial innovations.
- Banks provide a large part of overall startup money in the form of loans. Thus they benefit from a thriving startup environment.
- Successful ventures fill the IPO pipeline.
- New financial players or service providers emerge from VC-backed startups (think of P2P lending platforms), bringing new ideas and competition to the market.

The social returns on VC investments may exceed private returns to LPs and GPs combined which warrants public interest in this field. Yet, jump-starting a VC market can prove difficult and time-consuming because it can only work if a number of accompanying factors (entrepreneurial culture, regulation, investors, etc.) play along. The fact that Silicon Valley is still the global hotspot of VC activity (although silicon has given way to other sectors as the primary investment focus) points to the existence of idiosyncratic factors that are hard to replicate. Government activity must strike a careful balance between nurturing an emerging VC environment and crowding out too much private activity (e.g. by diluting performance).

Thomas Meyer (+49 69 910-46830, thomas-d.meyer@db.com)



5

© Copyright 2010. Deutsche Bank AG, DB Research, D-60262 Frankfurt am Main, Germany. All rights reserved. When quoting please cite "Deutsche Bank Research".

The above information does not constitute the provision of investment, legal or tax advice. Any views expressed reflect the current views of the author, which do not necessarily correspond to the opinions of Deutsche Bank AG or its affiliates. Opinions expressed may change without notice. Opinions expressed may differ from views set out in other documents, including research, published by Deutsche Bank. The above information is provided for informational purposes only and without any obligation, whether contractual or otherwise. No warranty or representation is made as to the correctness, completeness and accuracy of the information given or the assessments made.

In Germany this information is approved and/or communicated by Deutsche Bank AG Frankfurt, authorised by Bundesanstalt für Finanzdienstleistungsaufsicht. In the United Kingdom this information is approved and/or communicated by Deutsche Bank AG London, a member of the London Stock Exchange regulated by the Financial Services Authority for the conduct of investment business in the UK. This information is distributed in Hong Kong by Deutsche Bank AG, Hong Kong Branch, in Korea by Deutsche Securities Korea Co. and in Singapore by Deutsche Bank AG, Singapore Branch. In Japan this information is approved and/or distributed by Deutsche Securities Limited, Tokyo Branch. In Australia, retail clients should obtain a copy of a Product Disclosure Statement (PDS) relating to any financial product referred to in this report and consider the PDS before making any decision about whether to acquire the product.