



# Schumpeterian Entrepreneurship in Europe Compared to Other Industrialized Regions

Magnus Henrekson, Tino Sanandaji

**Document Identifier**

D2.6 Superentrepreneurship in Asia, Europe and the US

**Version**

1.0

**Date Due**

M18

**Submission date**

30 November 2016

**WorkPackage**

2

**Lead Beneficiary**

IFN



Grant Agreement Number 649378

## Change log

Version	Date	Amended by	Changes
<b>0.1</b>	26 October 2016	Magnus Henrekson	First version submitted
<b>0.2</b>	3 November 2016	Mark Sanders	Comments - Internal review procedure
<b>0.3</b>	4 November 2016	Luca Grilli	Comments - Internal review procedure
<b>1.0</b>	28 November 2016	Magnus Henrekson	Final version for submission

## Partners involved

Number	Partner name	People involved
<b>1</b>	Utrecht University	Mark Sanders (internal review)
<b>6</b>	Politecnico di Milano	Luca Grilli (internal review)
<b>8</b>	The Research Institute of Industrial Economics	Magnus Henrekson, Tino Sanandaji (authors)

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# Schumpeterian Entrepreneurship in Europe Compared to Other Industrialized Regions\*

Magnus Henrekson and Tino Sanandaji

November 24, 2016

*Abstract:* The purpose of this study is to explore whether Europe has an “entrepreneurship deficit” compared to other industrialized regions. Cross-country comparisons are difficult due to the lack of standard empirical definitions of entrepreneurship. Measures focusing on small business activity, self-employment and startup rates suggest that Europe has higher rates of entrepreneurship than the United States. However, most business activity is not entrepreneurial in the Schumpeterian sense. Comparisons of rates of small business activity and self-employment are therefore not sufficient to measure potential differences in Schumpeterian entrepreneurship.

We rely on empirical measures that more closely tallies Schumpeterian entrepreneurship. Our main measure is self-made dollar billionaires per capita identified from the *Forbes Magazine* annual list, and who earned their wealth by creating new firms. We identify 1,738 billionaire entrepreneurs in close to seventy countries during the 1996–2015 period. We also compare venture capital investment as a share of the economy, the number of successful unicorn startups and the number of top global firms founded since 1990. Western Europe is shown to underperform in these measures of high-impact entrepreneurship. The “entrepreneurship deficit” is even larger once we take into account Europe’s advantages in terms of high average income and strong performance in technological innovation. Potential institutional causes for the entrepreneurship deficit are discussed and some policy conclusions are drawn.

*JEL* Codes: L5; M13; O31; P14

*Keywords:* Billionaire entrepreneurs; Entrepreneurship; Innovation; Institutions; Regulation; Self-employment

<sup>1</sup>Research Institute of Industrial Economics (IFN)  
Box 55665  
SE-102 15 Stockholm  
Phone: +46-8-665 45 00  
Fax: +46-8-665 45 99  
e-mail: [magnus.henrekson@ifn.se](mailto:magnus.henrekson@ifn.se)  
[tino.sanandaji@hhs.se](mailto:tino.sanandaji@hhs.se)

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\* This study was written as part of the project Financial and Institutional Reforms for an Entrepreneurial Society (FIRES) that has received funding from the EU’s Horizon 2020 research and innovation programme under grant agreement No. 649378. We also gratefully acknowledge financial support from the Jan Wallander and Tom Hedelius Foundation and from the Marianne and Marcus Wallenberg Foundation. We thank Mark Sanders, Michael Fritsch and Andrea Hermann for useful comments and suggestions.

## 1. Introduction

It is sometimes argued that Europe suffers from an “entrepreneurship deficit”, especially compared to the United States. Concerns about European underperformance are common in the public debate and have been observed in academic studies (Audretsch 2002; Grilo and Thurik 2005; Cincera and Veugelers 2013). The attention paid to this topic reflects the belief that entrepreneurs play a disproportionate role in the economy. The European Commission (2013, p. 1) has, for example, declared a vision to “unleash Europe’s entrepreneurial potential, to remove existing obstacles and to revolutionize the culture of entrepreneurship in Europe. It aims to ease the creation of new businesses and to create a more supportive environment for existing entrepreneurs to thrive and grow.”

Despite the attention to this issue, there is neither agreement on Europe’s entrepreneurship deficit nor on how the rate of entrepreneurship can be boosted. A common counterargument is to point to the fact that Europe in fact has higher rates of small business activity, self-employment and firm creation than the United States and other industrialized regions. There is of course substantial variation also within Europe. Most policy and institutional factors affect conditions at the country level, which makes nations the ultimate focus of entrepreneurship policy. However, it is also interesting to compare broader regions such as Western Europe and East Asia. One practical reason is that some types of high-performance entrepreneurship are rare and thus better analyzed when aggregating smaller countries. Comparing regions also highlights the variation that may exist between Europe and the United States rather than within Europe.

Schmitt and Lane (2009, p. 1) write: “An important part of our national identity is built around the idea that – thanks to low taxes, limited regulation, unfettered labor markets, and a national spirit of entrepreneurship – the United States offers an environment for small business that is unmatched anywhere else in the world. The international economic data, however, tell a different story about the state of the U.S. small business sector. By every measure of small-business employment, the United States has among the world’s smallest small-business sectors.” European countries such as Portugal, Greece, Italy, France, Germany and Spain are higher in the various metrics of small business activity. The authors also point to the fact that the United States has a smaller share of the workforce employed in small firms (< 20 employees) than in virtually all other comparable countries.

In an article in *The Atlantic* Weissmans (2012, p. 1) similarly writes that “startups and young small businesses play a smaller role in America’s economy than in many other rich nations.” He further cites the enterprise birth rate to argue that European countries such as Sweden, Spain and Italy have higher rates of entrepreneurship than the United States. Even when disparities in high-tech startups are acknowledged, there is little agreement on the cause and policy conclusions.

The purpose of our study is to compare European countries with other regions using metrics that better approximate the Schumpeterian definition of entrepreneurship, that is to say innovative venture creation. Building on previous papers, we utilize measures of Schumpeterian entrepreneurship – i.e., the prevalence of innovative firms with a high impact on the overall economy – to compare the rate of entrepreneurship across countries and regions.

The focus is on quantifying and more precisely defining entrepreneurship in order to improve cross-country comparisons and facilitate policy analyses of how Europe can reduce its entrepreneurship deficit. The Schumpeterian approach makes it clear that there is indeed a significant entrepreneurship deficit in most western European countries. The deficit is even larger once we take into account that these are prosperous and knowledge-intensive countries.

The paper is organized as follows. Section 2 discusses the definition of entrepreneurship and how it should be measured. Section 3 surveys and evaluates previous evidence on the determinants of cross-country variation in entrepreneurship. Section 4 describes the method used to collect the data. In section 4, we present our own measures of Schumpeterian entrepreneurship and survey previous results based on these measures. a theoretical framework that can be used to understand the fundamental difference between self-employment and entrepreneurship. In section 5 we present and discuss our empirical results, and in the concluding section we discuss the implications of our study for European entrepreneurship policy. .

## 2. Defining entrepreneurship: theoretical and empirical considerations

The attention afforded to entrepreneurship is rooted in historical experience. Each wave of innovation has been associated with entrepreneurs such as James Watt, Andrew Carnegie, Henry Ford, Sam Walton and Bill Gates. Entrepreneurship theory is concerned with understanding the innovative process and with identifying policies that foster the creation of rapidly growing firms (Baumol 2002).

Arguably the most influential theoretical definition of entrepreneurship is the Schumpeterian definition, where the entrepreneur is seen as the key agent involved in the creation of innovative and growth-oriented firms. The concept emanates from the Austrian economist Joseph Schumpeter, who, in his classical book *The Theory of Economic Development*, first published in German in 1911, made the entrepreneur the *primus motor* of capitalism. The Schumpeterian view defines an entrepreneur as an innovator and as a driver of economic growth (Hébert and Link 2006; Henrekson and Roine 2007).

The entrepreneur brings about change by disturbing the status quo and pushing the economy towards a new equilibrium, which when successful generates entrepreneurial profits above the risk-adjusted market rate of return. Schumpeter focused on novelty, innovation and disrupting existing equilibria in his definition of entrepreneurship, and he makes clear that entrepreneurial ability in his sense is rare: “To act with confidence beyond the range of familiar beacons and to overcome that resistance requires aptitudes that are present in only a small fraction of the population and that define the entrepreneurial type” (Schumpeter 1942, p. 132). We attempt to follow this definition by referring to those firms that bring an innovation to the market and have the ambition to grow as Schumpeterian firms, and their founders as Schumpeterian entrepreneurs. The innovation can consist of a new technology but it can also be a new product, service or organizational practice. The premise is that there are fundamental differences in the quality of firms and that a small proportion of all firms are high-quality firms that contribute most of the economic benefits associated with entrepreneurship.

Schumpeter argued that entrepreneurship is about bringing about change and also defined those who carry out this function as employees in firms also are entrepreneurs.<sup>1</sup> Employees who carry out the entrepreneurial function as are sometimes referred to as intrapreneurs. Similarly, someone who inherited wealth could be entrepreneurial by bringing about more change in the family business. We agree with this point conceptually, but intrapreneurs and entrepreneurial heirs are difficult to identify and separate from other employees in an objective and systematic manner. For practical reasons, we empirically restrict our definition to business entrepreneurs who founded firms

Entrepreneurship is not an unambiguously and well-defined concept. Most studies tend to measure small business activity, the rate of self-employment or entry into self-employment. This may at least in part be explained by the fact that these metrics are easily identified based on data available in tax records and other public sources. There are some obvious merits to this approach. For example, that self-employed individuals operate a business, and need to wrestle with issues such as risk, uncertainty (Knight 1921) and alertness to opportunity (Kirzner 1973). But although Schumpeterian entrepreneurs are generally self-employed, the overwhelming majority of business activity is not entrepreneurial in the Schumpeterian sense. They do not bring a new innovation to the market or even aspire to grow their business. Using self-employment and closely related measures as proxies for entrepreneurship therefore has increasingly been called into question (Hurst and Pugsley 2011; Shane 2008; Henrekson and Sanandaji 2014).<sup>2</sup>

When academics and business leaders were asked to define entrepreneurship, the most common suggestion they gave was the creation and development of new ventures followed by innovation. In contrast, “the creation of a “mom-and-pop business”, i.e., small routine businesses, was not viewed as entrepreneurship (Gartner 1990). Self-employment is a legal concept rather than an economic function, and is certainly not synonymous with Schumpeterian entrepreneurship.

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<sup>1</sup> Schumpeter (1934, p. 74–75) defines entrepreneurs as “not only those ‘independent’ businessmen in an exchange economy who are usually designated, but all who actually fulfill the function by which we define the concept, even if they are, as becoming the rule, ‘dependent’ employees of company, like managers, members of board of directors, and so forth, or even if their actual power to perform the entrepreneurial function has any other foundation such as the control of a majority of shares.”

Self-employment has for a long time been questioned as being synonymous with entrepreneurship. However, suggested alternative metrics often suffer from similar shortcomings. This includes new business density, the Global Entrepreneurship Monitor total entrepreneurial activity (TEA) measure, business ownership, the share of the population engaged in starting a new business and startup ratios. These metrics mix a small number of innovative firms with high grow potential with a large number of small non-innovative firms engaged in standard small business activity. Moving from self-employment to metrics that largely consists of self-employment does not resolve the problem. The implicit idea is that businesses are *ex ante* homogenous and that having a large number of startups will ensure some to achieve entrepreneurial success. This leads to a policy focus on the quantity rather than the quality of firms.

A look at the numbers proves this point. In the United States, the industries with the largest concentrations of self-employed men are construction, landscaping services, auto repair, restaurants, truck transportation, and farming. For women, the corresponding industries include private household services, child day care services, restaurants, and beauty salons (Hurst and Pugsley 2011). The overwhelming majority of small businesses in the United States and Europe have no employees other than the owner; nor do most small businesses eventually grow large. Most small businesses are best described as permanently small rather than nascent entrepreneurial firms. Hurst and Pugsley (2011) estimate that only 10–20 percent of small businesses in the United States report any innovative activity. asked about growth ambitions, 75 percent of respondents stated that “I want a size I can manage myself or with a few key employees”. This type of firm plays an important role in, for example, generating employment, but should not be part of a measure that aims to gauge the rate of innovative entrepreneurship (Henrekson and Sanandaji 2014; Shane 2008).

A related concept to Schumpeterian entrepreneurship that is often used in empirical research is high-impact entrepreneurship, which is defined as firms which grow rapidly in terms of revenue, employment or similar outcomes (Acs 2008; Henrekson and Johansson 2010). The two are empirically close, but one conceptual difference is that Schumpeterian entrepreneurship is defined also *ex ante* and not merely *ex post* in terms of success. Firms that have the ambition and potential to innovate and grow are also defined as Schumpeterian, even if they ultimately fail.

The fact that entrepreneurial firms can be identified *ex ante* is conceptually important for entrepreneurship theory and to inform policy. Guzman and Stern (2016) estimate the entrepreneurial quality of newly registered American firms. Observable predictors include whether founders merely name the firm after themselves or use a unique name, whether the firm is organized in order to facilitate equity financing by registering as a corporation or in the state of Delaware, and whether the firm seeks intellectual property rights protection such as patents or trademarks. The authors show that these and other quantifiable measures are strong predictors of future growth, not necessarily because they are causal drivers of growth but because they are “digital signatures” which can be used to distinguish firm type (Fazio et al. 2016). Firms that anticipate that their business idea is good enough to eventually grow, obtain equity financing or go public are more likely to coin a unique name or incorporate in judiciary big-business friendly Delaware. While firms may appear to be similar in their startup phase, they are far from homogenous in terms of growth potential. The founders tend to be aware of their growth potential and ambition already early in the life cycle of the firm, which is why firms that expect to eventually become large register in Delaware whereas most firms do not.

Startup characteristics allow firms with higher entrepreneurial potential to be a priori identified with high predictive validity. Entrepreneurial success is in part random, but different types of firms differ greatly in growth potential and ambition from the start. These findings confirm that high-potential Schumpeterian startups are few and fundamentally different from the vast majority of other new firms. Of course, not all Schumpeterian startups succeed despite innovative potential, and a few firms that from the onset do not appear to have the characteristics of potential high-growth firms become very successful, either because quantifiable measures did not capture true potential or because the firm evolved. Nevertheless, entrepreneurial quality is extremely skewed, with each new Delaware corporation with an early patent and trademark equaling almost 4,000 local limited liability companies in terms of average impact (Fazio et al. 2016). The significance of these findings is that there are fundamental differences in firm quality already at startup, and that it is difficult to compensate for the lack of Schumpeterian entrepreneurship by a large quantity of non-Schumpeterian firms.

The relationship between startups, small businesses and new job creation is complex and points toward the importance of a small number of rapidly growing firms (Davis et al. 1996; Henrekson and Johansson 2010; Coad et al. 2014; Haltiwanger et al. 2016). Although small

firms create many new jobs, many of these jobs vanish as these firms downsize or exit. Careful studies for the United States suggest that the most important factor in job creation is not the size of a company but its age (Haltiwanger et al. 2013, 2016). Young firms tend to start small, which confounds estimates of the relationship between small firm activity and net job creation. Once age is accounted for, these studies find no systematic relationship between size and the number of jobs created. A small fraction of young firms which grow rapidly account for most of the net job creation of startups. Small companies that remain small by contrast create few net jobs and have a high likelihood of eventually going out of business; firms dynamics for young firms can be largely be characterized as “up-or-out”.

### **3. Cross-country variation in entrepreneurship: a survey and interpretation of previous evidence**

Our view is that explanations for the observed discrepancies in the rate of entrepreneurship originate from structural factors (population, income levels, etc.) as well as institutional factors (e.g., taxes and regulations). Institutions that have been identified as positively linked to entrepreneurship include rule of law and stable protection of private property, reasonable tax codes, well-functioning social insurance systems, flexible employment protection legislation, efficient competition policy and capital market regulation, as well as institutions governing education and knowledge production (Hall and Jones 1999; Bécharde and Grégoire 2005; Henrekson and Johansson 2009; Bjørnskov and Foss 2013, Cullen and Gordon 2007; Elert et al. 2016). Calvino et al. (2016) provide cross-country comparisons of policy and the growth pattern of startups. Policy factors associated with startup activity include strong contract enforcement and timely bankruptcy laws.

Other prerequisites of high-impact entrepreneurship include an educated workforce (Kuratko 2005; Bécharde and Grégoire 2005) and well-functioning labor markets (Poschke 2013). Technology is not in itself sufficient for entrepreneurial innovation, but of great importance when the other necessary prerequisites exists for it to be utilized. Porter and Stern (2002) argue that innovation has become the most important source of competitive advantage and attempt to quantify national innovative capacity. This is determined both by scientifically foundational factors such as the pool of scientists and engineers and by innovative private sector firms, which transform basic research into commercializable innovations. Important factors for linking science and innovation are the quality of scientific research institutions and the availability of venture capital. The United States overall outperforms Europe, but several

European countries such as Germany, Switzerland, the Nordic countries and the United Kingdom also rank highly.

A number of previous studies have compared various aspects of entrepreneurship in Europe with the United States. Western European countries on the whole differ in terms of institutional setting, the role of government and industry structure. The venture capital sector plays a far smaller role in Europe than in the United States. The disparity is attributed to the legal framework, tax policy, bankruptcy laws, investor protections and other institutional factors (Bruton et al. 2005; Da Rin et al. 2006; Henrekson and Sanandaji 2016). While the United States has had a larger and better performing venture capital sector for many years, Europe has closed the gap in terms of successful exits in recent years (Kräussl and Krause 2014). Bertoni et al. (2015) compare the investment patterns of venture capital firms. State backed venture capital plays a larger role in Europe than in the United States, accounting for around 40 percent of funds. Independent venture capital firms in the United States are more likely to invest in the youngest and riskier firms, whereas their European counterparts focus more on larger more mature firms in the expansion phase. State backed venture capital in Europe further tends to perform worse than its private counterpart (Grilli and Murtinu 2014, 2015; Cumming et al. 2014).

American industrial R&D experienced a period of major structural change from the late 1970s with a resurgence of entrepreneurship by younger smaller firms at the expense of incumbents (Brock and Evans 1986; Audretsch and Thurik 2001; Mowery 2009, Brown et al. 2009). Overall, Europe lags behind the United States in terms of structural change. On average, Europe has fewer young firms among leading innovators and lower R&D intensity among young firms (Foray and Lhuillery 2010; Cincera and Veugelers 2013).

In addition to economic factors, culture and attitudes appear to play important roles for explaining the cross-country variation in rates of entrepreneurship. Cultural factors and attitudes are more difficult to influence directly using policy, but important to be aware of when attempting to understand variation across countries. Culture is important both to explain institutional differences and differences in entrepreneurial activity itself.

Entrepreneurs are of course not motivated entirely by economic incentives; but also by cultural and psychological factors. For example, an entrepreneur may be motivated by a desire

to realize a business idea. Additionally, social recognition, media attention and the pursuit of awards may be significant. Joseph Schumpeter (1934) emphasized these motives as the most important, in addition to the ambition to found a “private empire”. William Baumol (2002) also believes that the entrepreneur’s driving forces are multifaceted. He maintains that most entrepreneurs are motivated by a desire for wealth, power and prestige. However, even if economic profit *per se* is not an objective that motivates the entrepreneur, it still serves as an indicator of success and ability.

Economic profit is also a necessary condition for obtaining resources for innovation and expansion. If an entrepreneur needs co-financiers at some point, then the entrepreneur is normally obligated to contribute part of the financing. Hence, even if profit seeking is not a goal in itself, profit is a necessary means for those who want to realize their entrepreneurial vision in the form of a successful firm. Revenue in excess of costs must ultimately be generated to obtain the financial resources required to operate and expand the business.

The predominant social attitudes regarding entrepreneurship and business activity also reflect the institutional setup and the incentives they present. For many individuals, the prospect of becoming an entrepreneur does not hold enough attraction when compared to other options. The expected benefits are simply not perceived to be sufficient to endure the inevitable risk which is an inescapable part of being an entrepreneur. In many societies, business owners who fail are shunned, sometimes verging on ostracism. Such attitudes make it difficult for entrepreneurs who have failed in the past to launch new projects—let alone succeed in future projects. The personal cost of bankruptcy is also very high in Japan, but when Japanese bankruptcy legislation was reformed to decrease the economic cost of bankruptcy, people became more inclined to start firms (Eberhart et al. 2016).

Negative attitudes toward entrepreneurship may also be the result of inherent attitudes. On the other hand, a more entrepreneurial culture generates a greater “demonstration effect” – a process whereby people are exposed to successful entrepreneurs and in turn stimulated to engage in entrepreneurial activities, further strengthening the entrepreneurial culture (Audretsch et al. 2002). Nevertheless, causality may indeed run in the opposite direction. A vibrant entrepreneurial culture is not a cause but rather a by-product of institutions that nurture entrepreneurship (Boettke and Coyne 2009). Hence, culture is a proximate rather than

an ultimate cause; focusing on its role in stimulating entrepreneurial activity is therefore deceptive.

#### **4. Our measures of Schumpeterian entrepreneurship**

To design and evaluate an effective entrepreneurship policy, one must be able to measure the rate of the desired type entrepreneurship. However, quantifying entrepreneurship across countries has turned out to be challenging. There are a vast number of cross-country studies of entrepreneurship, but surprisingly few that use reliable measures of Schumpeterian entrepreneurship.

The main measure used in this paper is the per capita number of self-made billionaire entrepreneurs. In addition, we use three complementary measures: venture capital investments as a share of GDP, the number of firms on *Forbes*' list of the world's two thousand largest firms founded in recent decades and the number of Unicorns, i.e., recent startups with one billion dollars in market value. These four measures are positively associated and often the same firms and founders turn up in three of the measures. Although the number of unicorns and large public firms founded in recent years outside the United States are too few for cross-country analyses, the numbers are sufficiently large to compare broad regions. Venture capital investments as a share of GDP is a widely-used measure which is better suited for cross-country analysis including small countries, and highly correlated with billionaire entrepreneurs. One disadvantage is that venture capital financed entrepreneurship is concentrated to countries with advanced financial markets. This fact biases the results against countries that finance Schumpeterian entrepreneurship by other means.

A major advantage of billionaire entrepreneurs is that the fairly large number of cases allows cross-country analyses. This measure focuses on the individual entrepreneurs who create firms rather than the firms or the source of finance. This has both advantages and disadvantages, but is interesting since there are many cross-country studies that rely on venture capital investments.

We utilize these measures to compare European countries to other industrialized countries in terms of entrepreneurship. We draw on our earlier research, in particular Henrekson and Sanandaji (2014, 2015), Sanandaji and Leeson (2013) and Sanandaji (2014). To our

knowledge, these are the first studies that attempt to estimate high-impact entrepreneurship through the accumulation of wealth by founders of new business ventures.

Billionaire entrepreneurs are obviously quite rare. However, they constitute a large percentage of the founders of the largest entrepreneurial firms. Of the 100 largest firms in the United States by market capitalization on the *Forbes* list in 2009, 34 were firms founded by entrepreneurs in the post-war era. The corresponding number in Western Europe for 2009 was only seven out of 100 largest firms. European firms include H&M, SAP, Carrefour Group, Zara, and ACS. American entrepreneurial firms founded in the post-war period include Intel, Microsoft, Apple, Google, Wal-Mart, Home Depot, Starbucks, Bloomberg, Facebook, eBay, Hewlett-Packard, Amazon, CNN, Fox News, Nike, and FedEx. Among the Asian firms on the list, one also finds famous brands such as Sony, Honda and Softbank.

Around half of the founders of the largest American firms founded since 1945 appear on the billionaire entrepreneur list, and many more founders would have appeared but had passed away by 1996 when the list starts, such as Wal-Mart founder Sam Walton and Honda founder Soichiro Honda. This strong correspondence suggests that the billionaire entrepreneur list captures entrepreneurial activity.

The number of entrepreneurs who become billionaires is both affected by the extent of business activity and by the share of the value creation in the firms that is captured by the founder. Countries with lower tax rates, more advanced financial sectors and higher income inequality could have more billionaire entrepreneurs for a given amount of business activity. However, it does appear that the variation in the number of self-made billionaire entrepreneurs is indeed highly related to actual business activity rather than being largely driven by distribution. The results hold after controls for income distribution, and many countries with few billionaire entrepreneurs have high rates of wealth concentration emanating from ownership of inherited firms (Sanandaji and Leeson 2013; Henrekson and Sanandaji 2014).

Every year, *Forbes Magazine* collects and publishes a list of all known dollar billionaires in the world. This list is referred to as “The World’s Billionaires”. Morck et al. (2000) were the first to take advantage of the billionaire data compiled by *Forbes Magazine* for academic research. Using the data for the year 1993, they found that countries where a higher share of

wealth was inherited tended to have lower rates of growth in subsequent years. Our measure of Schumpeterian entrepreneurship consists of all individual dollar billionaires who appear at least once on the annual list between 1996 and 2015. In total, there were 3,022 unique individuals on the list during this fifteen-year period.

To establish whether or not each of these individuals is a self-made entrepreneur, a number of distinct sources were used. First, *Forbes* provides a brief description of the source of wealth of each billionaire. In many cases, this background allowed us to exclude individuals with inherited wealth. We further excluded billionaires who neither inherited nor no create firms, and instead earned their wealth as entertainers, CEOs, traders, lawyers or other forms of employment. If the description by *Forbes* was not sufficient to determine entrepreneurial status, online sources, primarily *Wikipedia*, were consulted. In the rare cases where the information from *Forbes* and *Wikipedia* was insufficient to determine the status of a billionaire, additional library and internet searches were conducted, including the website of the firm which often contains detailed data on the history and founders. With a handful of exceptions (primarily for East- and South-Asian billionaires), these steps were sufficient to determine the source of wealth for the billionaires. The remaining ambiguous cases were excluded from the sample of billionaire entrepreneurs. We follow *Forbes* and rely on nationality rather than place of birth, which implies that immigrant's entrepreneurs are attributed to the country they moved to. Billionaires who reside in tax-havens but retain for example American citizenship are defined as Americans.

Sanandaji (2014) extensively discusses country of birth, nationality and country of residence, finding that around 15 percent of billionaire entrepreneurs are immigrants. Entrepreneurs that move tend to move to countries with higher GDP per capita and lower tax rates, but most entrepreneurs do not move at all and are native born. This may sound surprising, but a strong local bias has been documented also by other studies. Entrepreneurs are more likely to be active in the city where they were born, perhaps due to informational advantage (Michelacci and Silva 2007; Dahl and Sorenson 2009, 2012; Sanandaji 2013).

In total, we identify 1,738 billionaire entrepreneurs who did not inherit their wealth and who became wealthy by creating firms, out of the total sample of 3,022 billionaires. There were 66 countries with at least one billionaire entrepreneur in the sample, as well as a number of countries coded as having zero billionaire entrepreneur. A majority of the world's

entrepreneurs, 58 percent, did in fact acquire their wealth by starting a business. As noted above, the second most common source of wealth is inheritance, which is here not defined as entrepreneurship even in the many cases where heirs continue to be engaged in and control the family business. 34 percent inherited their wealth. The remaining 9 percent were self-made billionaires but did not become rich by creating firms but rather as employees, artists or in other ways. The last category also includes ambiguous cases where the source of last wealth was indeterminate.

The share of billionaire entrepreneurs out of all billionaires is lower in Europe, 42 percent, than in the United States, where 63 percent of the dollar billionaires are self-made entrepreneurs. Most of the billionaires who were not categorized as entrepreneurs acquired their wealth through bequests. Another five to ten percent of billionaires in various countries are self-made and did not inherit their wealth, but are not entrepreneurs who founded new companies. Non-entrepreneurial billionaires include traders in the financial sector, corporate CEOs, law firm partners and entertainers.

Our preferred measure has the advantage of enabling us to create a cross-country measure of high-impact entrepreneurship. While the billionaire entrepreneurs are few, they are disproportionately important, representing many of the most valuable, innovative and influential firms created. To examine the robustness of our results, we also consider two other cross-country measures of entrepreneurship. The first alternative measure is the share of the 100 largest firms that were founded by individual entrepreneurs after 1945 from *Forbes*' list of the world's 2,000 largest firms. Firms that were founded through privatization of government monopolies, merger of a large number of firms or spinoffs from existing large firms are not defined as entrepreneurial. The share of large firms that are founded in recent years is positively correlated with the per capita number of billionaire entrepreneurs and with venture capital activity. However, most of these 2,000 firms are domiciled in the United States, Japan and China, which means that there are too few firms for most countries to enable a comparison. However, it is possible to compare larger countries and aggregate regions. Here we also update the list and report the number of firms founded since 1990.

The second alternative measure is venture capital investment as a share of GDP, as calculated by Groh and Wallmeroth (2015). They rely on the database *Thomson One* for the years 2000 to 2013 to estimate venture capital activity in 118 countries, including both private and public

venture capital. While it would be theoretically preferable to separate between private and public venture capital, this measure is used due to the lack of systematic estimates of venture capital activity for a large number of countries. The estimates in Groh and Wallmeroth (2015) are close to the detailed estimates of Lerner and Tåg (2013), who examined smaller sample of countries. Venture capital activity tends to require financial development, and most developing countries report no venture capital activity. Groh and Wallmeroth (2015) further round down their figures so that activity below 0.0049 percent of GDP is recorded as zero. We have imputed the value of zero for developing countries such as Afghanistan and Libya with missing values to increase the sample size. The results are generally not sensitive to the exclusion of such countries, where some such as Sri Lanka and Lebanon are sufficiently developed to have some venture capital activity.

Venture capital investments are by definition focused on innovative and growth-oriented firms (Kortum and Lerner 2000, Kaplan and Lerner 2010). Therefore, venture capital investment as a share of GDP can be used to approximate Schumpeterian entrepreneurship. Two drawbacks with this measure are that not all entrepreneurial firms receive venture capital, and the size of the venture capital sector also depends on the financial sophistication of a country's financial markets. Still, venture capital investment as a share of GDP strongly correlates with the number of billionaire entrepreneurs per capita ( $r = 0.66$ ). This correlation remains high and statistically significant when controlling for per capita income. The correlation is even higher at ( $r = 0.84$ ) when the sample is restricted to countries with a population exceeding one million inhabitants and where the rate of venture capital activity does not have to be imputed. This is reported in *Figure 1*.

One limitation of our measure is that Schumpeterian entrepreneurship is measured *ex post*, i.e., after it has already proven successful. Yet, from a policymaker's vantage point, the end result – that is, new large firms – is more relevant than the number of failed attempts. Moreover, it appears that high-potential entrepreneurial firms tend to be also *ex ante* distinct from non-entrepreneurial small businesses. For example, Puri and Zarutskie (2012) show that approximately 0.1 percent of all firms in the United States receive early-stage financing from specialized venture capitalists. Among the startups that became extremely successful and made an IPO, as many as two thirds received venture capital early in their life cycle (Kaplan and Lerner 2010). Thus, a majority of the entrepreneurial firms with great potential were backed by venture capital. Therefore, it seems reasonable to use the receipt of venture capital

as a proxy for distinguishing entrepreneurial firms with high potential from other firms. Clearly, high-tech startups with novel innovations are fundamentally different from small “mom-and-pop” operations in terms of growth potential, but even successful restaurant chains such as McDonald’s and coffee shops such Starbucks tend to be based on unique business ideas; not merely being the lucky ones among a large number of entities that were virtually identical when they started (e.g., Chase and Apte 2007).

We may note some additional potential limitations of our measures. Entrepreneurship is not always productive, as emphasized by Baumol (1990) and Murphy et al. (1991), and as exemplified by several episodes during Russia’s economic transition. This concern becomes particularly critical in countries with weak institutions. As noted, the theoretical definition we pursue in this paper is innovation and growth in *new* firms. This empirical approach relies on the accrual of exceptional wealth through the creation of new firms. None of these definitions unequivocally indicate that the activity is valuable to society. However, this concern is hopefully secondary since the vast majority of the entrepreneurs and much of our focus is on industrialized countries with institutions rewarding wealth creation rather than rent seeking or predation. Examination of the companies reveals a low prevalence of billionaires having acquired their resources through other means rather than through innovative entrepreneurship. Bagchi and Svejnar (2015) examine the source of wealth of billionaires globally to separate those who acquired wealth through the market and through political connections. They conclude that wealth acquired through political connections is associated with negative effects on the rest of society but that this is not the case for billionaires who earn their fortune in the market. Unlike rent seeking, entrepreneurial activity contributes substantial value to society in addition to creating private wealth.

For all countries in our dataset of billionaire entrepreneurs with more than one million inhabitants, we compile data from available sources and make some cross-country regressions in order to further explore which types of countries that tend to have more billionaire entrepreneurs. In order to increase statistical precision, a Poisson Event Count Model is used for the number of billionaires, a type of model used to estimate the occurrence of non-negative integers in fixed periods (Winkelmann and Zimmermann 1995). The control variables used are selected to capture fundamental factors: population, per capita GDP, tax revenue as a share of GDP, regulatory burden, income inequality and scientific performance.

In order to deal with missing data for some variables for some years, the average for the years 2010 to 2014 are used. Data on the Gini coefficient of income inequality are often missing for many years. Because the Gini coefficient tends to be fairly stable over time, we use the years 2000 to 2015 to be able to include more countries, using the average for years where data exists (for the 103 countries where data on the Gini coefficient exists in both years, the correlation coefficient between the two periods is 0.97). This enables us to include 123 countries with over ninety percent of the world's population. We rely on the IMF World Economic Outlook Database for data on population levels, per capita GDP and state revenue as a share of GDP (IMF 2016).

World Bank data are used for self-employment rates and the so-called *ease of doing business* index (World Bank 2016). The index is designed to measure regulations and formal procedures directly affecting businesses using an average of ten sub-indices, including, e.g., contract enforcement and investor protection. It is often used to estimate how “smooth” it is to run a business in each country. A low number on the ranking implies more favorable, usually less burdensome, regulations for businesses. The index is reported as a distance to the frontier (i.e., to the best-performing country), where 100 represents the most favorable business environment. Since the World Bank does not report self-employment for China and Taiwan, data from the ILO for the year 2013 are used for these two countries.

For estimates of venture capital activity in a large number of countries, we rely on the data compiled by Groh and Wallmeroth (2015) for the average of the years 2000 to 2013. Venture capital activity is set to zero in developing countries not included in Groh and Wallmeroth (2015).

Recent startups with a market cap exceeding one billion dollars are sometimes referred to as unicorns, since such firms are both rare and extraordinary. Data on unicorns such as Uber and Spotify were hand collected from the venture capital database *CB Insights* combined with *Forbes Magazine*'s public “Unicorn list”, in both cases defining unicorns as firms founded no later than the year 2000. Companies appearing on either list are included as unicorns, a total of 210 such firms for 2016. The United States dominates; 115 of the unicorns are of U.S. origin – that is, more than half of all global unicorns. China is surprisingly strong with 47 unicorns, whereas a mere 22 unicorns come from Western European countries.

American unicorns include Uber, Airbnb, 23andMe, Snapchat, SpaceX and Dropbox. European unicorns include British Oxford Nanopore, German Delivery Hero, and the Swedish firms Klarna and Spotify. Chinese unicorns include smartphone maker Xiaomi and online financial marketplace Lufax. Unicorns tend to be innovative tech-intensive firms, including service providers that rely on high-tech devices to provide services. The extent of this type of extremely successful startups is a useful indicator of recent levels of Schumpeterian entrepreneurship although the number of unicorns is too low to be reliably used in cross-country analyses for smaller countries, but sufficient in number when comparing broad regions such as Western Europe with large countries such as the United States and China.

Another similar measure is entrepreneurial firms founded after 1990 that have grown into large global firms. These data are also hand-collected based on *Forbes Magazine's* list of the world's 2000 largest public firms in the year 2016, excluding state-owned firms and firms created through mergers. The threshold here is far higher than the one-billion-dollar limit for unicorns. Such firms include Google, Facebook, Amazon, LinkedIn and eBay in the United States, Baidu in China and EasyJet in the United Kingdom. The United States has 60 such firms compared to only 18 in Western Europe and 22 in China.

As a proxy for scientific output we use the Thomson Reuters estimate of highly-cited researchers worldwide based on their *Web of Science* in 2015. This is a measure of about 3,000 most highly cited researchers in 22 fields of science in each country (Thomson Reuters 2016). This measure is based on the number of scientific publications and is often used in studies which compare scientific output across countries (e.g., Bornmann and Bauer 2015).

## **5. More self-employed but fewer entrepreneurs in Europe**

*Table 1* displays our two measures of Schumpeterian entrepreneurship that can be presented at the country level – the number of billionaire entrepreneurs per million inhabitants and venture capital investment as a share of GDP – together with the rate of self-employment and the number of top researchers per million inhabitants. The countries which stand out as having the highest rates of self-employment are Greece, Romania, Italy and South Korea. A quarter or more of the workforce is self-employed in these countries. By contrast, the United States has the lowest self-employment rate among developed nations. The average rate of self-

employment in Western Europe is twice that of the United States. The negative relationship between the number of billionaire entrepreneurs per capita and the self-employment rate becomes even more apparent in *Figure 2*, where these two measures are presented for the OECD countries. In order to control, albeit coarsely, for any effect of a large agricultural sector, we instead use non-agricultural self-employment in the figure. The top countries in terms of self-employment are unchanged, and the United States still comes out as having the lowest self-employment rate.

This negative relationship is further underscored by the negative correlation between both measures of Schumpeterian entrepreneurship and self-employment reported in *Table 2*).

Table 1 about here

Table 2 about here

*Table 3* shows the results of basic cross-country regressions of the number of billionaire entrepreneurs on a number of relevant institutional and structural variables. As expected, billionaire entrepreneurs are more likely to appear in countries with a larger population. The relationship is overall fairly linear, but larger countries tend to have somewhat more entrepreneurs per capita. Also, as expected there is a strong positive relationship between per capita GDP and the number of billionaire entrepreneurs. Lower state revenue as a share of GDP and more favorable regulatory environment are associated with more billionaire entrepreneurs. The number of highly cited researchers is alone positively correlated with the number of billionaire entrepreneurs. However, in specifications which control for per capita GDP, taxes and regulation the number of highly cited researchers is negatively correlated with billionaire entrepreneurs, and insignificant when a European dummy is added.

The results show that the dummy variable for Western Europe is negative, which provides further evidence that Western Europe as a whole has fewer billionaire entrepreneurs than other comparable countries. Since the regression that controls for per capita income and a number of institutional variables, the negative sign of the dummy can be interpreted as showing that Western Europe, *ceteris paribus*, generates fewer billionaire entrepreneurs than other countries.

Table 3 about here

*Table 4* summarizes the results for Western Europe, the United States, China, East Asia and Eastern Europe. The rate of self-employment in the United States is less than half of the level in Europe and East Asia, while the number of billionaire entrepreneurs per capita is four times greater. Note that alternative measures of entrepreneurship provide similar results when comparing the United States and Europe. Total venture capital investment as a share of GDP is five times greater in the United States, and the number of large firms founded since 1990 is more than three times greater.

Europe scores clearly below Asia according to two of the measures of entrepreneurship, while Europe scores slightly higher when the rate of entrepreneurship is proxied by venture capital investment as a share of GDP.

Table 4 about here

One important factor explaining cross-country differences in entrepreneurship is taxation of business activity. European countries tend to have higher effective tax rates, a greater regulatory burden for startups, and a less favorable business climate in several other ways. Thus, contemporary Europe has a comparatively less encouraging “ecosystem” for innovative entrepreneurship and business activity. In turn, this reduces the likelihood that successful entrepreneurs can be identified through a competitive selection process and then expand until they realize their full potential.

Whenever discussing entrepreneurial innovation and taxes it is very important to keep in mind the high risk of failure and the high opportunity cost of leaving one’s current employment to pursue an entrepreneurial venture. Taxes, even very high taxes, would probably not prevent most people to exert effort to obtain a large sum of money (one billion, say) with certainty. However, entrepreneurship is by its very nature associated with high risk of failure, and a small likelihood of success. Taxes matter in this tournament setting by reducing the expected value of success. Few entrepreneurs become billionaires even when successful, and the overwhelming majority of entrepreneurial ventures fail altogether. The individuals who face the choice of becoming entrepreneurs generally have safe and lucrative carriers, and the choice becomes less attractive if taxes reduce the reward for success. The same is true for

financers, who rely on a small number of successful projects to compensate for many failures. Numerous studies have shown an empirical link between taxes and business activity (e.g., Poterba 1989; Gompers and Lerner 2001; Carroll et al. 2001; Da Rin et al. 2006). Henrekson and Sanandaji (2016) survey recent research on the effects of owner-level taxes on business activity in general and entrepreneurship in particular. The pursuit of private wealth is certainly not the only motivating factor for entrepreneurs, but nor is it irrelevant. In self-reported surveys, most entrepreneurs point to economic profit as a motivating factor (e.g., Gartner 1990).

It is natural that Schumpeterian entrepreneurship reduces the small-business share of employment, as each successful entrepreneurial venture expands the number of large firms. Upon introducing new innovations to the market, entrepreneurs often create new business entities with thousands of new high-salary jobs. Some of these positions are filled by people who would otherwise be self-employed. The effect is even greater if the entrepreneurial entity competes directly with small businesses and thereby reduces their share of the market.

In many industries, the most efficient firms in Europe have not grown large enough to be capable of consolidating the European market and achieve the scale that give them the cost advantage to compete in global markets. Southern Europe in particular has a fragmented industry and business structure with many small firms, but few entrepreneurial firms have consolidated markets by growing large.

As noted above, new and entrepreneurially-oriented firms tend to offer more attractive and well-paid employment opportunities, which reduce the value of becoming or remaining self-employed. If high tax rates reduce the probability that new entrepreneurial firms are created that may restructure the economy, or hinder the expansion of larger firms, we would expect high-tax countries to have a greater share of their business activity in small, less efficient firms.

The effect of regulation on self-employment and entrepreneurship is in many ways similar to the effect of taxation. Since income from self-employment does not require the writing of a formal contract with the employer, it offers substantial room for evading regulations that may impede an otherwise mutually beneficial contract. This may include aspects such as salary

levels, total number of working hours, days of paid vacation, pension rights and other social benefits (e.g., Román et al. 2011).

In many countries, particularly in Europe, firms below a certain threshold are exempted from certain regulations – concerning above all rigid labor security legislation, which typically only applies to firms above a certain size. France, for example, has a critical threshold at 50 employees, and Italy and Portugal has a threshold at 15 employees (Garicano et al. 2013; Braguinsky et al. (2011); Schivardi and Torrini 2008). Similarly, the 2010 American health care reform implies that small firms receive Federal government subsidies, which will be phased out when they grow larger. Consequently, this health care reform, unintentionally, gives rise to a surtax on firm growth. In this way, a regulatory imposition can hamper entrepreneurship aimed at introducing an innovation that may capture a large market share. Instead, this increases profitability for non-entrepreneurial activities, including self-employment, compared to salaried employment in a heavily regulated large firm. Or, it may fuel second-best evasive entrepreneurship in order to sidestep the regulation (Elert and Henrekson 2016), but this can rarely be achieved without forgoing the potential opportunity of building a large and highly efficient firm.

This reverse relationship between entrepreneurship and self-employment appears paradoxical only if entrepreneurship is defined as self-employment. Conversely, the mechanism is highly straightforward when defining entrepreneurs as individuals engaged in developing an innovation by establishing a new firm with the ambition to grow and attain its full potential, whereas self-employment is a contractual concept in the labor market that exists for a number of reasons. The most important reasons being preferences for being one's own boss, agency problems that are hard to handle in a standard employment contract, better ability to monitor employees in a small firm, evasion of high taxes, and avoidance of regulations applied to employees.

When superior firms expand, formerly self-employed or small-business owners are replaced and absorbed into salaried employment in more efficient firms. The result is both a more prosperous economy and a lower rate of self-employment.

## 6. Implications for European entrepreneurship policy

Does Europe suffer from an “entrepreneurship deficit” relative to other industrialized regions? Given basic preconditions that should not be the case. Europe’s high GDP per capita, its high-tech industries and well-educated workforce provide a fertile ground for making Europe into one of the world’s most innovative regions.

If entrepreneurship is measured as the self-employment rate or closely related measures such as the business ownership rate, new firm registration and the share employed in small businesses Europe seems to be doing quite well, but these measures are misleading.

The Entrepreneurship 2020 Action Plan of the European Union has an ambitious aim: “To bring Europe back to growth and create new jobs, we need more entrepreneurs.” (European Commission 2013, p.1). The emphasis on entrepreneurship is valid, but it is crucial to define entrepreneurship correctly. Along the same lines the European Commission (2012) maintained that the objective of entrepreneurship is “economic growth, innovation [and] job creation”. If entrepreneurship is defined as self-employment or startup activity *per se* entrepreneurship policy becomes synonymous to policy aimed at promoting small and medium-sized enterprises. Even if Schumpeterian entrepreneurship is significantly affected, there are many policies that promote both types of business activity. However, when Schumpeterian entrepreneurship is fostered by different types of institutions and support structures than self-employment and small business activity, there are risks that policy initiatives become counterproductive. A particular policy may encourage the formation of small firms without growth ambitions while discouraging entrepreneurship. Tax and regulatory exemptions for small firms are salient examples. *Figure 3* schematically illustrates the crucial differences between small business policy and entrepreneurship policy.

Prevailing tax policies in member countries are perhaps the most critical impediment to more innovative entrepreneurship in Europe (Henrekson and Sanandaji 2016). Potential billionaire entrepreneurs are rare and tend to have attractive well-paid jobs in existing firms. This gives rise to a substantial opportunity cost for someone considering establishing a new innovative firm; the risk of failure is always large. In order to attract a sufficient number of talented people to incur this opportunity cost and risk exposure, economic incentives must be sufficiently strong. Among the European countries that fare the best in terms of

Schumpeterian entrepreneurship are the United Kingdom and Switzerland, where capital gains taxes are relatively low.

Second, increasing the attractiveness of entrepreneurship does not imply that the incentives for productive self-employment should be reduced. However, small firms and the self-employed are more sensitive to other taxes – chiefly value added tax, social security fees, and the taxation of owner compensation. Small firms tend to be better able to evade taxes (Engström and Holmlund 2009). High taxes on successful firms that combine rules and enforcement that allow smaller firms to evade taxes risks inhibit firms from growing. One way to avoid this is to discourage tax evasion by increasing control and monitoring and using the additional revenue to make taxes on successful businesses less strenuous.

Small-firm owners have about the same average level of education as the overall population (Henrekson and Sanandaji 2014). By contrast, Schumpeterian entrepreneurship is highly human-capital intensive. In the United States, one third of billionaire entrepreneurs have a degree from an elite university such as Harvard, MIT or Stanford – compared to less than one percent of the total labor force. In many cases, billionaire entrepreneurs have an advanced degree in technology or the natural sciences. Strong educational credentials are also common among European billionaire entrepreneurs. This is likely both due to the causal effect of human capital and access to new ideas and the fact that unusually talented individuals are selected into elite universities. The entrepreneurial sector in Silicon Valley has evolved in close cooperation with academic research at adjacent Stanford University. The lack of elite universities in Europe compared to the United States is likely to be a major disadvantage for Schumpeterian entrepreneurship.

Regulations are commonly modified to make them less rigid for small firms. In Sweden, firms with ten employees or less are allowed to exempt two employees from the “last-in, first-out” principle in case of redundancies. Such small-firm concessions are even more prominent in France, Italy and Portugal. Occasionally, such concessions may be motivated, particularly in regard to auditing and reporting requirements. However, rules that make it both convenient and economically rational for businesses to stop growing beyond a certain size however

impede growth. Rather than granting exceptions from regulations to small firms, European countries ought to make the institutional setup more favorable for firms of all sizes.

European entrepreneurship policy has all too often favored small- and medium-sized firms rather than entrepreneurial firms. If one country or region suffers from a lack of potential entrepreneurs, the activities that would otherwise have evolved in that country or region may instead move elsewhere through international outsourcing or offshoring. Globalization and highly integrated markets make it more important than ever to create an advantageous ecosystem for entrepreneurship and to incentivize prospective entrepreneurs.

Having a knowledge-intensive and profitable entrepreneurial sector also leads to the emergence of new entrepreneurs through a number of channels. First, talented entrepreneurs are more inclined to move to regions where there is greater potential for future entrepreneurship (Andersson and Henrekson 2015). Second, many new entrepreneurial firms are formed as spinoffs by key employees in existing entrepreneurial firms that have already grown large (Klepper 2016). By working for an established firm, potential entrepreneurs acquire experience, knowledge and cutting-edge ideas of a type needed to start their own venture.

Weak incentives to exploit entrepreneurial opportunities are rarely offset by subsidies and tax breaks for capital investments. A well-educated labor force, modern infrastructure, capital supply and stable macroeconomic conditions are valuable but not sufficient to promote innovative entrepreneurship. High rates of Schumpeterian entrepreneurship critically depend on the institutional setup and the resulting incentive structures for business activity.

Schumpeterian entrepreneurship in Western Europe is shown to lag both the United States and many Asian economies. Relative to the size of its population, Western Europe produces fewer billionaire entrepreneurs, successful unicorn startups and firms founded in recent decades which have grown to be among the largest in the world. The entrepreneurship deficit becomes particularly apparent once we control for Western Europe's advantages in terms of a high level of income and high scientific output.

Lastly, our findings have some bearing on the contentious debate about the performance of the European economies as compared to the United States. Acemoglu et al. (2016) have argued that the U.S. economy is more innovative than Western European welfare states, and that American innovativeness benefits Europe and other countries. Piketty (2014) dismisses Acemoglu et al.'s suggestion. Piketty instead argues that there is little difference between Western Europe and the United States in terms of economic performance. Our results support Acemoglu et al. in that the United States appears to be significantly more innovative than Western Europe.

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*Table 1* Measures of business and scientific activity in selected countries.

Country	Billionaire entrepreneurs per million	Venture capital share of GDP, %	Self-employment, %	Top researchers per million
Australia	1.35	0.08	11.0	4.98
Austria	0.36	0.01	13.3	2.26
Belgium	0.36	0.06	14.5	3.35
Bulgaria	0.00	0.00	12.2	0.00
Canada	1.21	0.19	9.0	2.82
China	0.21	0.06	12.1	0.11
Croatia	0.00	0.00	19.4	0.00
Czech Rep.	0.38	0.02	18.0	0.48
Denmark	0.36	0.09	9.00	4.30
Estonia	0.00	0.03	8.9	2.26
Finland	0.19	0.08	13.6	2.78
France	0.44	0.05	11.5	1.47
Germany	0.69	0.03	11.4	2.21
Greece	0.27	0.03	36.3	0.81
Hong Kong	6.84	0.43	10.1	1.12
Hungary	0.00	0.01	11.7	0.10
Ireland	1.09	0.07	16.9	1.75
Israel	2.40	0.33	12.7	1.14
Italy	0.44	0.01	24.9	0.82
Japan	0.38	0.02	11.9	0.59
South Korea	0.38	0.06	28.2	0.64
Latvia	0.00	0.00	11.5	0.00
Lithuania	0.33	0.01	11.3	0.00
Luxembourg	0.00	0.18	8.6	0.00
Netherlands	0.24	0.07	15.6	5.85
New Zealand	0.45	0.02	16.0	2.02
Norway	1.79	0.06	7.2	2.38
Poland	0.24	0.01	22.3	0.16
Portugal	0.29	0.02	21.7	0.48
Romania	0.20	0.00	33.3	0.20
Singapore	2.84	0.48	14.9	4.35
Slovak Rep.	0.00	0.00	15.7	0.18
Slovenia	0.00	0.01	17.2	0.00
Spain	0.39	0.03	17.2	1.09
Sweden	0.94	0.10	10.5	2.72
Switzerland	2.26	0.14	15.3	9.17
Taiwan	1.37	0.05	17.2	0.60
UK	0.91	0.14	14.5	5.08
USA	1.71	0.30	6.8	4.97

*Source and definitions:* See main text.

*Table 2* Cross-country correlations between billionaire entrepreneurs per million, venture capital investment as a share of GDP, the self-employment rate and top researchers per million.

	Billionaire entrepreneurs	VC investment	Self-employment
VC investment	0.66		
Self-employment	-0.35	-0.31	
Top researchers per million	0.47	0.43	-0.42

*Source and definitions:* See main text.

*Table 3* Cross-country regressions of Schumpeterian entrepreneurship (measured as the number of billionaire entrepreneurs).

	(1)	(2)	(3)	(4)	(5)	(6)
Population	0.0037* (0.0001)	0.0037* (0.0001)	0.0036* (0.0001)	0.0036* (0.0001)	0.0037* (0.0001)	0.0035* (0.0001)
GDP per capita	0.075* (0.0015)	0.107* (0.0019)	0.088* (0.0029)	0.092* (0.0028)	0.099* (0.0039)	0.087* (0.0042)
State revenue share of GDP		-0.074* (0.0031)	-0.072* (0.0034)	-0.046* (0.0037)	-0.053* (0.0045)	-0.037 (0.0051)
Ease of doing business index			0.045* (0.0053)	0.044* (0.0051)	0.044* (0.0051)	0.052* (0.0051)
Gini Coefficient				0.073* (0.0047)	0.072* (0.0047)	0.055* (0.0051)
Top researchers per inhabitant					-0.055* (0.0198)	0.0001 (0.0228)
Western Europe dummy						-0.747* (0.0964)
Constant	-0.098 (0.076)	1.426* (0.101)	-1.234* (0.333)	-4.899* (0.428)	-4.729* (0.435)	-4.674* (0.439)
Observations	123	123	123	123	123	123
R-squared	0.65	0.74	0.76	0.79	0.79	0.80

*Note:* This table reports coefficients from a Poisson Event Count Model where the dependent variable represents the number people who become billionaire entrepreneurs in each country. GDP per capita is defined as the PPP-adjusted average for the years 2010 to 2014 from the IMF. Ease of doing business index refer to the ease of doing business, again as measured by the World Bank. State revenue share of GDP is based on IMF data, and measures total revenue as a percentage of the economy. The Gini coefficient is defined as the average of the years 2000 to 2015 based on data from the World Bank. Top scientists refer to the number of highly cited searchers per inhabitant. All variables other than the Gini refer to the average for 2010 to 2014. The Western Europe dummy takes the value one is one if the country is in Western Europe and zero otherwise. One star (\*) denote statistical significance at the 1% level.

*Table 4* Entrepreneurship in the United States, Eastern Asia and Western Europe.

	Popula- tion in million	Per capita GDP in USD	Billionaire entrepre- neurs, #	Billionaire entrepreneurs per million	Uni- corns #	Large firms founded since 1990	Venture capital share of GDP, %	Self- employment %
USA	314	51,300	538	1.71	115	60	0.30	6.8
China	1,354	11,300	291	0.21	47	22	0.06	12.1
Eastern Asia	213	37,200	163	0.76	8	19	0.06	16.3
Eastern Europe	104	22,600	18	0.17	1	2	0.01	21.0
Western Europe	411	39,400	249	0.61	22	18	0.06	15.8

*Note:* GDP per capita refers to PPP-adjusted average for the year 2010 to 2014, from the IMF. Population is for the same years, also from the IMF. Self-employment is based on World Bank data for the years 2010 to 2014, and includes agricultural self-employment. The country groups are defined as follows:

Eastern Asia: Japan, South Korea, Taiwan, Singapore and Hong Kong.

Western Europe: Germany, France, the UK, Italy, Spain, the Netherlands, Greece, Belgium, Portugal, Sweden, Austria, Denmark, Finland, Ireland, Luxembourg, Switzerland, Norway and Iceland.

Eastern Europe: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania, Slovak Republic, Slovenia and Poland.

Figure 3 The number of billionaire entrepreneurs per million inhabitants and venture capital activity as a share of GDP.

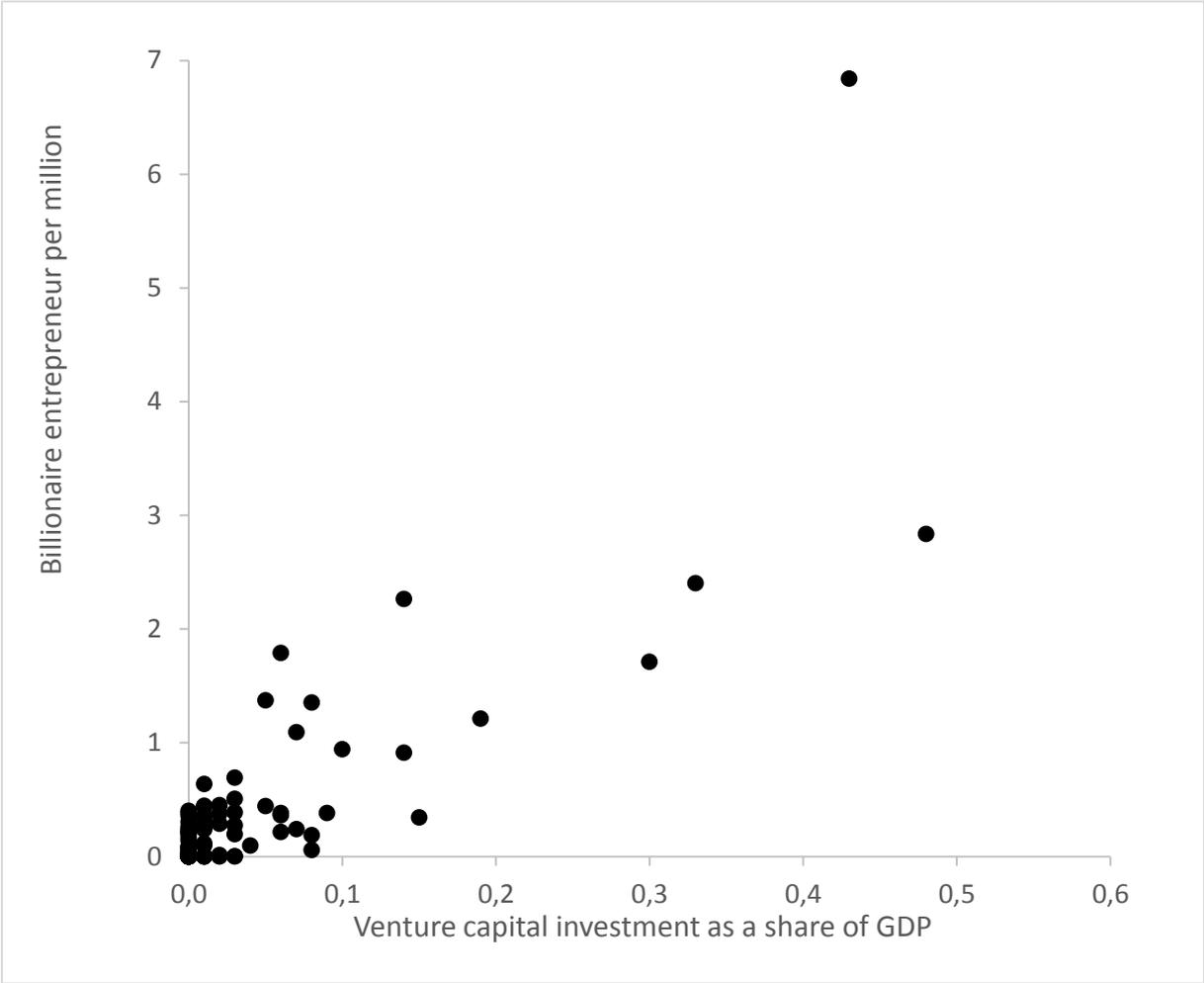
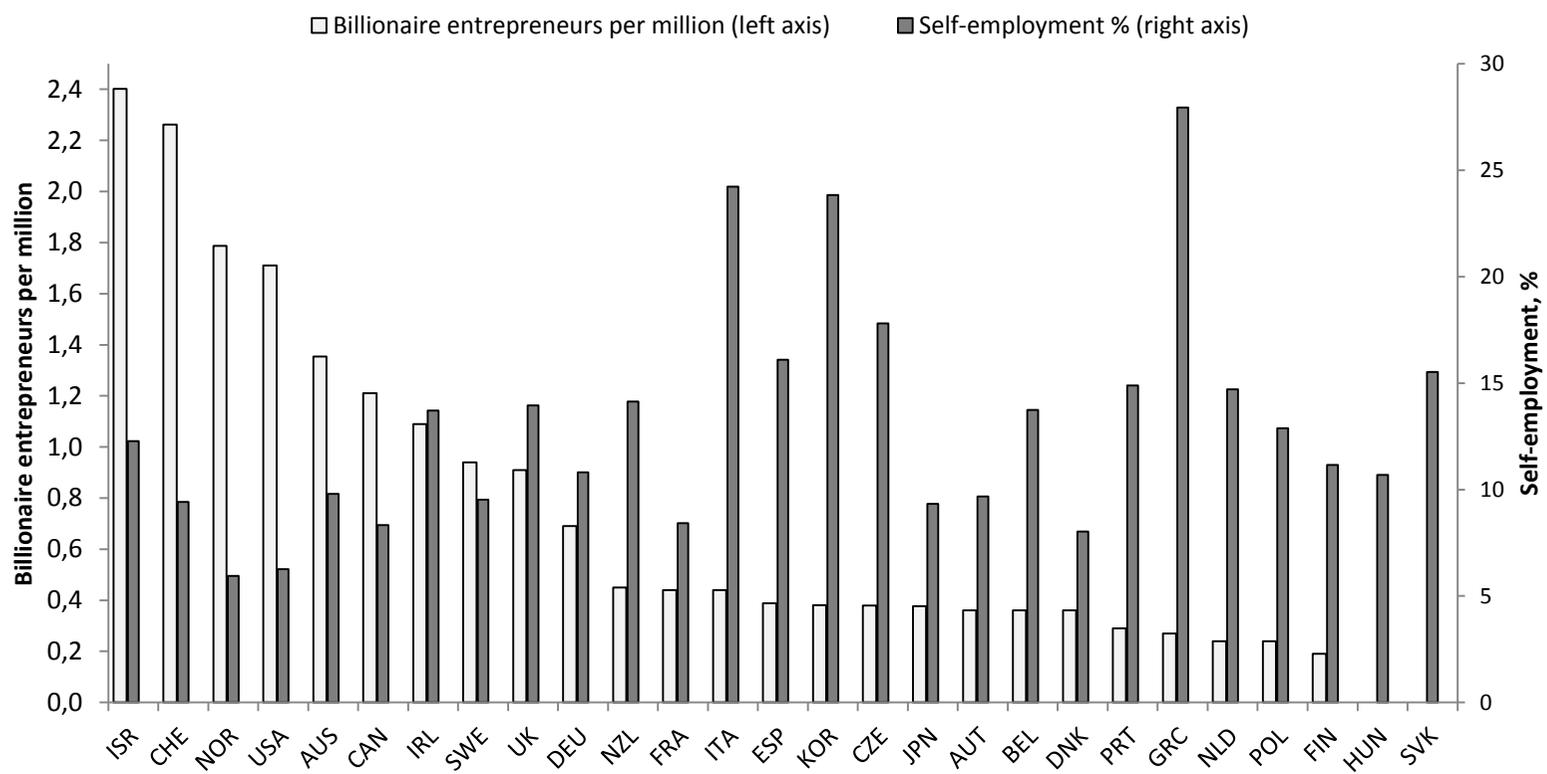
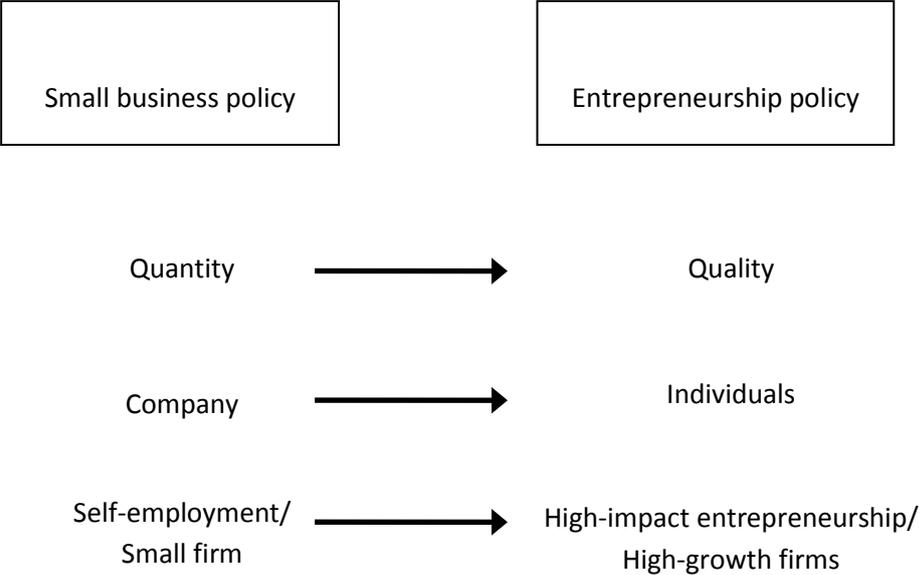


Figure 2 The number of billionaire entrepreneurs per capita and the non-agricultural self-employment rate in OECD countries.



Source and definitions: See main text.

Figure 3 Small business policy versus Schumpeterian entrepreneurship policy.



## Short author biographies

MAGNUS HENREKSON is a professor and president of the Research Institute of Industrial Economics (IFN). Until 2009, he was Jacob Wallenberg Professor at the Department of Economics at the Stockholm School of Economics. Since the end of the 1990s, Magnus Henrekson's primary research field has been entrepreneurship economics.

TINO SANANDAJI holds a PhD from the University of Chicago, where he defended his dissertation *Essays in Entrepreneurship Policy* in 2011. He is affiliated with the Institute for Economic and Business History Research (EHFF). He has a Master's degree from the Stockholm School of Economics (2003). Aside from entrepreneurship economics, his main field is historical economics.



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**Submitted to**

International Small Business Journal

**Manuscript ID**

ISB-16-0467

**Title**

Schumpeterian Entrepreneurship in Europe Compared to Other Industrialized Regions

**Authors**

Henrekson, Magnus

Sanandaji, Tino

**Date Submitted**

29-Nov-2016

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