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Schumpeterian Entrepreneurship in Europe Compared to Other Industrialized Regions[1]

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Abstract: Cross-country comparisons of entrepreneurship are difficult due to the lack of standard empirical definitions of entrepreneurship. Measures focusing on small business activity and self-employment suggest that Europe has the same or higher rates of entrepreneurship than the U.S. and East Asia. However, most business activity is not entrepreneurial in the Schumpeterian sense. We rely on empirical measures that more closely tally Schumpeterian entrepreneurship: self-made dollar billionaires per capita who earned their wealth by creating firms, top global firms founded in recent decades, unicorn startups, and VC investment as a share of GDP. Western Europe is shown to underperform in all four measures of high-impact Schumpeterian entrepreneurship relative to the U.S. Once we account for Europe's strong performance in technological innovation, an "entrepreneurship deficit" relative to East Asia also becomes apparent. This underperformance is missed by most standard measures. Finally, we also find that China performs surprisingly well in Schumpeterian entrepreneurship, especially compared to Eastern Europe.

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

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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). This is especially true for Western Europe, but also for new EU member states in Eastern Europe. The attention paid to this topic reflects the belief that

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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 consensus on Europe's entrepreneurship deficit nor on how the rate of entrepreneurship can be boosted. A common counterargument is that Europe in fact has a higher rate of self-employment, more small business activity, a higher employment share in small firms, and the same startup rate as the United States and other industrialized regions. This is not to deny that there is 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. Still, it is interesting to compare broader regions. One practical reason is that some types of high-performance entrepreneurship are rare and thus more appropriately analyzed when aggregating smaller countries. Comparing regions also highlights the variation that may exist between Europe, the United States, and East Asia rather than within Europe.

The purpose of our study is to compare European countries and Europe as a region with other regions using metrics that better approximate the Schumpeterian definition of entrepreneurship, that is to say innovative venture creation. We utilize four 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.[4]

Our approach makes clear that there is indeed a significant entrepreneurship deficit in most Western European countries. This deficit appears even more pronounced once one takes 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 can be appropriately proxied. 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, presents and motivates our four measures of Schumpeterian entrepreneurship, and surveys previous results based on these measures. Section 5 presents and discusses the empirical results. The concluding section presents the main conclusions and discusses implications for European entrepreneurship policy.

4. We extend earlier research, in particular Henrekson and Sanandaji (2014), 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.

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).

2.1. Schumpeterian Entrepreneurship

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. In his classical book, *The Theory of Economic Development*, Joseph Schumpeter (1911 [1934]) made the entrepreneur the *primus motor* of capitalism. The Schumpeterian view defines the entrepreneur as an innovator and as the foremost driver of economic growth (Hébert and Link 2006).

The entrepreneur brings about change by disturbing the status quo and pushing the economy towards a new equilibrium. When successful, Schumpeterian entrepreneurship generates profits above the risk-adjusted market rate of return. Schumpeter focused on novelty, innovation and disruption of existing equilibria in his definition of entrepreneurship, and he makes clear that entrepreneurial ability in this 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 adhere to 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 quality differences across firms, and only a small fraction of all firms are high-quality firms that contribute most of the economic benefits associated with entrepreneurship.

Bhidé (2000, p. 315) makes a useful distinction between the role of and skills needed by entrepreneurs when they start a business and when they build long-lived firms that grow large and become industry leaders:

> Their predisposition and their capacity to perform these tasks depend on a different set of qualities. […] The limited correlation between the qualities involved in starting and building a business helps explain why so few ventures become long-lived institutions. […] Only some of those who make the first cut

have the ambition to build a large, durable business and the tolerance for the requisite sacrifices and risks.

When the original entrepreneur remains in charge of the business as it grows into a large industry leader it is not sufficient to rely on the original novelty of the innovation. Among other things, the entrepreneur needs to be skilled in reallocating assets in response to disequilibria and changes in relative prices (Schultz 1975), and in imitating aspects of production and distribution processes as well as production features introduced by competitors that emerge in the course of the development of the entrepreneur's venture (Schmitz 1989).

Schumpeter argued that the entrepreneurial function can also be carried out by employees in firms (intrapreneurs).[5] Similarly, someone who inherited wealth could be entrepreneurial by bringing about further change in the family business. We agree with this conceptual point, 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 have founded firms.

2.2. Misleading Measures of Entrepreneurship

Entrepreneurship is not an unambiguously and well-defined concept. Most studies tend to measure small business activity (e.g., the employment share of firms with < 20 employees), 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, self-employed individuals operate a business, and need to wrestle with issues such as risk (Kihlstrom and Laffont 1979), uncertainty (Knight 1921) and alertness to opportunity (Kirzner 1973). But although Schumpeterian entrepreneurs are generally self-employed, the overwhelming majority of businesses are not entrepreneurial in the Schumpeterian sense. They do not bring a new innovation to the market or even aspire to grow their business. Therefore, the use of self-employment and closely related measures as proxies for entrepreneurship has increasingly been called into question (Shane 2008; Hurst and Pugsley 2011; Henrekson and Sanandaji 2014).

5. Schumpeter (1934, p. 74–75) asserts that entrepreneurs are "not only those 'independent' businessmen in an exchange economy who are usually so designated, but all who actually fulfil the function by which we define the concept, even if they are, as is becoming the rule, 'dependent' employees of a company, like managers, members of boards of directors, and so forth, or even if their actual power to perform the entrepreneurial function has any other foundations, such as the control of a majority of shares." See also Stam and Stenkula (2017) for an extensive discussion of intrapreneurship.

However, suggested alternative metrics often suffer from similar shortcomings. This includes new business density, Global Entrepreneurship Monitor's Total early-stage Entrepreneurial Activity (TEA) measure (e.g., Bosma and Levie 2010), 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 growth potential with a large number of small non-innovative firms engaged in standard small business activity. Moving from self-employment to metrics that largely consist of self-employment does not resolve this problem. Implicitly assuming that businesses are *ex ante* homogenous and that a large number of startups therefore maximizes the likelihood of some firms achieving entrepreneurial success, leads to a policy focus on the quantity rather than the quality of firms (Andersson and Henrekson 2015; Autio 2016).

A look at the numbers proves this point. 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 as 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 Schumpeterian entrepreneurship (Shane 2008; Henrekson and Sanandaji 2014).

2.3. Identifying Entrepreneurship *ex ante*

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. 2017). Although small firms create many new jobs, a large part 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, 2017). Young firms tend to start small, which confounds estimates of the relationship between small firm activity and firm age when estimating net job creation. Smaller firms appear to be drivers of net job creation, not because they are small per se, but because younger firms start as small. 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.

A concept closely related 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 concept is empirically close, but conceptually there is one important difference: Schumpeterian entrepreneurship is defined also *ex ante*, 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 any intellectual property rights protection. The authors show that these quality indicators 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 choose a unique name or incorporate in large-firm friendly Delaware. While firms may seem similar in the startup phase, they are far from homogeneous in terms of growth potential. The founders tend to already be aware of their growth potential and ambition 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 reliability. Entrepreneurial success is in part random, but different types of firms differ greatly in terms of initial ambition and growth potential. 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 high 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 incorporated business with an early patent and trademark equaling almost 4,000 local limited liability companies in terms of average impact (Fazio et al. 2016). Thus, there are fundamental differences in firm quality already at the time of entry, and even a large quantity of non-Schumpeterian firms is unlikely to substitute for the lack of Schumpeterian entrepreneurship.

3. Cross-Country Variation in Entrepreneurship: A Survey and Interpretation of Previous Evidence

Our view is that explanations for observed cross-country differences 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 (productive or formal sector) 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; Béchard and Grégoire 2005; Cullen and Gordon 2007; Henrekson and Johansson 2009; Bjørnskov and Foss 2013; Elert et al. 2017). 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; Béchard 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 exist 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 framework conditions, 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 protection, and other institutional factors (Bruton et al. 2005; Da Rin et al. 2006; Henrekson and Sanandaji 2016). While the U.S. venture capital sector has been larger and better performing for many years, Europe has narrowed 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 greater 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 young and riskier firms, whereas their European counterparts focus more on larger, more mature firms in the expansion phase. Moreover, state-backed venture capital in Europe tends to perform worse than its private counterpart (Grilli and Murtinu 2014, 2015; Cumming et al. 2017).

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).

Clearly, entrepreneurs are not motivated entirely by economic incentives; cultural and psychological factors also matter such as a desire to realize a business idea, social recognition, media attention, and the pursuit of awards. Schumpeter (1934) emphasized these motives, in addition to the ambition to found a "private empire". Baumol (2002) also believes that the entrepreneur's driving forces are multifaceted, maintaining 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.

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 is not sufficiently attractive relative to other options. The expected benefits are too small to compensate for the inescapable uncertainty 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 new projects (Eberhart et al. 2017).

4. Our Measures of Schumpeterian Entrepreneurship

To design and evaluate an effective entrepreneurship policy, one must be able to measure the prevalence of the desired type of entrepreneurship. However, quantifying entrepreneurship across countries has turned out to be challenging. There are a great number of cross-country studies of entrepreneurship, but

surprisingly few that use measures aimed at capturing Schumpeterian entrepreneurship.

4.1. Our Preferred Measure

The main measure used in this paper is the per capita number of self-made billionaire entrepreneurs. 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".[6] Our measure of Schumpeterian entrepreneurship is a subset of all individual dollar billionaires who appear at least once on the annual list between 1996 and 2015. In total, there were 2,325 unique individuals on the list during this period. Within this list we are looking for those billionaires that created their wealth by starting new firms.

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 created 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 information about its history and founder(s). 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 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 migrate 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

6. 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.

the city where they were born, perhaps due to informational advantage (Michelacci and Silva 2007; Dahl and Sorenson 2009, 2012).

In total, we identify 1,361 billionaire entrepreneurs who did not inherit their wealth and who became wealthy by creating firms, out of the total sample of 2,325 billionaires. There were 57 countries with at least one billionaire entrepreneur in the sample. Thus, a majority of the world's entrepreneurs, 60 percent, did in fact acquire their wealth by starting a business. The second most common source of wealth is inheritance (33 percent), which is not defined as entrepreneurship even in the many cases where heirs continue to be engaged in and control the family business. The remaining seven percent are self-made billionaires who became rich in ways other than by creating firms.

Billionaire entrepreneurs are obviously quite rare. However, in the United States 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 billionaire entrepreneurs in the postwar era. The corresponding number in Western Europe for 2009 was only seven out of the 100 largest firms from Western Europe that appeared on the *Forbes* list. European firms include H&M, SAP, Carrefour Group, Zara, and ACS. U.S. entrepreneurial firms founded in the postwar 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 U.S. firms founded since 1945 appear on the billionaire entrepreneur list. Many more founders, such as Wal-Mart founder Sam Walton and Honda founder Soichiro Honda, would have appeared had they not passed away by 1996 when the list was started. Thus, while the billionaire entrepreneurs are few, they are disproportionately important, representing many of the most valuable, innovative and influential firms created. This strong correspondence suggests that the billionaire entrepreneur list captures high-impact entrepreneurial activity.

4.2. Complementary Measures

Our preferred measure has the advantage of enabling us to create a cross-country measure of high-impact entrepreneurship. There are also other indicators of Schumpeterian entrepreneurship. We include several of these measures, both as comparisons with billionaire entrepreneurs and on their own merits. The results are more credible if multiple plausible indicators of Schumpeterian entrepreneurship point in the same direction and show a similar pattern.

The first alternative measure is the number of large firms that were founded by individual entrepreneurs after 1990 from *Forbes Magazine's* list of the world's

2,000 largest firms. These data were hand-collected based on *Forbes Magazine's* list of the world's 2000 largest public firms in 2016. Many founders of these firms also appear on the list of billionaire entrepreneurs. Firms that were founded through privatization of government monopolies, mergers of a large number of firms or spinoffs from existing large firms are not defined as entrepreneurial. There are too few firms for most countries to enable a cross-country comparison. However, the sample is sufficiently large to compare large countries and aggregate regions.

The second alternative measure is venture capital investment as a share of GDP, as calculated by Groh and Wallmeroth (2016). 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. Venture capital activity typically requires a high level of financial development. As a result, most developing countries report no 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. The latter factor biases the results against countries that finance Schumpeterian entrepreneurship by other means.

The third alternative measure is the number of unicorns, that is, the number of recent startups with a market capitalization exceeding one billion dollars, 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 since the year 2000. Unicorn valuation is based either on public valuation or valuation inferred from private equity deals. The one-billion-dollar threshold is far lower than the threshold needed to qualify as one of the world's 2,000 largest public firms, though a few unicorns are successful enough to appear on both lists.

Companies appearing on either list are included as unicorns, giving us 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.[7]

American unicorns include Uber, Airbnb, 23andMe, Snapchat, SpaceX and Dropbox. European unicorns include British Oxford Nanopore, German Delivery

7. Note that the firm size threshold for being among the top 2000 global firms is far higher than the one-billion-dollar limit for unicorns. Top 2000 global firms founded since 1990 include such major firms as Google, Facebook, Amazon, LinkedIn and eBay in the United States, Baidu in China and EasyJet in the United Kingdom.

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, but sufficient in number when comparing broad regions such as Western Europe with large countries such as the United States and China.

Thus, three of our four measures of Schumpeterian entrepreneurship identify those rare entrepreneurs highlighted by Bhidé (2000), i.e., entrepreneurs who not only start an innovative firm but also have the ambition and ability to build a large, durable firm.

Yet another candidate measure which relies on the expectations of the founder (Koellinger 2008) is Growth Expectation early-stage Entrepreneurial Activity. Total early-stage Entrepreneurial Activity (TEA) is a widely-used measure of business activity, collected by the Global Entrepreneurship Monitor (GEM) using annual surveys (Singer et al. 2015). TEA measures the share of the working-age population (aged 18–64) who is either in the process of creating a new business or running a business less than three and a half years old. TEA captures both innovative startups and the much larger number of regular small firms. GEM makes a distinction between those firms where the founders self-report that they expect to employ at least five employees five years from now and other firms. The former measure is called Growth Expectation early-stage Entrepreneurial Activity, which we will denote Growth-EA. Its residual (TEA minus Growth-EA) will be denoted No-growth-EA. We also include the share of TEA that consists of Growth-EA.

Growth-EA encompasses too many firms to be considered an indicator of Schumpeterian entrepreneurship. Nevertheless, it is interesting to include it as a further robustness check. First, GEM data are widely used in other studies and including such data in our study increases comparability with other studies. Second, if Growth-EA and No-growth-EA correlate differently with our proposed measures of Schumpeterian entrepreneurship it adds further credibility to the validity of those measures.

4.3. The Pros and Cons of the Different Measures

The different measures have different foci. The number of billionaire entrepreneurs focuses on the individuals who create firms, while the number of large businesses on *Forbes'* list founded in recent years and the number of unicorns are firm-based measures of entrepreneurship. Finally, venture capital

activity is pertinent since the type of startups that receive entrepreneurial financing tend to have high potential.

Our preferred measure identifies Schumpeterian entrepreneurship *ex post*, i.e., after it has already proven successful. From a policymaker's vantage point, the end result – that is, new firms that grow large – is more relevant than the number of failed attempts. Moreover, as noted in section 2, high-potential entrepreneurial firms tend to be *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.

Entrepreneurship is not always productive (Baumol 1990; Murphy et al. 1991). This becomes a particularly critical concern in countries with weak institutions. As noted, the theoretical definition we adhere to in this paper is innovation and growth in *new* firms, where the empirical approach relies on the accrual of exceptional wealth through the creation of new firms (in the case of venture capital investment it relies on the expectation of wealth accrual). None of the measures unequivocally indicate that the activity is socially valuable. However, this concern is hopefully secondary since the overwhelming 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 shows a low prevalence of billionaires having acquired their resources through other means than through innovative entrepreneurship.[8]

With that said, if all four measures gave similar results, despite being based on different aspects of the entrepreneurial process, this would strengthen the hypothesis that we are capturing cross-country variation in Schumpeterian entrepreneurial activity.

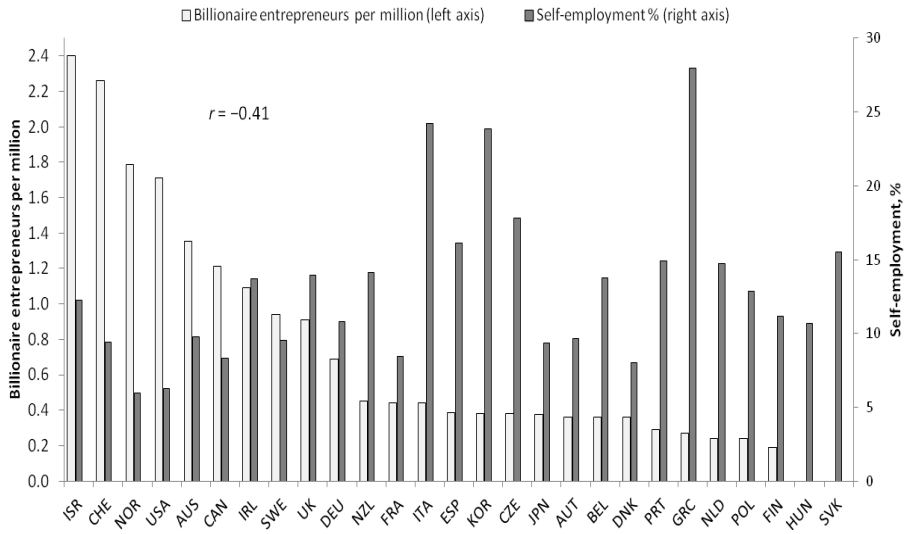
5. Empirical Results

The definitions and sources of all variables are summarized in Appendix *Table A1*. We begin by plotting the number of billionaire entrepreneurs per capita

8. 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.

against the self-employment rate for OECD countries in *Figure 1*. In order to control, albeit coarsely, for any effect of a large agricultural sector, we use non-agricultural self-employment. The top countries in terms of billionaire entrepreneurs per capita tend to have low rates of self-employment, and the United States – together with Norway – comes out as having the lowest self-employment rate.[9] The correlation is strongly negative at -0.41. By contrast, venture capital investment as a share of GDP correlates positively and even more strongly with the number of billionaire entrepreneurs per capita ($r = 0.85$). This is shown in *Figure 2*.[10]

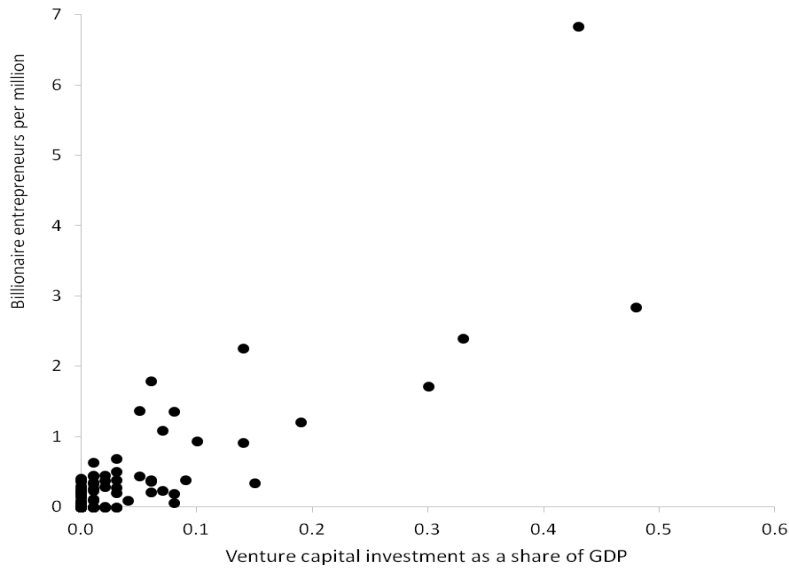
Figure 1: The number of billionaire entrepreneurs relative to population and the non-agricultural self-employment rate in OECD countries.*



* The number of billionaire entrepreneurs relative to population is defined as No. of U.S. dollar billionaires per million inhabitants (defined as the 2010–2015 average) who have created their wealth by starting new firms and who appeared at least once on the *Forbes* list between 1996 and 2015. The non-agricultural self-employment rate is the average for 2010–2015.
Source: See *Table A1*.

9. This partly reflects non-comparability of self-employment numbers in the *OECD Labour Force Statistics*. In particular, owner-managers of incorporated businesses are excluded from the self-employment count for the United States, whereas this group of (incorporated) self-employed are included for several other OECD countries (van Stel 2005).
10. The association remains high and statistically significant when controlling for per capita income.

Figure 2: The number of billionaire entrepreneurs per million inhabitants and venture capital activity as a share of GDP.



Note: The sample consists of countries with a population exceeding one million.
Source and definitions: See *Table A1*.

The negative relationship is further underscored by the negative correlation between both cross-country measures of Schumpeterian entrepreneurship and self-employment reported in *Table 1*.

Table 1: Cross-country correlations between measures of Schumpeterian entrepreneurship, small business activity and the level of technology.

	Billionaire Entrepreneurs	Top researchers	VC investment	TEA	Growth-EA	No-growth-EA	Share Growth-TEA	Self-employment
Top researchers	0.62**							
VC investment	0.86**	0.56**						
TEA	-0.10	-0.18	-0.05					
Growth-EA	0.10	-0.07	0.08	0.60**				
No-growth-EA	-0.16	-0.19	-0.10	0.94**	0.31**			
Share Growth-EA	0.19	0.00	0.15	0.07	0.77**	-0.23		
Self-employment	-0.34**	-0.41**	-0.25*	0.39**	-0.17	0.54**	-0.44**	
Unicorns per capita	0.78**	0.44**	0.90**	-0.01	0.15	-0.08	0.22	-0.20

Note: Two stars (**) and one star (*) indicate statistical significance at the 5 and 10% level, respectively.
Source and definitions: See *Table A1*.

The use of self-employment as a proxy for entrepreneurship has been sharply criticized. We therefore also include the GEM TEA measure as an alternative. This measure also correlates negatively (but not significantly) with measures of Schumpeterian entrepreneurship. When TEA is split into Growth-EA and No-growth-EA, Growth-EA correlates positively with both measures of Schumpeterian entrepreneurship, while No-growth-EA correlates negatively. However, these correlations are not statistically significant. The table also shows correlations of the number of unicorns per capita and all other measures. While there are fewer non-zero observations in this case, all correlations come out analogously: a strongly positive correlation with the two other measures of Schumpeterian entrepreneurship, a positive correlation with Growth-EA and a zero or negative correlation with the other measures.

Ceteris paribus, one would expect the prevalence of Schumpeterian entrepreneurship to be positively related to the level of technology and human capital. As a proxy for the level of technology we use Thomson Reuter's estimate of highly-cited researchers worldwide based on the *Web of Science* in 2015. This is a measure of (roughly) the 3,000 most highly cited researchers in 22 fields of science in each country (Thomson Reuters 2016).[11] The correlations in *Table 1* of this measure with the other variables underscores the importance of the level of technology for Schumpeterian entrepreneurship: there is a strongly positive correlation with the three measures of Schumpeterian entrepreneurship and a negative correlation with the non-Schumpeterian measures.

Table 2 shows the results of basic cross-country regressions for our preferred measure of Schumpeterian entrepreneurship – the number of billionaire entrepreneurs per million inhabitants – with controls for per capita income and an often-used measure of the business climate, the ease of doing business index (World Bank 2017).[12] We also include a dummy for Western European countries in order to test for the possible existence of any "entrepreneurship deficit". In column (4) we add dummy variables for Eastern Europe and North America, which means that the comparison is of Western Europe with the remaining regions.

11. This measure is based on the number of scientific publications and is often used in studies that compare scientific output across countries (e.g., Bornmann and Bauer 2015). One advantage of this highly-cited researchers measure is that it can be calculated for a large number of countries. Results are similar when using other measures of scientific output such as the education level, the number of scientific journal articles and quality adjusted patents, though these variables are available for fewer countries and thus reduce the sample size. Highly-cited researchers has been used in cross-country studies of scientific output, but rarely as a control variable in the entrepreneurship literature, which also adds to the motivation of using it in this paper.
12. 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 high index value implies more favorable, usually less burdensome, regulations for businesses. The index is reported as a (reverse) distance to the frontier (i.e., to the best-performing country), where 100 represents the most favorable business environment.

Table 2: Cross-country regressions of Schumpeterian entrepreneurship (measured as the number of billionaire entrepreneurs per million inhabitants).

	(1)	(2)	(3)	(4)
GDP per capita	0.014**	0.014**	0.006*	0.006
	(0.006)	(0.007)	(0.005)	(0.006)
Western Europe dummy		-0.041	-0.44**	-0.52**
		(0.26)	(0.21)	(0.25)
Eastern Europe dummy				-0.31*
				(0.16)
North America dummy				-0.14
				(0.24)
Ease of doing business			0.010*	0.012*
			(0.006)	(0.007)
Top researchers per			0.17***	0.17***
million inhabitants			(0.041)	(0.042)
Constant	-0.051	-0.051	-0.55	-0.65*
	(0.057)	(0.074)	(0.31)	(0.36)
Observations	143	143	143	143
R-squared	0.24	0.24	0.36	0.39

Note: This table reports ordinary least squares cross-sectional regressions where the dependent variable is the number of billionaire entrepreneurs per one million inhabitants in each country, with robust standard errors. All variables refer to the average for 2010 to 2015. The Western Europe dummy takes the value one if the country is in Western Europe and zero otherwise. See *Table A1* for sources and exact definitions. Three stars (***), two stars (**) and one star (*) indicate statistical significance at the 1, 5 and 10% level, respectively.

As expected, the regression in column (1) shows that there is a positive relationship between GDP per capita and Schumpeterian entrepreneurship. In column (2) we add the Western Europe dummy, which turns out to be negative but not significant. In column (3) we add controls for the business climate and the level of technology. A more favorable regulatory environment (a greater "ease of doing business") and the number of top researchers correlate positively with the number of billionaire entrepreneurs. Even more importantly, the Western Europe dummy becomes both large and statistically significant.

The negative dummy variable for Western Europe provides further evidence that Western Europe as a whole has fewer billionaire entrepreneurs than other comparable regions and countries. Since the regression in column (3) controls for per capita income, the business climate and the level of technology, the negative sign of the dummy can be interpreted as showing that Western Europe, *ceteris paribus*, generates fewer billionaire entrepreneurs than countries in other comparable regions of the world, notably North America.[13]

13. The ease of doing business coefficient is only weakly significant, but if we omit this variable the coefficient for Western Europe remains significant and virtually unchanged at –0.41.

In column (4) we add dummies for North America and Eastern Europe, so that the Western European dummy can be interpreted as a comparison with the remaining regions, notably China and East Asia. Taken at face value, an estimate of -0.52 for the Western Europe dummy implies a Western European deficit of almost 250 billionaire entrepreneurs given its level of technology and overall business climate.

Interestingly, the dummy for North America is not significantly different from zero. This could be interpreted as an indication that the high number of billionaire entrepreneurs in North America reflects economic and institutional factors. The regression also detects an entrepreneurship deficit for Eastern Europe, although the estimated effect is smaller and less precisely estimated.

Table 3 presents the results for Western Europe, Eastern Europe, the United States, China, East Asia, and selected countries for all four measures of Schumpeterian entrepreneurship plus the other measures of business activity.[14] The rate of self-employment in the United States is considerably smaller than the level in Western Europe and East Asia, while the number of billionaire entrepreneurs per capita is three times greater. The alternative measures of Schumpeterian 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 than in Western Europe, the number of large firms founded by an entrepreneur since 1990 is more than three times greater despite Western Europe's much larger population, and the number of unicorns per capita is almost seven times greater. Moreover, Growth-EA is the lowest in Western Europe. Further support for a greater prevalence of Schumpeterian entrepreneurship is given by the fact that the billionaire entrepreneurs constitute a mere 45 percent of all billionaires in Western Europe, whereas 64 percent of the U.S. billionaires are self-made entrepreneurs. Since Canada does much better than Western Europe, the conclusions regarding the Western Europe–U.S. comparison also holds true for a comparison of Western Europe to North America.

In addition, the table shows results for the largest countries in Western Europe plus the Nordic region and Switzerland. This makes clear that Italy and Spain, in particular, suffer from an entrepreneurship deficit, having miniscule VC markets, no unicorns and only one large firm each founded since 1990. On the other hand, Switzerland stands out in that most of the measures indicate a high rate of Schumpeterian entrepreneurship. Israel is a small economy, but included since it is often noted for its entrepreneurial activity. The measures used in this paper confirm that Israel appears to be an unusually entrepreneurial economy, both when compared with Western Europe and overall.

14. Often the same firms and founders turn up in three of the measures. Although the number of large public firms founded in recent years outside the United States is too few for cross-country analyses, the numbers are sufficiently large to compare broad regions, which is the main purpose of this paper. As mentioned earlier, the same applies for unicorns.

Table 3: Entrepreneurship in the United States, East 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-employ-ment, %	TEA, %	No-growth-EA, %	Growth-EA, %	Employed in firms < 20 employees, %
USA	316	52,000	432	1.37	115	60	0.30	6.8	11.9	8.3	3.6	18
China	1,358	11,600	228	0.17	47	22	0.06	12.1	15.6	11.7	3.9	n.a.
East Asia	213	37,700	118	0.55	8	19	0.06	16.3	4.8	3.2	1.6	31
Eastern Europe	104	23,000	14	0.13	1	2	0.01	21.0	8.6	5.9	2.7	40
Western Europe	412	39,700	194	0.47	22	18	0.06	15.8	5.9	4.8	1.1	39
Germany	81	44,300	42	0.52	5	3	0.03	11.4	5.0	4.0	1.0	n.a.
UK	64	38,300	46	0.72	10	5	0.14	14.5	7.9	6.2	1.7	n.a.
France	64	39,500	25	0.39	2	1	0.05	11.5	5.3	4.1	1.2	n.a.
Italy	60	35,400	23	0.38	0	1	0.01	24.9	3.9	3.5	0.3	n.a.
Spain	47	32,900	12	0.26	0	1	0.03	17.2	5.4	4.7	0.6	n.a.
Nordic	26	47,600	16	0.62	2	0	0.08	9.5	6.0	5.0	1.0	n.a.
Switzerland	8	56,100	14	1.75	1	2	0.14	15.3	6.7	0.9	5.7	n.a.
Canada	35	43,000	37	1.06	2	3	0.19	9.0	13.3	9.9	3.4	n.a.
Israel	8	31,700	14	1.75	2	1	0.33	12.7	8.3	6.3	2.0	n.a.

Note: See *Table A1* for sources and definitions. The country groups are defined as follows:
East Asia: Japan, South Korea, Taiwan, Singapore and Hong Kong.
Western Europe: Germany, France, the UK, Italy, Spain, 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.
Nordic region: Denmark, Finland, Iceland, Norway, and Sweden.

Western Europe scores clearly below East Asia according to two of the measures of Schumpeterian entrepreneurship and at the same level when the rate of entrepreneurship is proxied by venture capital investment as a share of GDP. Western Europe trumps East Asia only in terms of the number of unicorns. China has surprisingly high rates of entrepreneurship according to most measures given its low GDP per capita. The per capita number of billionaire entrepreneurs is lower than in the United States and Western Europe, but higher than in Eastern Europe. Venture capital activity as a share of GDP is similar to Western Europe. The number of large new firms and unicorns is high, reflecting China's economic size and fairly high rate of entrepreneurial activity, perhaps due to being a newly developing economy. Eastern Europe scores clearly below East Asia and China on all four measures and it also has the highest rate of self-employment among the five regions compared.[15]

Overall, our results suggest that contemporary Europe has a comparatively less fertile "ecosystem" for Schumpeterian entrepreneurship and business activity

15. The high self-employment rate partly reflects the large agricultural sectors in many Eastern European countries.

than the United States, and in some respects also relative to China and East Asia. In turn, this reduces the likelihood that successful entrepreneurs can be identified through a competitive selection process and expand until they realize their full potential.

6. Conclusions and Implications for European Entrepreneurship Policy

The analysis presented in this study shows that Schumpeterian entrepreneurship in Western Europe clearly lags the United States, and in some respects it also lags the industrialized East Asian economies. Relative to the size of its population, Western Europe has fewer billionaire entrepreneurs, fewer successful unicorn startups, as well as fewer firms founded in recent decades which have grown to be among the largest in the world. Moreover, the venture capital sector relative to GDP is only one fifth of the size of its U.S. counterpart. Eastern Europe underperforms to an even greater extent; this region is ranked below the other regions in all four measures of Schumpeterian entrepreneurship.

Given basic preconditions, Europe should not suffer from an "entrepreneurship deficit" relative to other industrialized regions. Europe's high GDP per capita, its high-tech industries and well-educated workforce provide a fertile ground for making Europe one of the world's most entrepreneurial regions. If entrepreneurship is measured as the self-employment rate or closely related measures such as the share employed by small firms and, to a lesser extent, total entrepreneurial activity as defined by the Global Entrepreneurship Monitor, Europe seems to be doing quite well. However, 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. However, the European Commission (2012, p. 120) says that it sees it as:

> vital to mobilise and adapt to small business all existing policies and tools, at both European and national levels. […] These policies aim to create conditions in which small firms can be created and thrive. If the EU is to achieve its goals of speeding up economic growth and creating more and better jobs, it will be SMEs which will play the most important role.

Our study shows that this view is ill-conceived. If entrepreneurship is defined as self-employment or startup activity *per se*, entrepreneurship policy becomes synonymous to a policy aimed at promoting small and medium-sized enterprises. We have shown that the European entrepreneurship deficit does not consist of a lack of small firms or too few self-employed. What Europe needs is more Schumpeterian entrepreneurship, which is likely to be fostered by different types of institutions and support structures, rather than more self-employment and small

business activity. Therefore, policy initiatives aimed at promoting SMEs risk becoming counterproductive.

A particular policy may encourage the formation of small firms without growth ambitions while discouraging entrepreneurship. In many European countries, firms below a certain threshold are exempted from certain regulations – concerning above all rigid employment protection legislation, which typically only applies to firms above a certain size.[16] In this way, a regulatory imposition can hamper entrepreneurship aimed at introducing an innovation that may capture a large market share, while increasing the profitability of 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.

European entrepreneurship policy has all too often favored small and medium-sized firms rather than entrepreneurial firms. If the institutions of a country or region do not support entrepreneurial firms, 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.[17]

Having a knowledge-intensive and profitable entrepreneurial sector also leads to the emergence of new entrepreneurs through two important 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 growth-oriented entrepreneurship. High rates of Schumpeterian entrepreneurship critically depend on the institutional setup and whether the resulting incentive structures promote that type of business activity.

16. France, for example, has a critical threshold at 50 employees, while Italy and Portugal have a threshold at 15 employees (Garicano et al. 2013; Braguinsky et al. 2011; Schivardi and Torrini 2008).
17. For an in-depth analysis of a wide range of policy areas the reader is referred to Elert et al. (2017).

Appendix

Table A1: Variable definitions and sources.

Variable	Definition	Source
Billionaire entrepreneurs	No. of U.S. dollar billionaires per million inhabitants (defined as the 2010–2015 average) who have created their wealth by starting new firms and who appeared at least once on the list between 1996 and 2015.	*Forbes Magazine*'s list "The World's Billionaires".
Venture capital investment	Venture capital investment as a share of GDP, average of the years 2000 to 2013.	Groh and Wallmeroth (2016) based on data from *Thomson One*.
Large firms founded since 1990	Number of firms founded by an individual entrepreneur after 1990 and being among the 2,000 largest firms in 2016.	*Forbes Magazine's* list of the world's 2,000 largest firms in 2016.
Unicorns	No. of firms started since 2000 with a market cap of at least one billion U.S. dollars in 2016 and appearing in at least one of our two sources.	Venture capital database *CB Insights* and *Forbes Magazine's* public "Unicorn list".
TEA	Share of population aged 18–64 who is either in the process of creating a new business or is running a business less than three and a half years old.	Global Entrepreneurship Monitor.
Growth-EA	Share of population aged 18–64 who is either in the process of creating a new business or is running a business less than three and a half years old, and who expect to employ at least 5 persons in 5 years.	Global Entrepreneurship Monitor.
No-growth-EA	TEA – Growth-EA.	Global Entrepreneurship Monitor.
Share Growth-EA	The share of TEA that is classified as Growth-EA.	Global Entrepreneurship Monitor.
Population	Population in million (for relevant years).	IMF (2017).
Self-employment	The total number of self-employed relative to total employment, defined as the 2010–2015 average.	World Bank.*
Non-agricultural self-employment	The number of self-employed outside agriculture relative to total non-agricultural employment, defined as the 2010–2015 average.	OECD.
Top researchers	No. of researchers per million inhabitants in 2015 among (roughly) the 3,000 most highly cited researchers in 22 fields of science identified by Thomson Reuters in the *Web of Science*.	Thomson Reuters (2016).
GDP per capita	PPP adjusted GDP per capita averaged for the years 2010 to 2015.	IMF (2017).
Ease of doing business	Index of regulations and formal procedures directly affecting firms defined in terms of distance to the best-performing country, where a higher index implies greater ease of doing business.	World Bank (2017).
Employed in firms < 20 employees, %	Share of business sector employees employed in firms with fewer than 20 employees.	OECD, Structural Business Statistics.

Note: *Since the World Bank does not report self-employment for China and Taiwan, data from the ILO for the year 2013 were used for these two countries.

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