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**Working Paper**

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IFN Working Paper, No. 959

**Provided in Cooperation with:**

Research Institute of Industrial Economics (IFN), Stockholm

*Suggested Citation:* Henrekson, Magnus; Sanandaji, Tino (2013) : Billionaire Entrepreneurs: A Systematic Analysis, IFN Working Paper, No. 959, Research Institute of Industrial Economics (IFN), Stockholm

This Version is available at:

<https://hdl.handle.net/10419/81402>

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# **Billionaire Entrepreneurs: A Systematic Analysis**

Magnus Henrekson and Tino Sanandaji

# Billionaire Entrepreneurs: A Systematic Analysis<sup>\*</sup>

Magnus Henrekson and Tino Sanandaji

March 10, 2013

*Abstract:* The overwhelming majority of self-employed individuals are not entrepreneurial in the Schumpeterian sense. In order to unmistakably identify Schumpeterian entrepreneurs we focus on self-made billionaires (in USD) on *Forbes Magazine's* list who became wealthy by founding new firms. In this way we identify 996 billionaire entrepreneurs in over fifty countries in the 1996–2010 period. To our knowledge this is the first systematic cross-country study of billionaire entrepreneurs, an economically important group. We demonstrate that the common practice of relying on self-employment and related measures to proxy for entrepreneurship often gives rise to misleading inferences. Interestingly the rate of billionaire entrepreneurs per capita correlates negatively with self-employment rates. Countries with higher income, higher trust, lower taxes, more venture capital investment and lower regulatory burdens have higher entrepreneurship rates but less self-employment.

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

*Keywords:* Entrepreneurship; Innovation; Institutions; Regulation; Self-employment.

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<sup>\*</sup> Financial support from Karl-Adam Bonniers Stiftelse and from the Jan Wallander and Tom Hedelius Foundation is gratefully acknowledged. We are grateful for useful comments and suggestions on earlier versions of this paper from Zoltan Acs, Per Davidsson, Benson Honig, Scott Shane, Andrea Asoni and Dina Neiman.

## Introduction

Entrepreneurs perform a central function in the economy by carrying out innovations and exploring new ways to organize factors of production (Schumpeter 1934). They are consequently widely believed to play an important role for economic growth. The attention afforded to entrepreneurship by policy makers and academics is also rooted in historical experiences, as each wave of innovation in modern times has been associated with entrepreneurs such as James Watt, Andrew Carnegie, Henry Ford, Sam Walton and Bill Gates. Entrepreneurs have more recently been linked to firm performance using careful causal methods (Becker and Hvide 2013). Entrepreneurship theory is concerned with understanding the innovative process and with identifying policies that foster the creation of rapidly growing firms (Baumol 2002). The dominant view of entrepreneurship in the literature is arguably the Schumpeterian definition of the entrepreneur as an innovator and as a driver of growth (Hébert and Link 2006; Henrekson and Roine 2007). When academics and business leaders were asked to define entrepreneurship, the most common choices were the creation and development of new ventures followed by innovation. In contrast, “the creation of a mom-and-pop business” was not viewed as entrepreneurship (Gartner 1990). Whether or not self-employment is synonymous with entrepreneurship or not is in part a question of semantics. However since self-employment is defined by a legal employment form rather than the economic function it is not necessarily synonymous with Schumpeterian entrepreneurship.

Nevertheless, the most commonly used proxy for Schumpeterian entrepreneurship in empirical work is self-employment. There are some obvious merits to this approach, for example that self-employed individuals, just like Schumpeterian entrepreneurs, rarely work for someone else, operate a business and need to wrestle with issues such as risk, uncertainty (Knight 1921) and alertness to opportunity (Kirzner 1973). However, an overwhelming majority of self-employed individuals are not entrepreneurial in the Schumpeterian sense, as they do not bring a new innovation to the market or plan to grow their business.<sup>1</sup>

Nor do most small businesses eventually grow large. Of all the small firms with employees started in 2002, four years later 90% were either out of business or still had fewer than 5 employees. Hurst and Pugsley (2011) provide a wide range of survey evidence suggesting that the vast majority of American self-employed neither innovate nor intend to innovate, nor grow or intend to grow. Most of the small firms that do have employees are best described as permanently small rather than nascent entrepreneurial firms. Whilst this class of firms plays an important role in the economy, they are not necessarily a good testing ground for theories of entrepreneurship.

Even though there are strong reasons to believe that self-employment may be distinct from entrepreneurship, there is no dearth of articles in which self-employment or similar metrics are used as an empirical proxy for entrepreneurship. Prominent papers taking this approach include Evans and Jovanovic (1989), Evans and Leighton (1989), Holtz-Eakin et al. (1994), Blanchflower and Oswald (1998), Quadrini (1999), Carroll et al. (2000), Gentry and Hubbard (2000, 2004), Hamilton (2000), McMillan and Woodruff (2002), Moskowitz and Vissing-Jorgensen (2002), Bruce and Schutze (2004), Hurst and Lusardi (2004), Lazear (2004), Bitler et al. (2005), Djankov et al. (2006), Cagetti and De

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<sup>1</sup> In the United States, the industries with the largest concentrations of self-employed men are construction, landscaping services, auto repair, restaurants, truck transportation, and crop production (farmers). For women, the corresponding industries are private households (cooks, maids, caretakers), child day care services, services to buildings (janitors and cleaners), restaurants and beauty salons.

Nardi (2006, 2009), Guiso et al. (2006), Paulson et al. (2006), Ardagna and Lusardi (2008), Kitao (2008), Glaeser (2010), Glaeser and Kerr (2009) and Djankov et al. (2010).

Shane (2008) argues that necessity driven and opportunity entrepreneurs should be treated separately, documenting a wide range of differences between the two categories. He further shows that there is a negative cross-country correlation between having many high-expectation startups and many low-expectation startups.

Hurst and Pugsley (2011) argue forcefully against using self-employment as synonymous with entrepreneurship. They point out that when new American startups were asked by the Panel Survey of Entrepreneurial Dynamics about growth ambitions, 75% of respondents state that “I want a size I can manage myself or with a few key employees”. Based on the PSED and the Kaufman Firm Survey, Hurst and Pugsley estimate that only 10–20% of small businesses report any innovative activity at all.

The aim of this paper is to propose a new measure of high-impact Schumpeterian entrepreneurship, and to contrast this new measure to self-employment (and similar metrics) as empirical proxies for entrepreneurship. In order to investigate the consequences of using self-employment to proxy for entrepreneurship we assembled a dataset using information from the *Forbes Magazine* world-wide list of billionaires between 1996 and 2010. For each billionaire, additional information was gathered on the source of wealth, allowing us to identify 996 individuals who became rich by founding new firms. Using these individuals to construct a per capita rate of entrepreneurship, we show that this measure is negatively correlated with self-employment rates. Countries with higher per capita GDP, lower taxes and fewer regulations on startups have higher entrepreneurship rates but less self-employment. Two additional cross-country proxies plus some further observations for U.S. billionaires point in the same direction. Thus, the bias of self-employment as a proxy for entrepreneurship is so strong that, in several important applications, self-employment and our measure of entrepreneurship correlate in opposite ways to key economic and institutional variables.

The paper is organized as follows. Section 2 describes the method used to construct the datasets. Section 3 sketches a theoretical framework for understanding the differences between self-employment and entrepreneurship. Section 4 reports and discusses the main empirical findings of the paper. Section 5 concludes with a discussion of the most important implications of our findings.

## 2 The Data

Entrepreneurship researchers have exhibited considerable ingenuity in tackling the methodological problem of distinguishing the self-employed from Schumpeterian entrepreneurs. One strategy has been to study new firms, another has been to restrict attention to “high-impact entrepreneurs” (Leibenstein 1968; Acs 2008). The original empirical attempts defined high-impact entrepreneurship based on revenue growth (Birch 1982). In recent years the most commonly used definition is employment growth, with the rapidly growing firms often referred to as “gazelles” (Acs and Mueller 2008; Henrekson and Johansson 2010).<sup>2</sup> We measure high-impact entrepreneurship based on the

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<sup>2</sup> OECD (2009a) presents several types of measures which can arguably be used to estimate entrepreneurship. The measures which correspond most closely to entrepreneurship rates are the share of gazelles and high growth firms. Alas, data for these measures are available for a small number of countries only. In the future, these data-sources will hopefully become developed and standardized enough to allow cross-country

amount of personal wealth created. The cross-country measure of entrepreneurship is determined based on counting the number of dollar billionaires who acquired their wealth by starting their own business.

## 2.1 A Cross-Country Measure of Entrepreneurship

*Forbes Magazine* annually compiles a list of the world's billionaires known as "The World's Billionaires". Our primary cross-country measure of entrepreneurship is constructed from all individual billionaires who appeared on the annual list at least once between 1996 and 2010. In total, there were 1,723 unique such individuals. Some of these individuals cannot be plausibly be categorized as entrepreneurs, because they did not acquire their wealth by starting a company. Excluding individuals who did not acquire their wealth by starting a company leaves 996 billionaires from a total of 53 countries.

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 allowed us to exclude individuals with inherited wealth, or non-entrepreneurial billionaires from the sample. If the description by *Forbes* were not sufficient to determine the entrepreneurial status, online sources, usually *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 carried out. 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. Out of the 1,723 billionaires, we were unable to find sufficient information on 29 individuals. These individuals were classified as non-entrepreneurs, but additional analyses treating them as entrepreneurs yielded substantively identical results. *Forbes* reports the country of citizenship and the country of residence for each individual. This information was supplemented with data on country of birth. When no information on country of birth could be found the individual's country of birth was assumed to be the same as his or her citizenship.

A majority of the world's entrepreneurs, 58%, did in fact acquire their wealth by starting a business. The figure is lower in Europe, 42%, than in the U.S., where 65% of the dollar billionaires are entrepreneurs.<sup>3</sup> Most of the billionaires who were not categorized as entrepreneurs acquired their wealth through bequests, and in many cases these bequests reflected the entrepreneurial successes of the previous generation. Moreover, many of the non-entrepreneurial CEOs who make the list of the world's richest were hired by entrepreneurial startups, such as Microsoft's Steve Ballmer. These individuals are not defined as entrepreneurs, since they did not found the company. Other non-entrepreneurial billionaires includes traders in the financial sector, corporate CEOs, law firm partners and writers/entertainers whose wealth exceeds the one billion dollar threshold. In the rare cases where the source of wealth could not be determined in any way, the individual was coded as a non-entrepreneur.

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comparison of entrepreneurship rates, especially if owner-managed firms are separated from firms with hired management.

<sup>3</sup> Acs and Szerb (2009) construct a cross-country index based on attitudes of the population towards entrepreneurship and the aspirations of business founders. 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.

This is to our knowledge the first study that attempts to estimate high-impact entrepreneurship through the accumulation of wealth for founders of new business ventures. This measure has the advantage of enabling us to create a cross-country measure of high-impact entrepreneurship. Other cross-country measures of entrepreneurship generally rely on various estimates of self-employment or entry into self-employment. This measure of entrepreneurship can be criticized on a number of counts. A first potential problem is that one billion dollars is an excessively high threshold, as many successful entrepreneurs will thereby be inadvertently excluded as a consequence. The choice of this threshold is entirely due to data limitations. Hopefully the extreme tail of the distribution tells us something also about the mean; a country with many more exceptional entrepreneurs is likely to have more “ordinary” entrepreneurs as well. Furthermore, while the billionaire entrepreneurs are few, they are disproportionately important, representing many of the most valuable, innovative and influential firms created.

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, 34 are firms founded by entrepreneurs in the post war era.<sup>4</sup> Among these firms half were founded by billionaire entrepreneurs on our list. A similar share of the founders of the largest new entrepreneurial firms in Europe and Japan are on our list of billionaires. The fact that billionaire entrepreneurs are rare reflects the fact that successful Schumpeterian entrepreneurship that leads to large new firms is a rare phenomenon.

Similarly, venture capital (VC) funding only goes to around one to two thousand American firms every year. However, among the firms that are extremely successful and at some point are able to go public through an IPO, roughly two thirds received VC funding (Kaplan and Lerner 2010). This means that the subsample of firms that receive VC funding includes the majority of high-potential entrepreneurial firms. Receiving Venture capital funding is a reasonable (though of course incomplete) proxy that a firm is entrepreneurial.

One limitation of our study is that we are only able to measure Schumpeterian entrepreneurship *ex post* in the form of successful entrepreneurship. We cannot observe how many individuals attempted to start new firms. We believe it most plausible that entrepreneurial attempts and entrepreneurial success are positively correlated across countries. From the point of view of policymakers, the end results in the form of large new firms is likely more important than the number of failed attempts, though for other purposes both may be equally important. In practice, separating Schumpeterian entrepreneurship from non-entrepreneurial self-employment is easy *ex post*, but quite difficult in the early stage of startups.

Merely about three percent of American firms seek VC funding, yet as noted above two thirds of entrepreneurial firms that are successful enough to go through an IPO received VC funding at some point in their lifecycle. This indicates that obtaining VC funding is a reasonable *ex ante* proxy for being a high-potential entrepreneurial firm. As we will show, VC investment as a share of GDP and billionaire entrepreneurship rates correlate very strongly. This suggests that *ex ante* and *ex post* measures of Schumpeterian entrepreneurship rates are in close correspondence.

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<sup>4</sup> Own calculations based on *Forbes Magazine's* list of largest firms.

## 2.2 A Complementary Measure of Entrepreneurship

To examine the robustness of the results, we also consider another cross-country measure of entrepreneurship. This is VC investment as a share of GDP, calculated by from Lerner and Tåg (2013). VC investments typically go to innovative and growth oriented firms (Kaplan and Lerner 2010). For this reason VC investment as a share of GDP can be used to approximate how entrepreneurial a country is. One problem with this measure is that not all entrepreneurial firms receive VC, and that the size of this sector also depends on how financially sophisticated a country is. VC investment as a share of GDP strongly correlates with per capita billionaire entrepreneurs ( $r = 0.83$ ). The correlation remains high and statistically significant when controlling for per capita income.

Both measures demonstrate the large differences in entrepreneurship rates between the United States and Western Europe. The number of billionaire entrepreneurs per capita is approximately five times higher in the United States than in Western Europe, defined as the 15 core EU members. VC investment as a share of GDP is nearly seven times higher in the United States than in Western Europe. By contrast, the self-employment rate is twice as high in Western Europe.

## 2.3 Independent Variables

For all countries in our dataset with more than one million inhabitants we gather data on per capita income, business regulation and taxes. Data on population and purchasing power adjusted per capita income rates for the year 2009 were obtained from the International Monetary Fund (IMF 2009). To measure national self-employment, we used non-agricultural self-employment rates from the OECD (2009b) for the year 2000, which was the latest year for which a standardized measure was reported. For non-OECD countries, we use data from the most recent year for which ILO data were available (mostly 2007 or 2008). It should be noted that since self-employment rates are stable over time our empirical estimates are not sensitive to the exact year used. The data on trust levels are adapted from Bengtsson et al. (2008), who in turn use information from the World Value Survey.

The data on business regulation were collected from two sources. For 28 developed countries, the OECD has constructed an index measure referred to as “Administrative burdens on corporations and sole proprietor start-ups”, as well as a measure of employment protection regulation (OECD 2005). For most nations in the world the World Bank estimates the ranking of “the ease of doing business” (World Bank 2010). A low number on the ranking implies more favorable, usually less complex (simpler), regulations for businesses. The corporate tax data are from the same source. To estimate the tax burden imposed on firms we use the standard statutory corporate tax rate in 2009.

We may note some further potential limitations of these measures of entrepreneurship. First, entrepreneurship need not be productive, as emphasized by Baumol (1990) and Murphy et al. (1991), and as illustrated by events during the economic transition in Russia. This concern is especially pressing in countries with weak institutional environments. As noted, the theoretical definition we aim to capture in this paper is innovation and or growth in new firms, while the empirical strategy uses the accumulation of extraordinary wealth through the founding of new firms. None of these definitions necessarily signify that the activity is socially valuable. Since most of the entrepreneurs and much of the focus is on industrialized countries with institutions that reward wealth creation rather than rent seeking or predation, this is hopefully a secondary concern. A careful inspection of



the companies reveals that the incidence of billionaires who acquired their resources through predation rather than innovative/productive entrepreneurship is very low. All the main results of this paper hold when the sample is restricted to the OECD countries.

Yet another concern is that successful entrepreneurship is measured *ex post*, having no data on the *ex ante* attempts to enter into entrepreneurship. Since much of the focus in the research is on entrepreneurship policy, a partial defense is that what matters most is in fact the final number of successful new firms, while the intermediate steps (are there more successful firms because more people had incentives to enter entrepreneurship or because more of the entrants succeeded?) are likely to be of secondary importance.

## 3 Theory

### 3.1 Previous Literature

The empirical regularity that self-employment is negatively related to economic development both across countries and over time is well established (e.g., Kuznets 1966), although the reasons are not fully understood. In his seminal paper Lucas (1978) pointed to the tendency of more advanced economies to have larger firms and less self-employment, as a result of increased capital intensity.<sup>5</sup> Carree et al. (2002), Wennekers et al. (2005) and Wennekers et al. (2010) are examples of a line of literature that instead argue that the relationship between entrepreneurship and economic development is U-shaped, using self-employment or business ownership as proxies for entrepreneurship.

There are a number of theoretical studies in macroeconomics where the implication for productivity and entrepreneurship are investigated by means of occupational choice models with financial friction. Quadrini (2009) provides a recent review of this literature as well as more generally of the macro entrepreneurship approach. Jeong and Townsend (2007) uses a two sector model where the self-employed in the undeveloped sector may remain small because of lack of access to capital. Amaral and Quintin (2010) show in simulations that financial frictions can reduce the average plant size. Quintin (2008) similarly finds that a lack of contract enforcement can help explain the difference in establishment size between the U.S. and Latin America. Buera et al. (2011) and Antunes et al. (2008a, 2008b) are closest to the model used here, and show that financial imperfections can influence the mean and dispersion of the skill in entrepreneurial ventures as well as firm size. When financial frictions decrease, those entrepreneurs who are best at managing firms get to operate them, raising output, raising the average establishment size and raising wage levels. While many of the theoretical predictions are consistent with our findings, none of these studies distinguish between entrepreneurs and self-employed or provide data on entrepreneurship levels.

Stenholm et al. (2013) review different cross-country measures of entrepreneurship. Based on their preferred metrics, they find that the institutional environment not only affects the amount of

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<sup>5</sup> The Lucas result relies on an elasticity of substitution between capital and labor strictly less than one, and would thus not hold if a standard Cobb-Douglas production function is used. While many studies of the elasticity of substitution find values lower than one, others find values close to one or occasionally even higher (Chirinko 2002; Antrás 2004; Léon-Ledesma et al. 2010). The long-run elasticities are likely to be higher than the values estimated empirically, which makes this mechanism a less likely general explanation of the decline of self-employment in advanced countries.

entrepreneurial activity, but also its quality. The policies that lead to more high impact entrepreneurship are not the same as policies that produce a large number of imitative self-employed firms.

Samuelsson and Davidsson (2009) rely on a Swedish panel data set and use careful methods to separate innovative firms from imitative firms. They find major differences between these two classes of firms. This includes human capital, social capital and the venture creation process. Interestingly theories developed for entrepreneurial companies fit the behavior of innovative firms more than the behavior of the far larger class of imitative firms.

Tåg et al. (2013) also rely on Swedish data and demonstrate that conditional on size, workers in less hierarchical firms are more likely to create a new business. Separating between entrepreneurs (limited liability firms) and the self-employed (closely-held full liability firms) they find substantially stronger effects for entrepreneurs than for the self-employed. This again underscores the importance of separating between these two types of business creators.

Sanandaji and Leeson (2013) link the per capita number of billionaire entrepreneurs and self-employment to institutional variables across countries, including property rights protection, legal origin and the Economic Freedom Index. Countries with strong property right protection, higher economic freedom and English legal origins are found to have a higher number of billionaire entrepreneurs per capita but lower self-employment.

### **3.2 How Entrepreneurship Reduces Self-Employment**

Former JC Penney employee and retail franchise operator Sam Walton founded Walmart in 1962, when his idea for establishing discount stores in small town America was rejected by his employer. By 1985 Sam Walton was the richest man in America according to the *Forbes Magazine* ranking. Walmart grew to be the largest private employer in the world, and has been estimated to have contributed to a non-negligible share of productivity growth in recent years (Johnson 2002; Hausman and Leibtag 2009). The Walmart story illustrates the impact that creative entrepreneurship can have on self-employment rates. Its growth was accompanied by, and indeed required, the replacement of thousands of smaller mom-and pop retail operations (Stone 1995; Basker 2005; Jia 2008). Between 1963 and 2002, when the U.S. population increased by 53%, the number of single-store retailers in the U.S. declined by over half (Basker 2007).<sup>6</sup>

This pattern is not unique to Walmart; firms such as Home Depot, Gap, Ikea, H&M and Amazon have similarly reduced the number of self-employed in their industry. Nor is the process unique to the retail sector. Starbucks replace operations that before their entry, and in other countries where they have not yet entered, are managed by a multitude of self-employed. Even the growth of firms such as Intel, Microsoft and Google, which do not directly compete with a large number of small businesses, reduce self-employment. In their case the mechanism is offering better career prospects

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<sup>6</sup> Baumol (2010) argues that small firms and entrepreneurial firms have different roles regarding job creation. The net job creation of small employers is less cyclical than large firms (Moscarini and Postel-Vinay 2012). Therefore small firms are disproportionately important for net employment growth during economic downturns, while high growth entrepreneurial firms contribute most to long run job creation.

for employees, thus raising the opportunity cost of self-employment.<sup>7</sup> It is natural that entrepreneurship reduces the small-business share of employment, since each successful entrepreneurial venture results in an increase in the number of large firms. In the process of bringing new innovations to the market, entrepreneurs typically (according to some by definition) create entirely new organizations with thousands of new high paying jobs, some of which are filled by people who otherwise would work for themselves. The effect is even stronger if the entrepreneurial firm directly competes with small businesses and reduces their share of the product market.<sup>8</sup>

This reverse relationship between entrepreneurship and self-employment only appears paradoxical if entrepreneurship is defined as merely the contractual form of working for oneself. If entrepreneurs are instead viewed as individuals engaged in innovation and the creation of new firms, and self-employment is viewed as a general ownership solution for a broad range of motivations, the process is quite natural. Examples of non-entrepreneurial impetus for self-employment include a preference for being one's own boss (Hurst and Pugsley 2011; Blanchflower and Oswald 1998), solving agency problems in offering your skills and services (Bitler et. al 2005), better monitoring of employees (Marshall 1920), and evading taxes and regulations (Slemrod and Bakija 2008). Entrepreneurship is one of the mechanisms through which firms with valuable innovations or firms that are more efficiently organized than their competitors in the product and labor markets grow their share of the economy. As these firms expand they replace and absorb the previously self-employed by providing better options. This simultaneously results in a more prosperous economy and a lower rate of self-employment.

The empirical measure in this paper captures high-impact entrepreneurship in recent history, requiring the founder to be alive in 1996 or later. Needless to say, most of today's large public firms were entrepreneurial at some point in history. However firms that were entrepreneurial a long time ago and now rely on employed managers cannot be meaningfully referred to as entrepreneurial.

### **3.3 Asymmetric Policy Effects on Self-Employment and Entrepreneurship**

The theoretical relationship between entrepreneurship and taxation is not unambiguous (Henrekson and Sanandaji 2011). The classical finding of Domar and Musgrave (1944) is that when losses are fully deductible taxes can stimulate risk taking activities by compressing the distribution of after-tax returns of the marginal investment. However, because of the risk for abuse and moral hazard no real-world tax system offers full loss offsets. Moreover, not only taxes on entrepreneurship matter, but the relative tax rate between running a business and working as an employee. Most tax systems are

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<sup>7</sup> It is also possible for entrepreneurial firms to increase self-employment as an indirect result of technological innovations. Information technology, for example, appears to have lowered the costs of operating a small, independent business. However, this indirect effect is ambiguous and may just as well go the other way when the introduction of new technology lowers transaction costs within large organizations. Another way in which it appears that entrepreneurship can increase self-employment is by creating franchises. However, franchises so far constitute a negligible share of self-employment rates (Price Waterhouse Coopers 2011). Finally, we note that the net job creation of small employers is less cyclical than for large firms (Moscarini and Postel-Vinay 2012; Baumol 2010). Therefore small firms are disproportionately important for net employment growth during economic downturns, while high growth entrepreneurial firms contribute the most to long-run job creation.

<sup>8</sup> Drawing on Antunes et al. (2008), Sanandaji (2011) develops a general equilibrium occupational choice model with heterogeneous managerial ability and financial frictions. This model is consistent with the empirical findings in this paper.

progressive and tax entrepreneurship more than employed work due to the higher dispersion in entrepreneurial returns compared to labor earnings.<sup>9</sup>

The story is complicated by the well documented ability of small businesses to evade taxes far more than average (Slemrod and Bakija 2008; Engström and Holmlund 2009; Hurst et al. 2011). Tax evasion is closely related to firm size. As the company grows an ever smaller share of firm income can be used for personal consumption, while the probability of tax audits increases. Empirical evidence suggests that taxes stimulate self-employment, either because the self-employed face lower taxes than employees or because self-employment makes it easier to evade taxes (Gordon and MacKie-Mason 1994; Gordon 1998; Bruce 2000; Cullen and Gordon 2002). There is no evidence, however, that large, successful entrepreneurial firms evade taxes at above average rates. Instead Chen et al. (2010) show that public American firms controlled by the founders or their family members – a little less than one half of all public firms – are less tax aggressive than widely held firms.<sup>10</sup> There are therefore reasons to expect that taxes combined with the differential opportunities for evasion increase small scale self-employment while reducing innovative entrepreneurship. Since the self-employed are the overwhelming majority of the observations in micro datasets, they will dominate the result of any empirical estimation that does not distinguish between the self-employed and entrepreneurs, giving rise to spurious results for that subsample.

General equilibrium considerations add another possible mechanism through which taxes could be related to self-employment and entrepreneurship in opposite ways. As noted, new entrepreneurial firms offer more productive work opportunities and reduce the relative attractiveness of remaining self-employed. The same is true for expanding publicly controlled firms, which are affected by profit taxes similar to entrepreneurial firms. If taxes decrease the likelihood that new entrepreneurial firms emerge and reorganize the economy or limit the expansion of large public firms, countries with higher profit taxes can be expected to have a greater number of less efficient self-employed firms. Hence, in general equilibrium not only the tax faced by the individual determines the entry decision, but also the tax rates imposed on other potential entrepreneurs, particularly the most talented ones.

The relationship between regulations, self-employment and entrepreneurship is in many ways similar to taxes. Because self-employment does not go through formal contracts, they can more easily evade regulations than employees of large firms. Furthermore, in most countries small firms below a certain threshold are exempt from many burdensome regulations. In particular, the onerous labor protection rights many countries impose on firms larger than a certain size. For example, many important statutes of the 2010 health care reform act in the U.S. depend on firm size. Smaller firms alone receive some benefits, while many demands are made only on firms that grow beyond a certain size. A heavy regulatory burden can in this way reduce entrepreneurship centered on bringing a particular innovation to the market, while making it more lucrative to conduct a non-entrepreneurial activity as self-employed rather than as an employee of a large regulated firm. Again similar to taxes, general equilibrium effects can lead regulations to increase self-employment in small

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<sup>9</sup> Whenever discussing entrepreneurial innovation and taxes it is very important to keep in mind the high risk of failure. Entrepreneurship is by its very nature associated with a high risk of failure, and a small chance of success. Taxes matter in this tournament setting by reducing the expected value of success. Persson and Sandmo (2005) show that taxes even on exceptionally high earnings can reduce effort, if the probability of obtaining those earnings is small.

<sup>10</sup> As shown by Holderness (2009), dispersed ownership and management control is less common than generally believed among U.S. public firms.

unproductive firms precisely because they reduce innovative entrepreneurship and impede the growth of larger companies.

## 4 Results

### 4.1 Cross-Country Evidence on Self-Employment and Entrepreneurship

Figure 1a displays the rate of non-agricultural self-employment as measured by the OECD in 2008. Mexico, Greece, Italy, South Korea, Turkey and Portugal stand out as the countries with the highest rates of self-employment. Close to one third of the workforce is self-employed in these countries. By contrast, the U.S. has the second lowest self-employment rate among developed nations. The average rate of self-employment in Western Europe is twice that of the U.S. Figure 1b instead shows the number of billionaire entrepreneurs per million inhabitants for the same countries (henceforth referred to as the rate of entrepreneurship). Hong Kong, Israel, the U.S. and Singapore stand out as particularly entrepreneurial, while Western Europe and Japan have a comparatively low number of high-impact entrepreneurs per capita. Considering the fact that self-employment is often used as a measure of entrepreneurship, the results in Figure 1c, which plots the national self-employment rates against the entrepreneurship rates, are quite remarkable. Entrepreneurship and self-employment rates among OECD countries are negatively related.<sup>11</sup>

We argue that the primary channel behind this reverse relationship is the opposite ways in which self-employment and entrepreneurship are related to economic development and to the institutional environment. Countries with better institutions and more business friendly policies have fewer self-employed and more entrepreneurs. Consistent with this proposed mechanism, Figure 1d shows that self-employment is strongly negatively linked to per capita income levels among the OECD countries.<sup>12</sup> Figure 1e shows the correlation between per capita number of billionaire entrepreneurs and income per capita.

Figure 1a–1d

The patterns observed for wealthy countries also hold for the full sample of nations: entrepreneurship is positively related to per capita income levels (Figure 2a) and self-employment is negatively linked to per capita income levels (Figure 2b). Figure 2c differs from Figure 2b by instead using the log of per capita income. Figure 2d plots self-employment and entrepreneurship rates for all available countries, again demonstrating a negative relationship that appears to be close to linear with regard to the log of per capita income.<sup>13</sup>

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<sup>11</sup> The linear relationships between the variables in Figures 1c–5b are all statistically significant at the 10% level or better.

<sup>12</sup> The negative relationship between per capita income and self-employment is robust to only including self-employment in the manufacturing sector, in order to make sure that shifts in sector compositions alone are not driving the results.

<sup>13</sup> It has sometimes been argued that self-employment rates in the U.S. have witnessed a revival (e.g., Carree and Thurik 2005). If true, that would eventually lead to a reversal of the negative relationship between self-employment and economic development. The argument is that while self-employment relates negatively with development in poor countries, self-employment in wealthy countries is different (more entrepreneurial) in nature, and after a threshold positively linked to income levels. We find little evidence for this view. According

#### Figure 2a–2d

One alternative to relying on self-employment when attempting to capture truly entrepreneurial activity that has been used increasingly by researchers is to focus on VC-backed firms. Clearly far from all entrepreneurial firms use venture capital, but in countries with a well-developed financial sector such as the U.S., a significant share of the most important ones do. Over 60 percent of firms that made an IPO between 1999 and 2009 were VC-backed (Kaplan and Lerner 2010). Such firms deserve particular attention from economists as they are far more likely to be innovative, far more likely to grow, and far more likely to correspond to theories of entrepreneurial behavior. Figure 3a shows the correlation between VC investment as a share of GDP and the per capita number of billionaire entrepreneurs, which as previously mentioned correlate positively. Figure 3b plots the statistically significant negative correlation between self-employment rates and VC investment as a share of GDP.

#### Figure 3a and 3b

Figure 4a reports one of the more surprising findings of this paper, which is that the OECD index of regulatory burdens, “Administrative burdens on corporations and sole proprietor start-ups” (OECD 2005), is positively associated with self-employment. Countries where starting a new firm is more difficult have higher rates of self-employment. Meanwhile entrepreneurship is negatively linked with the regulatory burden on start-ups (Figure 4b).

#### Figure 4a and 4b

One possible explanation is that regulation on startups also correlates positively with labor market regulations, which are driving the results. However, the positive association between self-employment and regulation on startups remains – with the coefficient virtually unchanged – if the degree of employment protection regulation measured by the OECD is controlled for. Other potential explanations are evasion and general equilibrium effects through lower entrepreneurship. In highly regulated countries, the self-employed may choose not to expand and thereby continue to operate under the regulatory radar. While in countries with less burdensome regulations employment in entrepreneurial firms and large public firms is likely to be larger, thus crowding out low productivity self-employment.

Similarly, when the level of trust in a society is low, it becomes more important to monitor employees closely or rely on your own or kin labor, which encourages self-employment. When hired employees cannot be trusted entrepreneurs will have a difficult time growing their firms rapidly around innovative ideas. Alfred Marshall (1920, p. 284) anticipated this advantage of small firms: “the master’s eye is everywhere; there is no shirking by his foremen or workmen, no divided responsibility, no sending half-understood messages.” Figures 5a and 5b show that, in countries where trust is low, self-employment is high whereas entrepreneurship is low, and vice versa. High trust could also affect the levels of entrepreneurship and self-employment by reducing agency problems in the financial sector (Guiso et al. 2004).

#### Figure 5a and 5b

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to the BLS, the American non-agricultural self-employment rate in 2008 was 6.4%, the lowest figure in U.S. history.

Table 1 and 2 relate some of the correlations indicated in the figures in a more systematic way to self-employment and entrepreneurship rates in the 90 countries for which we have data for all variables of interest. These countries represent over 80% of world GDP. Table 1 reports the association between self-employment rates, per capita income, the standard corporate tax rate and the regulatory burden on firms. Since the OECD only provides data on regulation for developed countries, the measure of regulation used is the ranking on the World Bank's "ease of doing business" index. Higher numbers imply a lower ranking and therefore a less favorable regulatory environment.

#### Table 1 and 2

The central problem with cross-country regressions is omitted variable bias. There exists no clear-cut theory determining which variables one should be included in the regressions, and many variables that help determine the result are certainly missing. The claim that background variables such as taxes are causally linked to self-employment and entrepreneurship can therefore not be made with any confidence. But making such claims is not the focus of this paper. Our argument is instead that several important variables are related in opposite ways to self-employment and entrepreneurship rates.

High taxes on firm profit and regulations are hence associated with higher self-employment. One explanation could be that countries with higher profit tax rates have even higher taxes on employment, driving the results due to the tendency of the self-employed to more easily evade taxes. Another possibility in line with the argument put forward in this paper is that the high profit taxes on entrepreneurial firms and on large public firms discourage economic activity by this class of companies. Higher rates lower the relative attractiveness of being employed in a firm that pays the profit tax rather than working for oneself and not paying the tax fully or at all.

Table 3 relates VC investment as a share of GDP to per capita income, tax rates and regulations on business. As our main measure of entrepreneurship, VC-investments are positively and statistically significantly related to per capita income. The VC-investments are also negatively associated with tax rates and the regulatory burden. However, the estimates are not statistically significant.

#### Table 3

In an influential study Acemoglu et al. (2001) used colonial mortality rates as an instrument for economic development. The idea was that higher mortality rates created more extractive institutions whereas colonies with lower mortality rates created institutions with better property right protection. If so, mortality rates can be used as an instrument for institutional quality. We use the same measure of institutional quality as Acemoglu et al., namely expropriation risk. The same instrument (colonial mortality rates) is used to estimate the causal effect of institutional quality to entrepreneurship and self-employment. Table 4 and 5 shows that higher quality institutions lower self-employment, while raising entrepreneurship, either directly or indirectly through higher economic development

#### Table 4 and 5

## 4.2 Do Startup Rates, Rates of Business Ownership or Firm Density Rates Measure Entrepreneurship?

The problems with using self-employment to measure entrepreneurship have long been recognized. In response to these problems researchers have devised new empirical measures, such as participation in startups and the rate of business ownership. A prime example is the Global Entrepreneurship Monitor, a multi-country research effort which provides detailed cross-country data on the share of the population that participated in a business startup during the last 3.5 years. This has been used to support a U-shaped relationship between entrepreneurship and economic development (e.g., Reynolds et al. 2002, Wennekers and Thurik 1999, and Carree and Thurik 2005).

While the GEM approach is superior to self-employment, the standard GEM measure for "nascent entrepreneurship" (TEA) is nevertheless a measure of starting a small business, regardless of whether the firm brings a new innovation to the market or otherwise has growth potential. Rather than entrepreneurship, the aggregate GEM figures are more appropriately interpreted as a measure of the flow into the stock of self-employment. Relying on the GEM estimates leads to counterintuitive results, such as the Republic of Yemen having the highest rate of entrepreneurship of all countries (Bosma and Levie 2010). Not surprisingly, the GEM startup rates correlate strongly positively ( $r = 0.72$ ) with the non-agricultural self-employment rate. By contrast, the GEM measure correlates negatively with our measure of high-impact entrepreneurship ( $r = -0.32$ ).

In addition to TEA, the GEM provides other measures which correspond more closely to high-impact entrepreneurship. One such measure is "high-growth entrepreneurship", the share of the population which owns a firm with at least 20 employees. While it is not established that the owner in fact founded the firm, this measure excludes the smallest type of firms. This measure correlated positively and significantly with per capita billionaire entrepreneurs ( $r = 0.49$ ) and negatively and significantly with self-employment ( $r = -0.35$ ). Koellinger (2008) has attempted to separate innovative from non-innovative business startups in the GEM data, finding that startups with few competitors and with new products differ from the rest.

Since most new businesses do not aim at innovation and lack the potential for growth, relying on startup rates or the rates of business ownership instead of self-employment does not solve the problem. Over three quarters of American firms never hire anyone and likely never intended to hire anyone; they exist for other reasons. Using business ownership also entails some additional problems. Rich individuals are more likely to own firms for tax purposes and as investment vehicles. This can lead to the spurious conclusion that more firms *cause* higher growth and wealth levels. Entrepreneurship theory is based on individuals who combine effort and ownership, and therefore constitutes (at best) an imperfect theory for explaining the passive investment patterns of the rich. Over a third of American private firm equity is owned by people other than the manager (Moskowitz and Vissing-Jorgensen 2002).

Table 6 shows correlation between the self-employment rate and six different proxies for entrepreneurship plus GDP per capita. The six alternative measures of entrepreneurship included are: (i) the business ownership rate, namely the share of the workforce who owns a business for the year 2007 (OECD 2011); (ii) employment in firms with less than 10 employees as a share of total employment in 2007 (OECD 2011); (iii) the birth rate of employer enterprises for the years 2005–2007 (OECD 2011); (iv) the widely used GEM Total Entrepreneurial Activity (TEA) measure for the



years 2001–2010; (v) the rate of billionaire entrepreneurship per capita; and (vi) VC investment as a share of GDP.

It is clear from Table 6 that the measures can be grouped into two categories. One category consists of the rate of billionaire entrepreneurship per capita, VC investment as a share of GDP and per capita GDP. These three measures are negatively related to self-employment. The second category consists of four conceptually related measures: the business ownership rate, the small firm employment share, the birth rate of employer enterprises and the TEA measure. These four measures correlate positively with self-employment. One may also note an extremely strong positive correlation between TEA and the business ownership rate ( $r = 0.89$ ). This suggests that the problem of self-employment being a poor proxy for Schumpeterian entrepreneurship is not solved by using empirical metrics conceptually related to the self-employment rate, such as the TEA or the business ownership rate.

Table 6

### 4.3 Other findings

Silicon Valley, Boston and the New York metropolitan area are often identified as having above average rates of entrepreneurial activity (e.g., Lerner 2009). Indeed New York State, Massachusetts and California are highly over-represented in the number of billionaire entrepreneurs per capita, accounting for close to half of all of America's entrepreneurs. It is therefore interesting to investigate how common metrics of entrepreneurship perform in identifying entrepreneurial activity in these areas. Compared to the national average these regions had a lower self-employment rate, lower firm density, a lower share of employment in firms with less than 20 employees and a higher share of employment in firms with more than 500 employees (own calculations based on data from Small Business Administration 2007 and Current Population Survey 2008). The main exception is New York City, which has above average rates of firm registration per capita, perhaps because of its role as a commercial center.

An interesting finding of this study is that the overwhelming share of earned top wealth in developed countries is earned through entrepreneurship rather than through employment. This includes billionaires who became rich in the financial sector, all of whom are founders rather than employees of companies in the financial industry. In contrast to the average wealth of 2.4 billion for American entrepreneurs the average pay of the 100 top-earning CEOs in the U.S. in 2003 was 23 million dollars per year (Picketty and Saez 2007). The fact that such a high share of billionaires became rich through starting their own business rather than working for someone else indicates that there are fundamental economic forces at work. In the market for top talent, retaining residual ownership rights seems crucial. Labor market contracts, even combined with stock options and bonus systems, simply do not appear powerful enough to fully handle the agency problems associated with earning top wealth created through entrepreneurship. It appears that, for fundamental economic reasons, radical innovation and the creation of exceptional personal wealth is disproportionately carried out in new rather than pre-existing firms, and through retention of ownership rights, rather than as employees of others.

Not surprisingly the billionaire entrepreneurs, an extremely select group, differ in education from the self-employed. Even including the many college dropouts, only 16% of billionaire entrepreneurs lack a college degree, compared to 53% of the self-employed and 54% of salaried workers. Interestingly,

45% of the billionaire entrepreneurs have an advanced degree (5 percentage points of which are PhDs), compared to 14% of the self-employed and 13% of salaried workers (about 1 percentage points of which are PhDs).<sup>14</sup>

## 5. Conclusions

Despite decades of academic research Schumpeterian entrepreneurship remains an elusive concept, difficult to define and harder yet to measure. Researchers have therefore habitually used self-employment rates to proxy for entrepreneurship. Since the self-employed, just like entrepreneurs, expose themselves to risks and manage their own business, and since data on self-employment are more readily available, this approach has a certain appeal. We show that in several respects, this empirical practice results in misleading inferences not just about the magnitude of statistical relationships, but also about their signs.

The different – indeed opposite – expected impact of policy variables on rates of self-employment and Schumpeterian entrepreneurship is therefore likely to produce misleading results if self-employment is used as a proxy. This can, for example, be the case when evaluating the impact of taxes and regulation, when attempting to measure the return to entrepreneurship and when assessing the entrepreneurship rates of immigrants. Once it is recognized that self-employment and Schumpeterian entrepreneurship often respond very differently to policy changes, it calls for a reevaluation of entire strands of research. For example, the empirical finding that tax rates to increase self-employment (e.g., Schuetz and Bruce 2004) can no longer be interpreted as relevant to the question of how tax policy affects entrepreneurship. This insight goes further than policy alone, and has implications for the economics of entrepreneurship in general. The empirical finding that the self-employed do not earn more than the employed (e.g., Hamilton 2000) does not imply that entrepreneurship has no economic premium, and the higher rate of self-employment among U.S. immigrants does not imply that immigrants are more likely to create high-growth firms. Taken as a whole these findings suggest that self-employment and Schumpeterian entrepreneurship are two distinct phenomena, explained by different forces and associated with different outcomes. Researchers and policy-makers are well advised not to treat self-employment as tantamount to innovative and growth oriented entrepreneurship.

Instead, a strong case can be made that researchers should use a definition of entrepreneurship which is based on innovation broadly construed, as this is closer to how the concept is defined in entrepreneurship theory. Such a definition resonates with the implicit definition used by policy makers who express an interest in entrepreneurship research. What policymakers hope will emerge from the academic study of entrepreneurship is of course knowledge about how to spur technological progress through entrepreneurship policies. For example, the European Commission states that the aim of promoting entrepreneurship is “economic growth, innovation [and] employment” (EU Commission 2012). When entrepreneurship is defined as self-employment, it makes sense to view entrepreneurship policy and so called SME policies – which seek to encourage the formation of small and medium size enterprises – as essentially interchangeable terms. We argue that such an approach obscures a potentially important policy tradeoff; some policies may well

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<sup>14</sup> The sources for the percentages in this paragraph are our own Billionaire database and own calculations based on data from the American Community Survey (ACS).

encourage the formation of small businesses, whilst simultaneously *dampening* entrepreneurship rates.

Recognizing the theoretical and empirical differences between the two concepts, more effort should now go into analyzing them separately. The point is decidedly not that Schumpeterian entrepreneurs are important while the self-employed are unimportant. The self-employed play a central role in any economy, although not as innovators or job creators. Instead, self-employment can provide a flexible employment form, mitigate agency problems, enable minorities to escape employment discrimination, and provide a safety valve for inappropriately regulated or otherwise dysfunctional economies. Schumpeterian entrepreneurship, by contrast, is fundamentally related to innovation and an ambition to grow a business. Future work aimed at better elucidating these distinctions is likely to lead to a better understanding of how entrepreneurship ought to be understood, measured and ultimately promoted. As a first step it seems clear that whenever self-employment is used as a measure of entrepreneurship a distinction should be made between Schumpeterian/innovative entrepreneurship and non-innovative/replicative entrepreneurship.

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Figure 1a Non-agricultural Self-Employment in the OECD in 2008 as a Share of Total Employment (%).

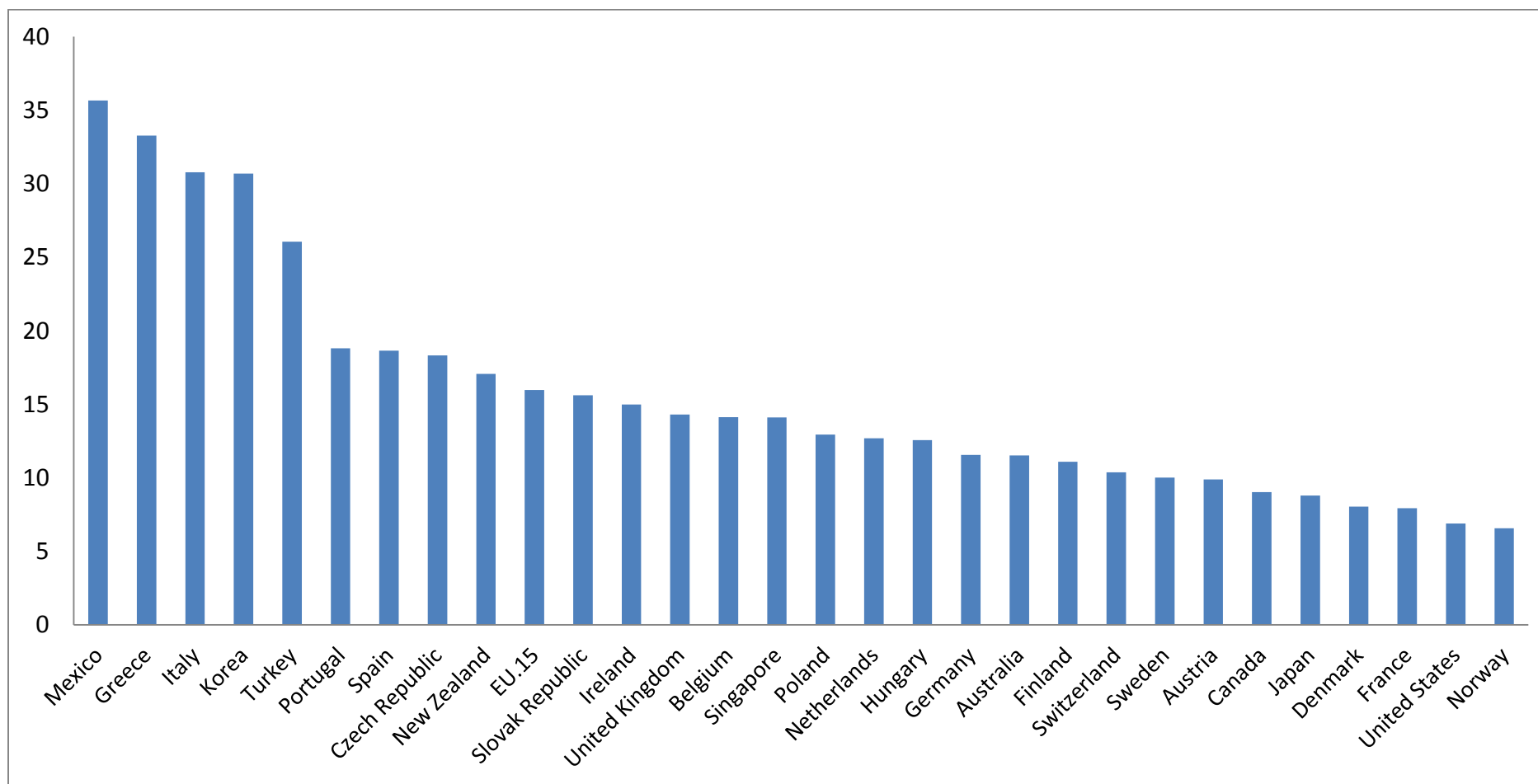


Figure 1b Entrepreneurship Rate: Number of Billionaire Entrepreneurs per Million Inhabitants, 1996–2010.

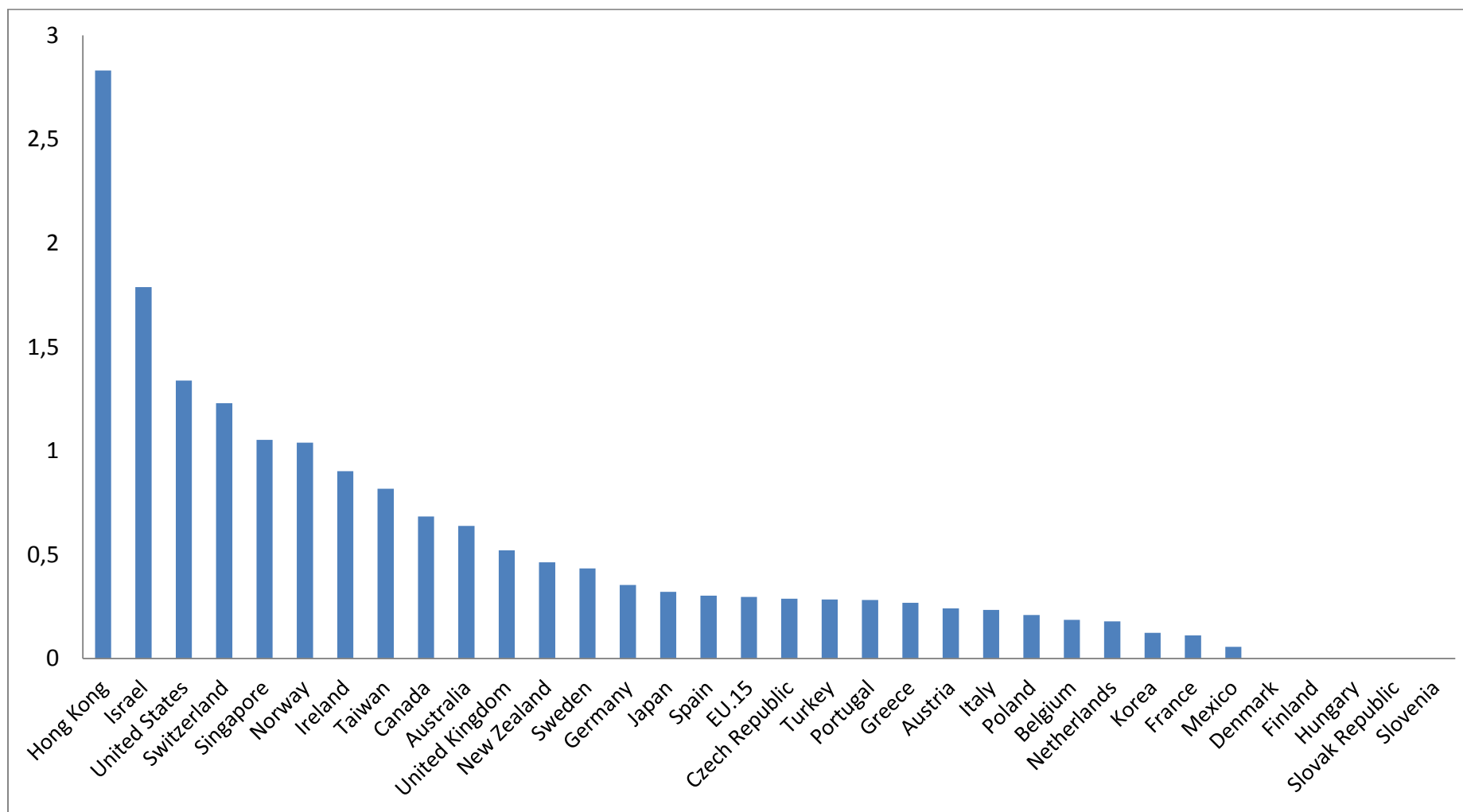


Figure 1c Entrepreneurship and Self-Employment, OECD countries.

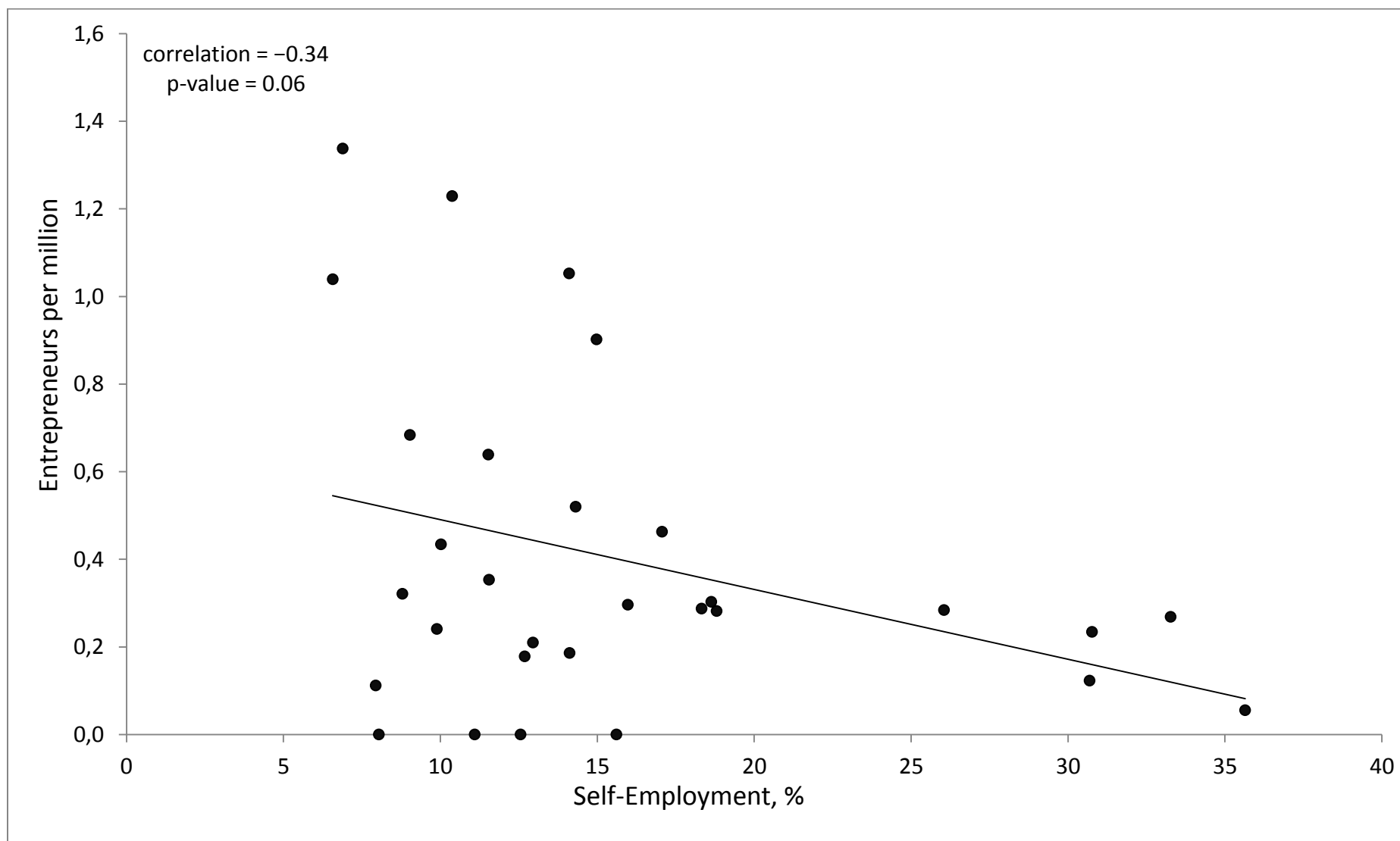


Figure 1d Self-Employment and Per Capita Income, OECD countries.

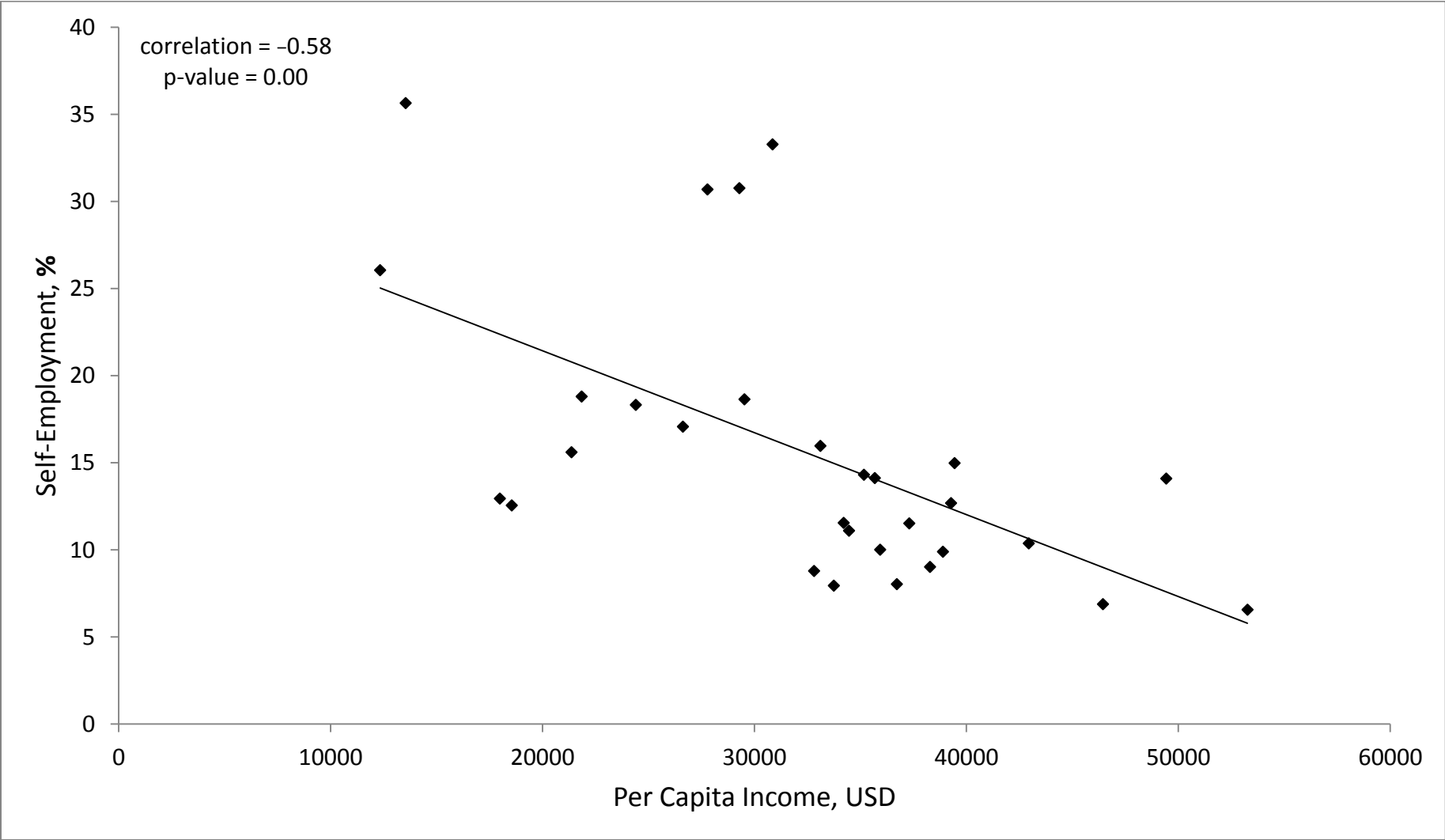


Figure 1e Entrepreneurship and Per Capita Income, Developed Countries.

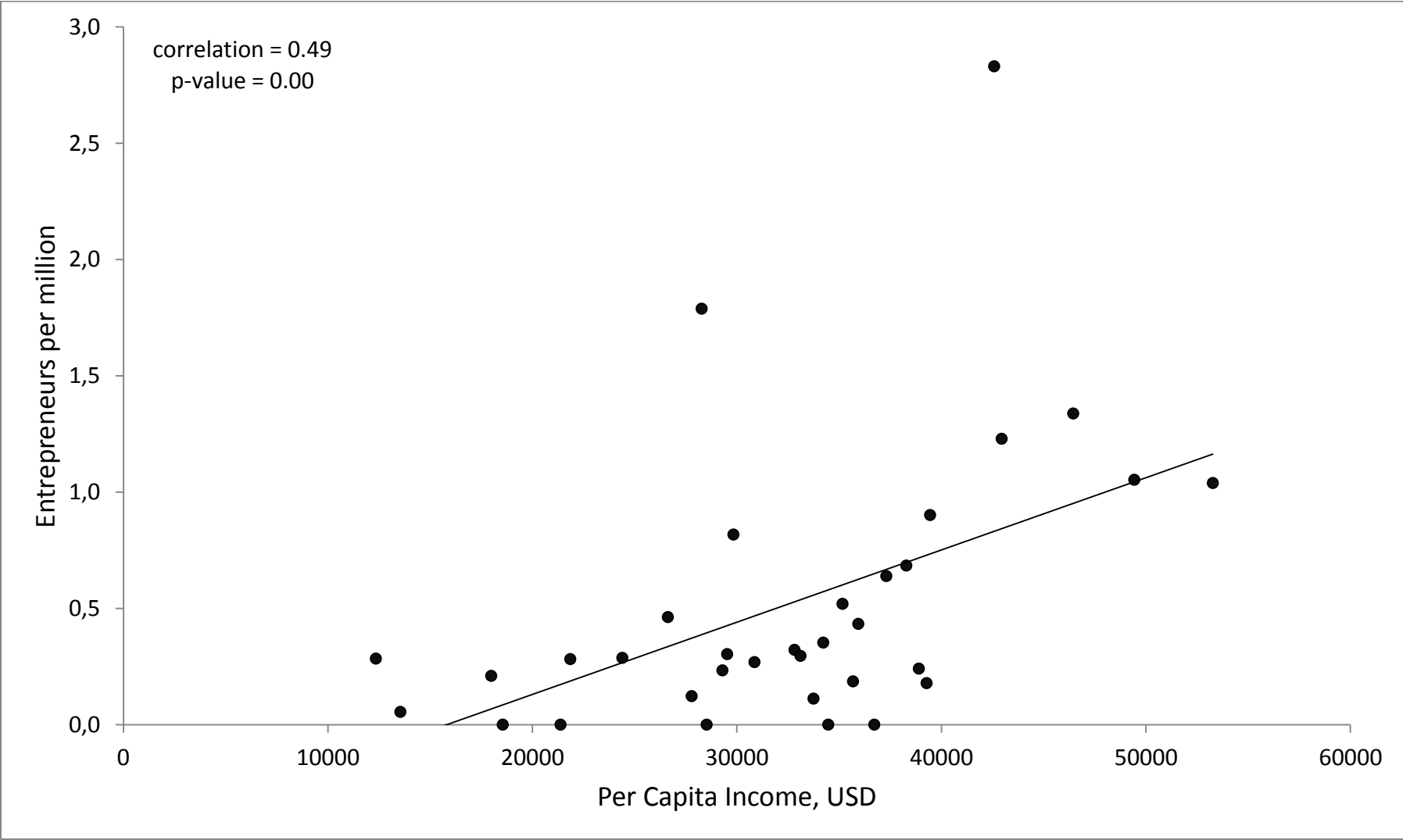


Figure 2a Entrepreneurship and Per Capita Income, All Countries.

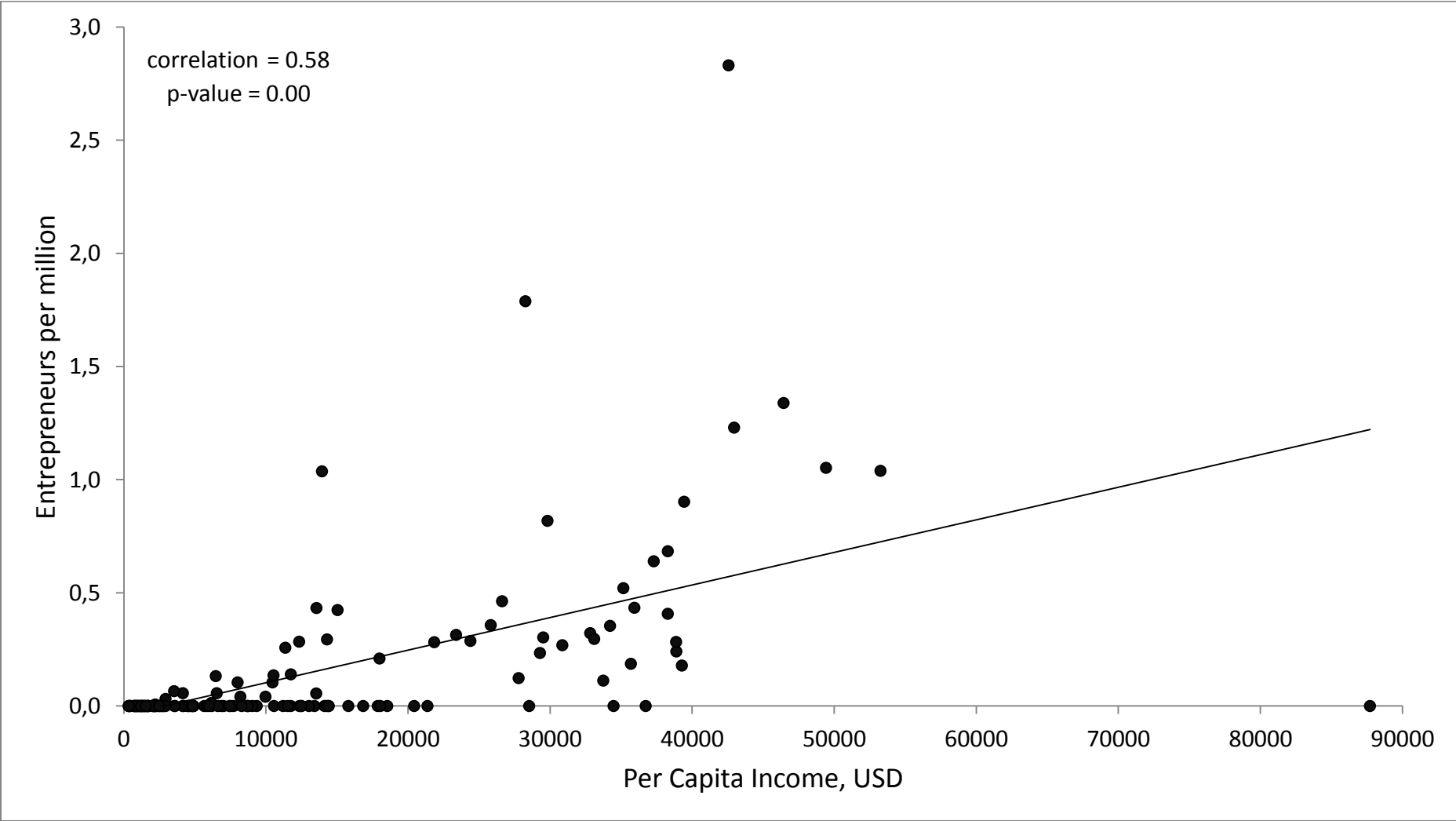


Figure 2b Self-Employment and Per Capita Income, All Countries.

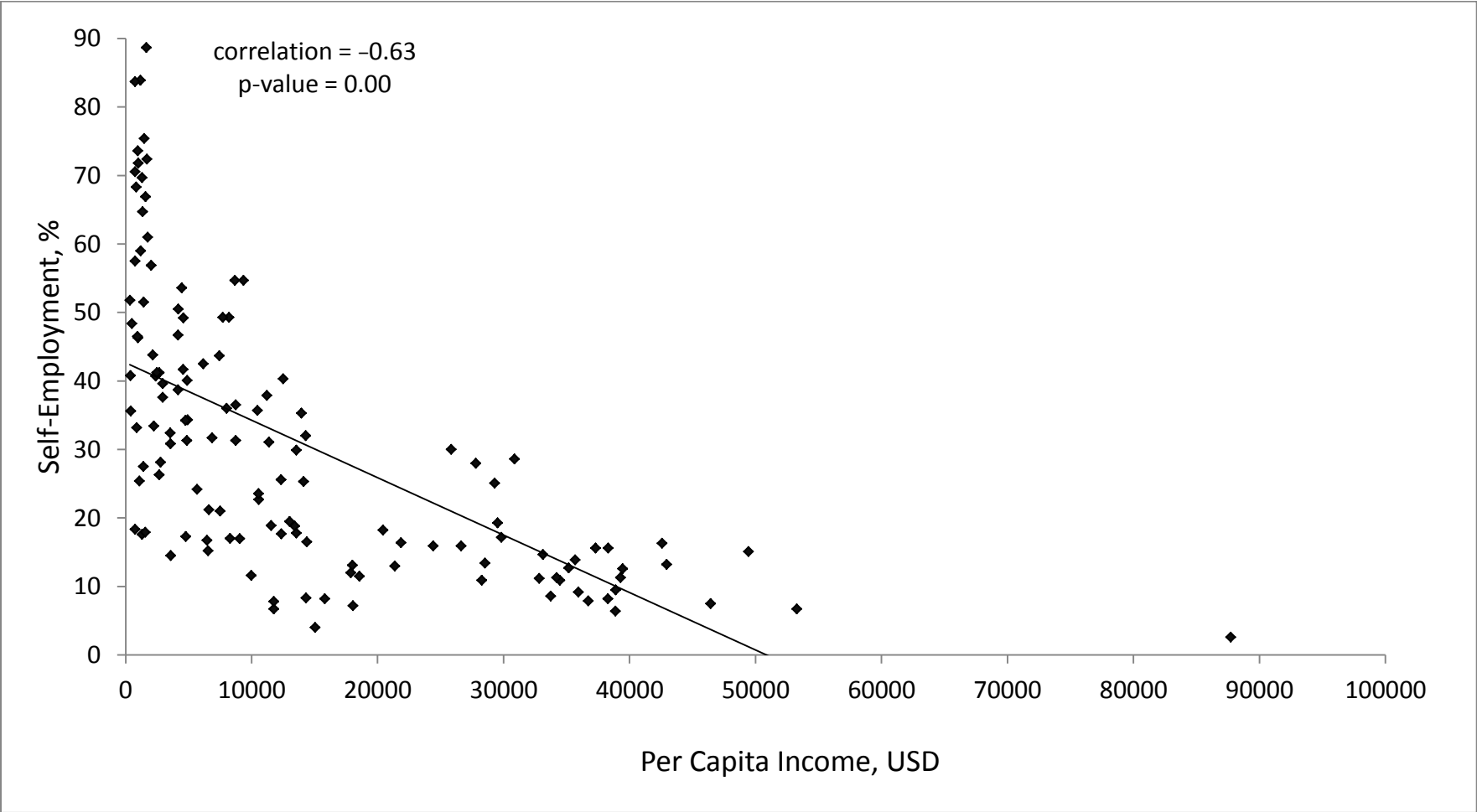


Figure 2c Self-Employment and the log of Per Capita Income, All Countries.

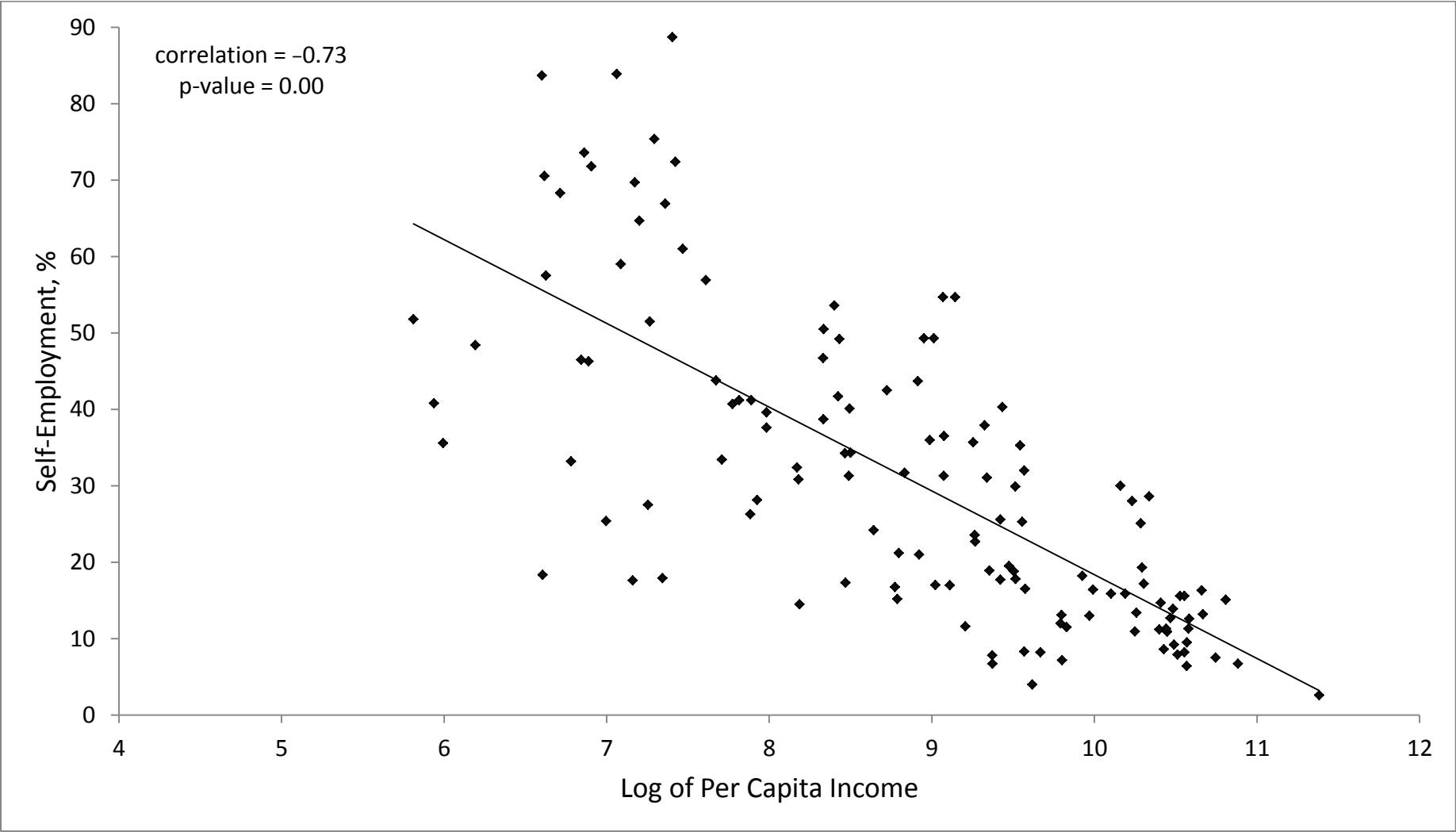




Figure 2d Entrepreneurship and Self-Employment, All Countries.

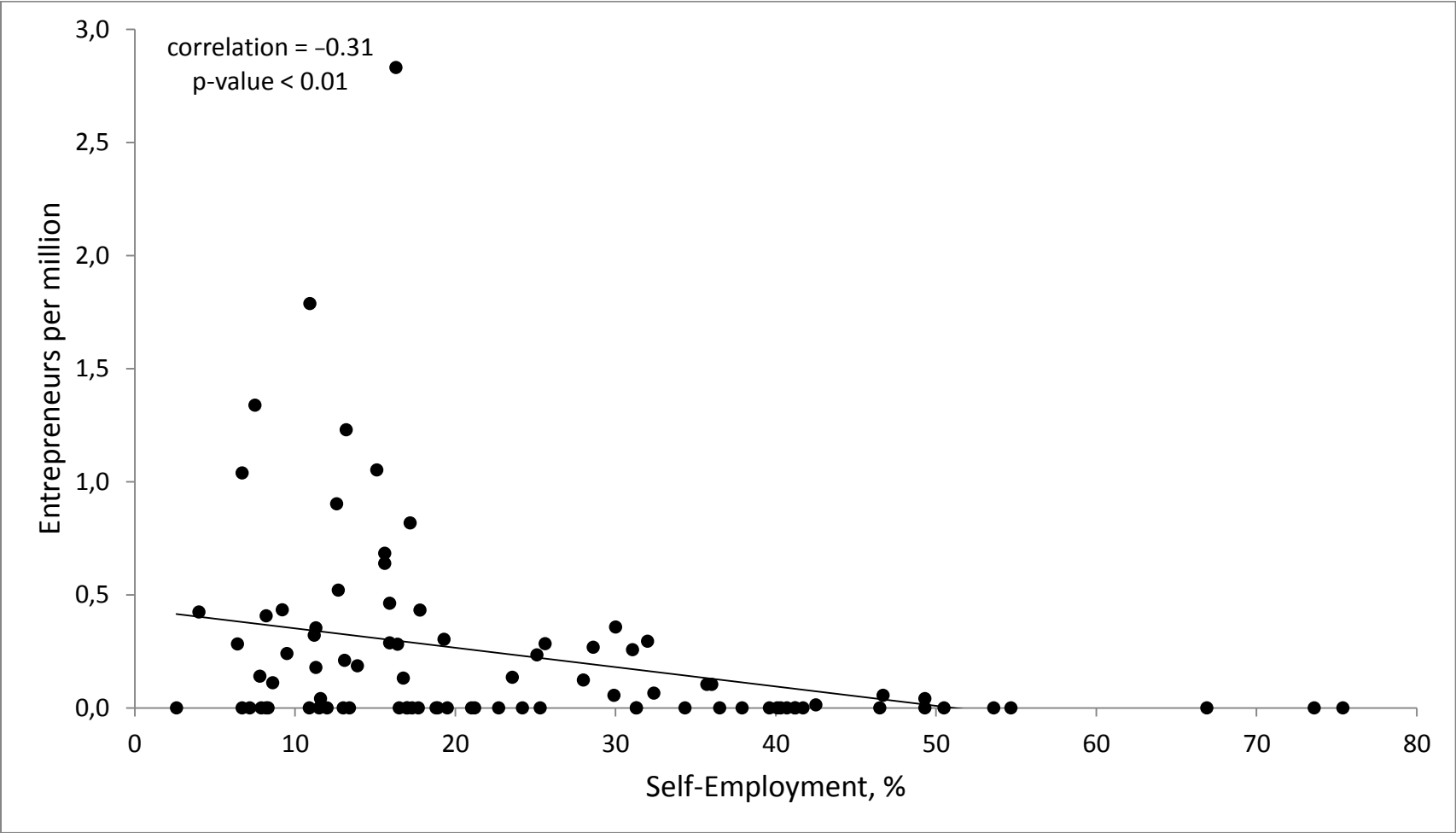


Figure 3a Entrepreneurship and Venture Capital Investment as a Share of GDP.

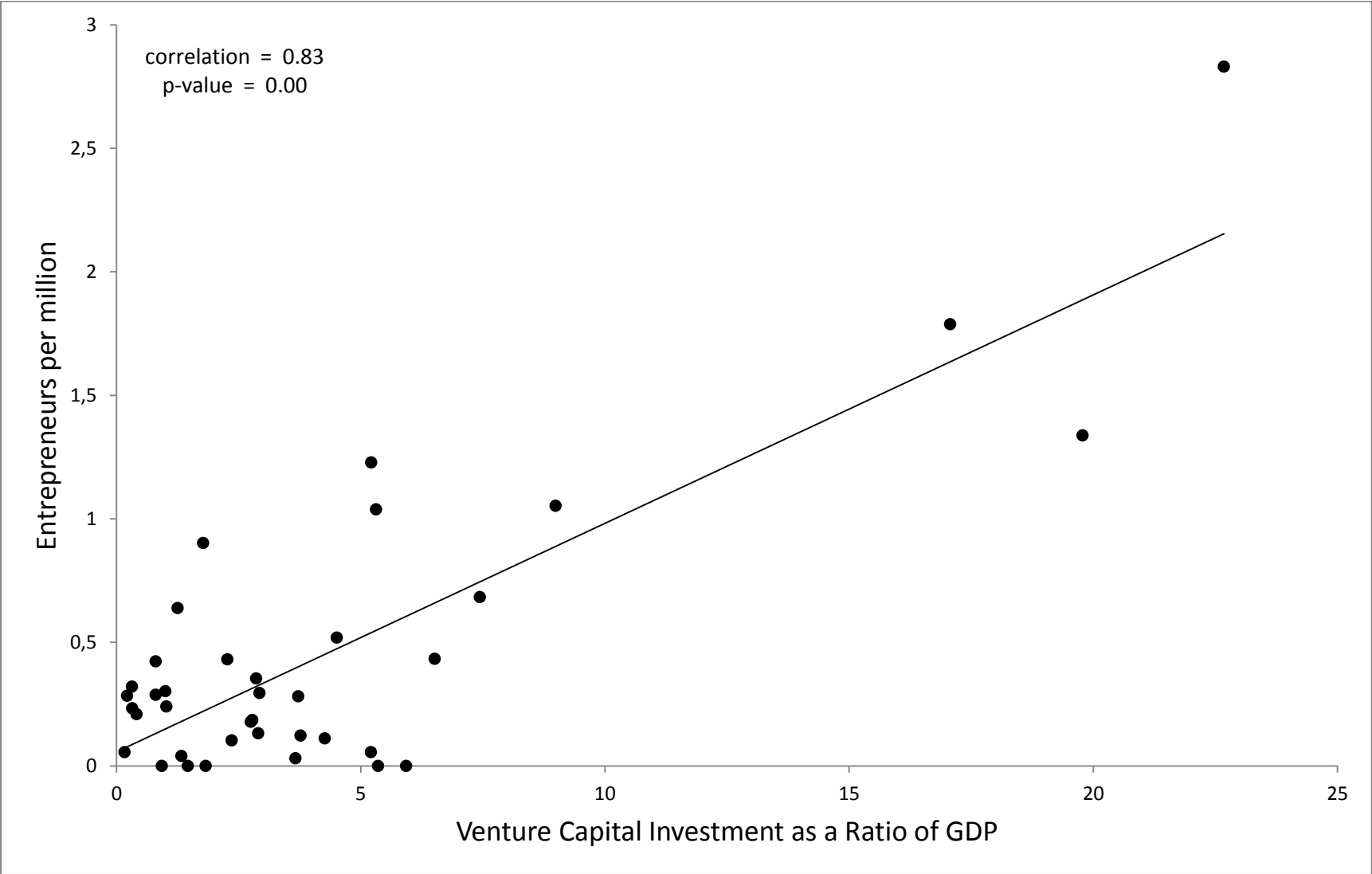


Figure 3b Self-Employment and Venture Capital Investment as a Share of GDP.

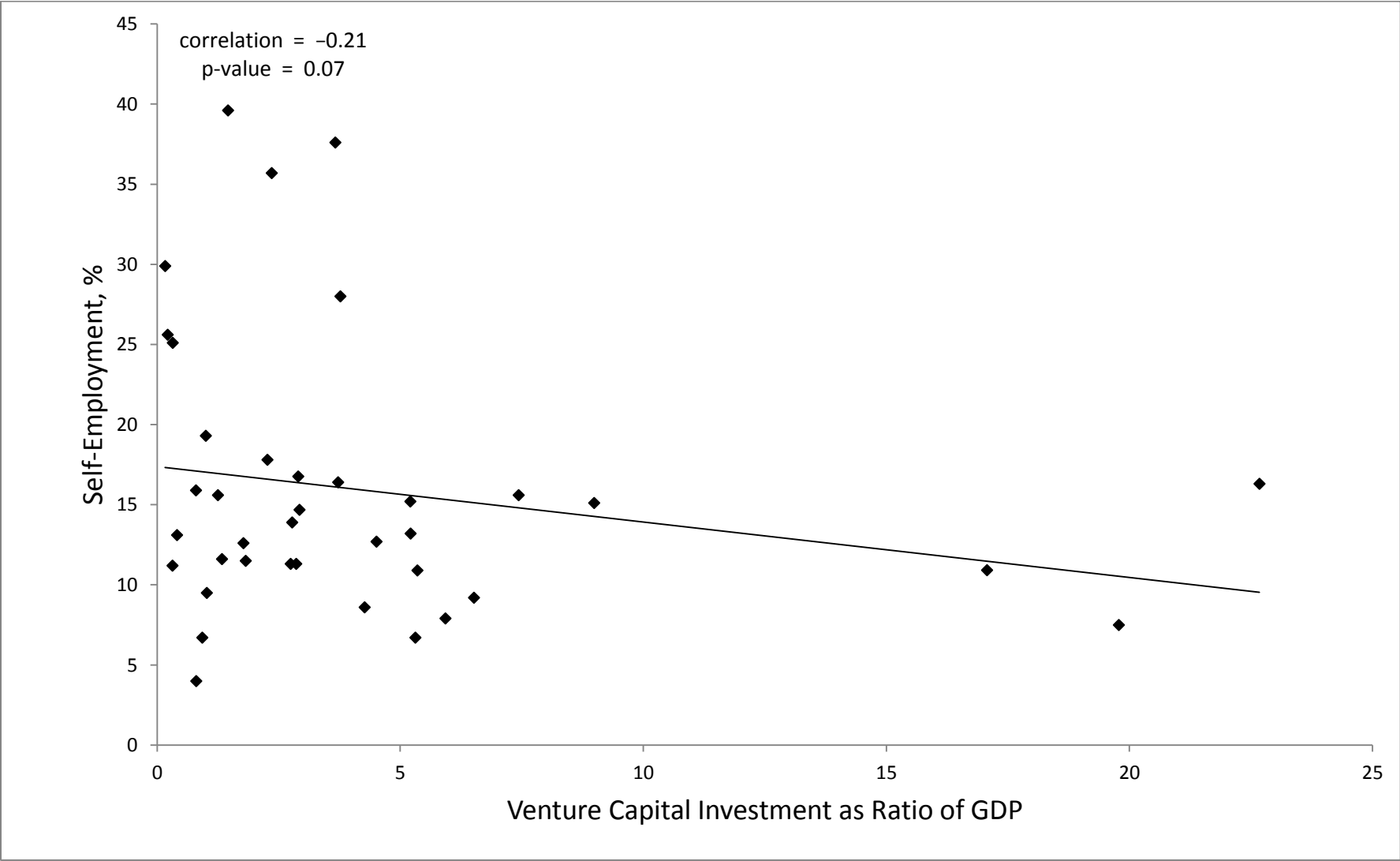


Figure 4a Self-Employment and the Regulatory Burden on Firms, OECD Countries.

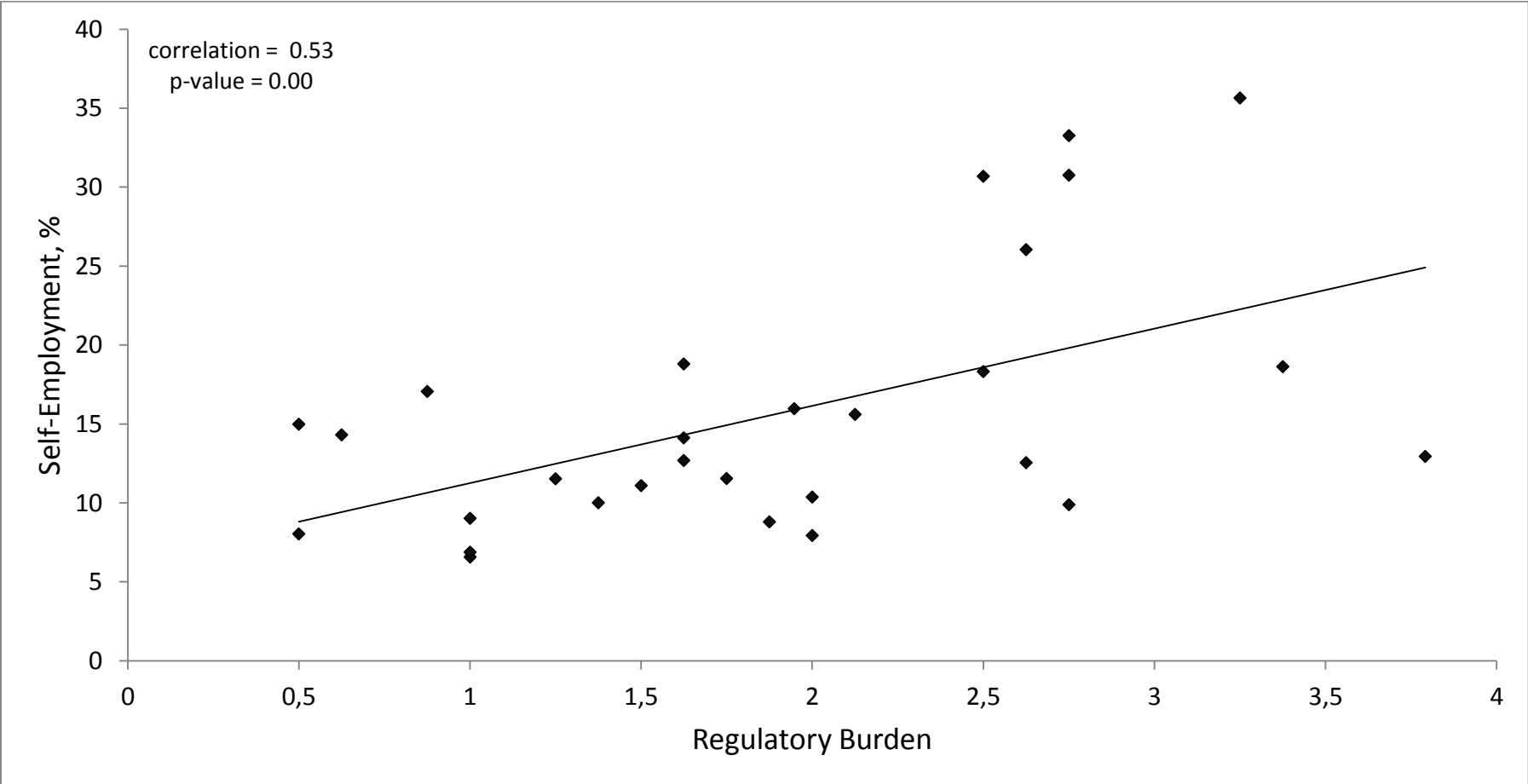


Figure 4b Entrepreneurship and the Regulatory Burden on Firms, OECD Countries.

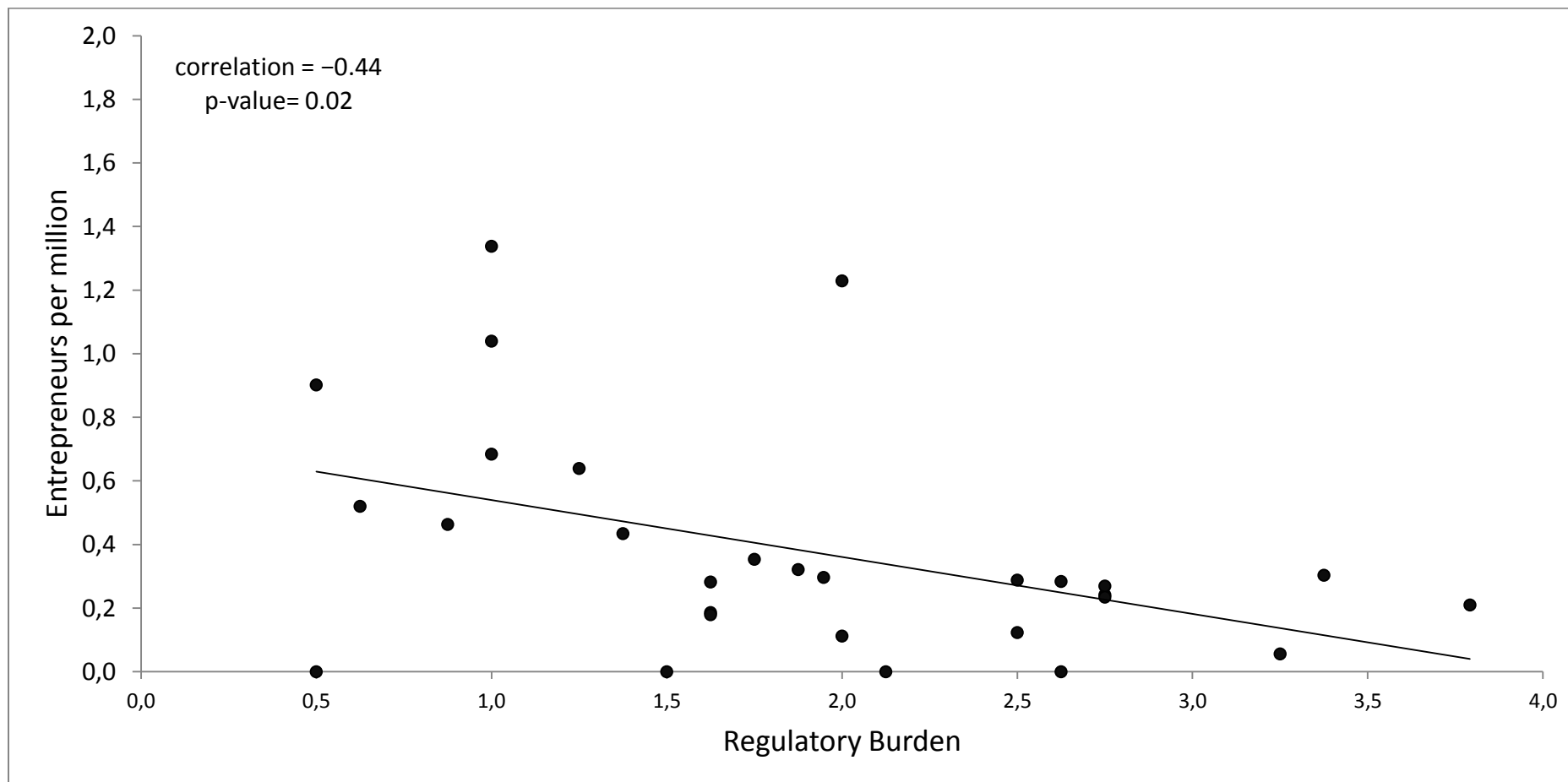


Figure 5a Self-Employment and Trust, OECD Countries.

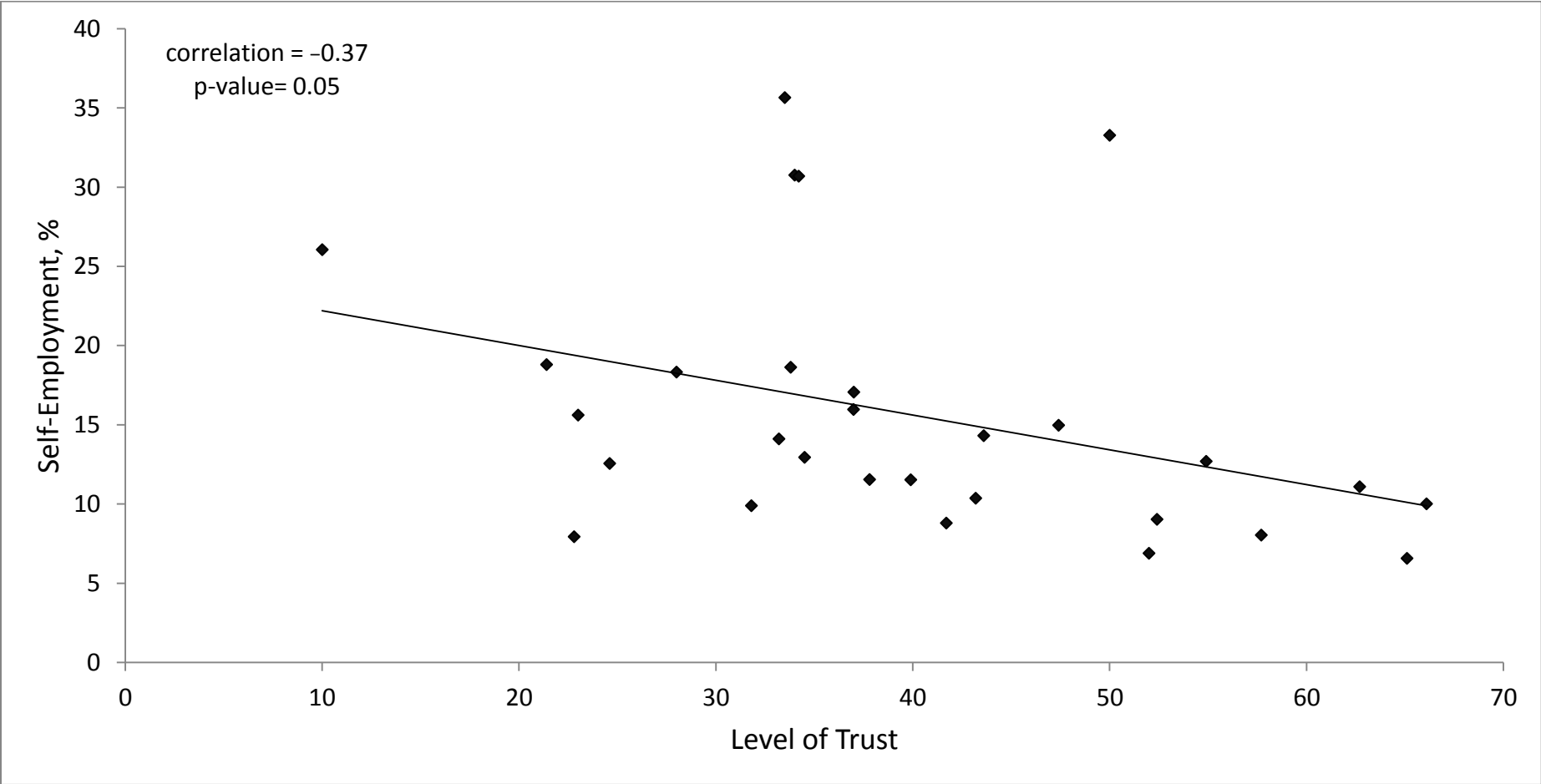


Figure 5b Entrepreneurship and Trust, OECD Countries

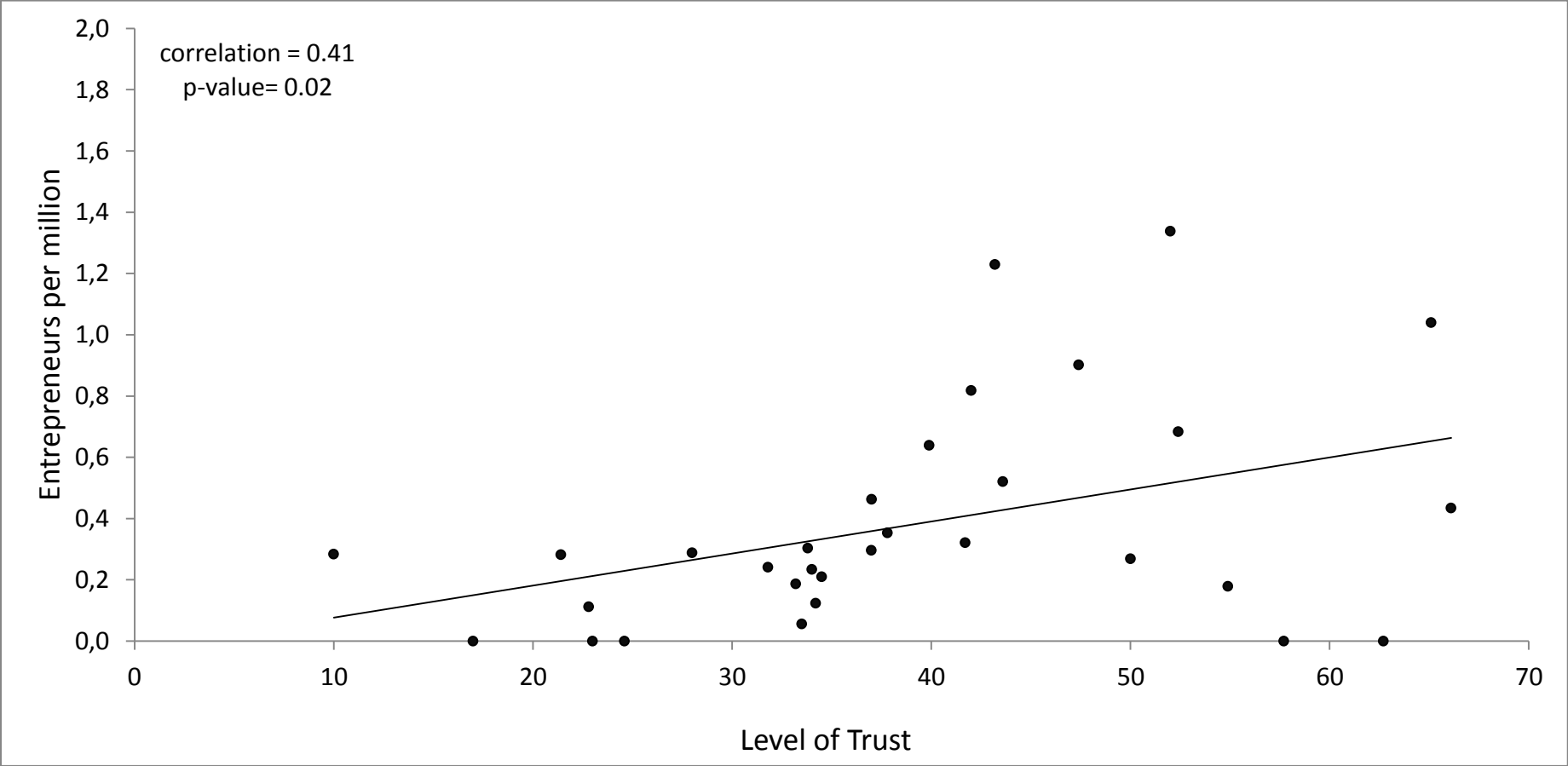


Table 1 Cross-Country Regressions of Self-Employment Rates.

	(1)	(2)	(3)	(4)
GDP per capita	-0.645** (0.085)	-0.654** (0.083)	-0.415** (0.105)	-0.445** (0.105)
Taxes		0.373* (0.161)		0.286** (0.156)
Regulations			0.119* (0.035)	0.107* (0.035)
Constant	36.49** (2.08)	26.93** (4.58)	24.11** (4.16)	18.03** (5.28)
R-squared	0.40	0.43	0.47	0.49
No. of obs.	90	90	90	90

*Note:* This table reports standard cross-sectional regressions where the dependent variable is the self-employment rate. Taxes refer to the corporate income tax rate as measured by the World Bank. Regulations refer to the ease of doing business, again as measured by the World Bank. Two stars (\*\*) denote statistical significance at the 1% level, one star (\*) denote statistical significance at the 5% level.

Table 2 Cross-Country Regressions of Entrepreneurship Rates.

	(1)	(2)	(3)	(4)
Population	0.014** (0.000)	0.015** (0.000)	0.013** (0.000)	0.014** (0.000)
GDP per capita	0.037** (0.002)	0.039** (0.002)	0.024** (0.003)	0.027** (0.003)
Taxes		-0.027* (0.007)		-0.024** (0.007)
Regulations			-0.007** (0.001)	-0.007** (0.001)
Constant	0.159* (0.78)	0.750** (0.174)	0.893** (0.150)	1.393** (0.212)
R-squared	0.79	0.79	0.80	0.80
No. of obs.	90	90	90	90

*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. Taxes refer to the standard statutory corporate income tax rate as measured by the World Bank. Regulations refer to the ease of doing business, again as measured by the World Bank. Two stars (\*\*) denote statistical significance at the 1% level and one star (\*) denote statistical significance at the 5% level.



Table 3 Cross-Country Regressions of Venture Capital Investment Rates.

	(1)	(2)	(3)	(4)
GDP per capita	0.160** (0.058)	0.191** (0.063)	0.129* (0.064)	0.146** (0.066)
Taxes		-0.005 (0.160)		-0.0006 (0.163)
Regulations			-0.014 (0.018)	-0.031 (0.020)
Constant	-0.125 (1.21)	-1.102 (4.131)	1.313 (2.140)	0.922 (4.652)
R-squared	0.18	0.22	0.19	0.23
No. of obs.	36	36	36	36

*Note:* This table reports standard cross-sectional regressions where the dependent variable is VC investment as percentage of GDP. The investment ratio will have the value 100 if VC investment totals one percent of GDP in a given year. Taxes refer to the corporate income tax rate as measured by the World Bank. Regulations refer to the ease of doing business, again as measured by the World Bank. Two stars (\*\*) denote statistical significance at the 1% level.

Table 4 Institutions and Self-Employment Rates.

Institutional quality	-16.38** (3.35)
Constant	147.83** (22.17)
R-squared	0.147
No. of obs.	56

*Note:* This table reports coefficients from a 2SLS regression. The first stage relates a measure of institutional quality (expropriation risk 1985–1995) to the logarithm of colonial mortality rates. If colonies with higher mortality rates created more extractive institutions whereas colonies with lower mortality rates created institutions with better property right protection mortality rates can be used an instrument for institutional quality (Acemoglu et al. 2001). The measure of institutional quality is the same as used in Acemoglu et al. (2001). The second stage presented above relates the predicted quality of institutions based on mortality rates to self-employment rates. Two stars (\*\*) denote statistical significance at the 1% level.

Table 5 Institutions and Entrepreneurship Rate.

Institutional quality	0.248** (0067)
Constant	1.489** (0.489)
<i>R</i> -squared	0.082
No. of obs.	64

*Note:* This table reports coefficients from a 2SLS regression. The first stage relates a measure of institutional quality (expropriation risk 1985–1995) to the logarithm of colonial mortality rates. If colonies with higher mortality rates created more extractive institutions whereas colonies with lower mortality rates created institutions with better property right protection mortality rates can be used an instrument for institutional quality (Acemoglu et al. 2001). The measure of institutional quality is the same as used in Acemoglu et al. (2001). The second stage presented above relates the predicted quality of institutions based on mortality rates to the number of billionaire entrepreneurs per capita. Two stars (\*\*) denote statistical significance at the 1% level.

Table 6 The Correlation between Self-Employment and Other Entrepreneurship Proxies

Business ownership rate	0.69
Small firm employment share	0.30
Birth rate of employer enterprises	0.08
GEM TEA	0.72
Billionaire entrepreneurs per capita	−0.33
VC investment as a share of GDP	−0.09
GDP per capita	−0.63

*Sources and definitions:* See main text.