Does Self-Employment Measure Entrepreneurship?

Evidence from Great Britain

Giulia Faggio* and Olmo Silva**

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Author for correspondence:
Olmo Silva,
Department of Geography and Environment,
London School of Economics,
Houghton Street, WC2A 2AE, London, UK.
Tel.: +44 (0)20 7955 6036
Email: o.silva@lse.ac.uk

* Spatial Economics Research Centre (SERC), London School of Economics.

** Department of Geography and Environment and Spatial Economics Research Centre (SERC), London School of Economics; and IZA Bonn.

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Abstract

Although information on self-employment is often used to proxy for entrepreneurship, little evidence has been collected on the link between these two measures. In this paper, we use data from the UK Labour Force Survey (LFS) combined with data from the Business Structure Database (BSD), and the Community Innovation Survey (CIS) to study the relation between self-employment and some salient aspects of entrepreneurship, namely business creation and innovation. In order to do so, we aggregate individual and firm-level data at the Travel-to-Work Area (TTWA) level and investigate how the incidence of self-employment correlates with the density of business start-ups and innovative firms. Our results show that in urban areas a higher incidence of self-employment positively and strongly correlates with business creation and innovation, but this is not true for rural areas. Further analysis suggests that this urban/rural divide is related to lack of employment opportunities in rural areas, which pushes some workers into self-employment as a last resort option.

JEL classification: L26, J21, R12, R23.

Keywords: Entrepreneurship; self-employment; spatial distribution.

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1. Introduction

Since the writings of Marshall (1890) and Schumpeter (1921), entrepreneurship is believed to be a key determinant of the economic success of a country or region and a crucial factor in shaping the spatial distribution of economic activities on the national territory. Entrepreneurs are not only responsible for the creation of new firms, but also for their technological lead and success as well as for the creation of new jobs. In a nutshell, entrepreneurs are engines of economic growth and differences in levels of entrepreneurial activities bear important implication for disparities in income across countries and regions.[1]

Unsurprisingly, policy makers devote a lot of attention to business start-up rates and have set in place a number of institutions aimed at promoting entrepreneurship. In the US, the federally funded Small Business Administration (SBA) agency was created in 1953 with the aim of helping Americans to "start, build and grow businesses". In the UK, the Department for Business, Innovation and Skills (BIS) assists small businesses through the Enterprise and Business Directorate[2] with the aim of "enabling more people (…) to start their business" and "boosting enterprises, start-ups and small business growth". Recently, President Barack Obama presenting the American Jobs Act (September 2011) stated that "everyone knows that small businesses are where most new jobs begin. (…) So for everyone who speaks passionately about making life easier for job creators, this plan is for you".

Despite its relevance to both economic thinking and policy making, academic research on entrepreneurship is partly impaired by fundamental issues surrounding the definition of the entrepreneur and the identification of entrepreneurial individuals in available data. The vast majority of the empirical work has focused on the study of self-employment. Examples include Blanchflower and Shadforth (2007) and Evans and Leighton (1989) on trends in entrepreneurship in the UK and the US, respectively; Blanchflower and Oswald (1998), Evans and Jovanovic (1989), Holtz-Eakin *et al.* (1994a) and (1994b), Hurst and Lusardi (2004) and Michelacci and Silva (2007) on the role of credit constraints; Cagetti and De Nardi (2009) and Carroll *et al.* (2000) on the role of taxation; and Ardagna and Lusardi (2008), Lazear (2004) and Silva (2007) on the role of skills and individual characteristics.

According to the seminal writings by Knight (1921) and Schumpeter (1921), entrepreneurs are individuals who bring innovations to the market in a process of creative destruction, strive to grow and create jobs, and bear the risk of the uncertainty surrounding entrepreneurial success

[1] See Aghion and Howitt (1992), Audretsch (2007) and Michelacci (2003) for a discussion of the role of entrepreneurs in growth models, and Acs and Audretsch (2003) and Storey (2006) for some empirical evidence.

[2] The UK government has a long history of supporting small businesses and since the 1970s a number of government-sponsored schemes assisting small businesses have existed with different names and administrated by different agencies/departments.

(see also Kanbur, 1979; and Khilstrom and Laffont, 1979). However, from this perspective, not all self-employed individuals are clearly entrepreneurial types. Alba-Ramirez (1994), Martinez-Granado (2002) and Santarelli and Vivarelli (2007) argue that some self-employment spells can be explained by lack of employment opportunities and thus identify self-employment out-of-necessity. Along similar lines, Baumol (2011) and (2005) distinguishes between 'innovative' and 'replicative' entrepreneurs and suggests that only the former are key to an economy's long-run success by supplying new ideas. Conversely, replicative entrepreneurs, who manage retail units and small businesses, predominantly respond to local demand and growing population, and are therefore symptoms of a growing economy rather than causes.[3] Finally, some recent work by Hurst and Pugsley (2010) and Sanandaji (2010) cast further doubts on the mapping between self-employment and entrepreneurship.

In this paper, we investigate these issues by combining three data sources, namely the UK Labour Force Survey (LFS), the Business Structure Database (BSD), and the Community Innovation Survey (CIS). To start with, we use information contained in the LFS over the period 1995 to 2009 to identify individuals who are: *(i)* independent self-employed (i.e. excluding freelancers, subcontractors and agency workers; more details in Section 2); and *(ii)* self-employed who own their business or a controlling majority of the business where they work. The LFS includes a large and representative sample of individuals in the UK, and these definitions are similar to those adopted by previous studies that analyse entrepreneurship using individual-level data on self-employment activities.

Next, we use information contained in the BSD over the period 1997 to 2008 to identify how many firms are created and destroyed every year, and compute proxies for net and gross firm creation. The BSD is an administrative dataset that covers almost all business organizations in the UK, including both single and multi-plant enterprises. Finally, we use data from the CIS in 2001, 2005, 2007 and 2009 to identify firms that innovate by creating new products or new processes of production. The CIS sample was chosen to be representative of small, medium and large businesses across all UK regions and core sectors, and this data has been extensively used to study firms' innovative behaviour (see D'Este *et al.*, 2012 and references therein).

In order to compare the incidence of self-employment with the intensity of business start-ups and innovative behaviour, we aggregate individual-level data and firm-level data at the Travel-to-Work Area (TTWA) level. These areas are functional geographical units constructed by UK government agencies and can be considered as self-contained labour markets and economically relevant aggregates. By combining these three sources of data, we are able to

[3] Nevertheless, it should be noted that replicative entrepreneurship could have beneficial effects on economic efficiency by promoting division of labour, by providing goods and services and by fostering input-output linkages.

investigate how self-employment 'lines up' with some of the most salient aspects of a dense entrepreneurial environment, namely firm creation and innovation. These two proxies have been extensively used in the literature to capture entrepreneurship; see the discussion in Audretsch (2007), Glaeser and Kerr (2010) and Santarelli and Vivarelli (2007).

In terms of findings, we show that our two measures of self-employment and both firm creation and the incidence of innovation are positively and significantly correlated in *urban* areas. However, this is not the case for *rural* areas. This distinction is not easily explained by differences in the sectoral composition of businesses in urban and rural TTWAs. Indeed, we find similar results when we distinguish between services and manufacturing across urban and rural TTWAs. Similarly, we find that our results are not easily explained by differences in the skill composition of the workforce or in industrial concentration in urban and rural areas.

In order to shed some light on this issue, we exploit additional information contained in the LFS and compute the following proxies for lack of employment opportunities in the TTWAs: *(i)* the incidence of underemployment; *(ii)* the incidence of temporary employment; *(iii)* the lack of full time employment. Our analysis shows that these variables significantly predict the misalignment between self-employment, and both firm creation and innovation in rural areas, but not in urban areas. These findings suggest that the urban/rural divide is related to lack of employment opportunities in rural areas, which might push some workers into self-employment as a last resort option. All in all, our results carry some important implications for the academic debate on entrepreneurship, as well as for the design of policies that promote self-employment with the aim of stimulating business creation and innovation.

In relation to the existing literature, our findings are most closely linked – and in part comparable – to Hurst and Pugsley (2010) and Sanandaji (2010). Hurst and Pugsley (2010) show that the vast majority of US small businesses do not innovate, do not want to innovate, do not significantly grow in size and do not want to expand. This suggests that most US self-employed workers are hardly entrepreneurial from the perspective of innovation and job creation. Although we cannot measure small entrepreneurs' intentions to grow and innovate, we can link the incidence of self-employment to net firm creation – related to firm survival and expansion – and innovative activities, thus looking at these issues from a similar angle. Sanandaji (2010) uses cross-country data to document that the correlation between the incidence of self-employment and billionaires who became rich by setting up their own business (as listed in Forbes Magazine) is negative and significant. In this respect, we follow a similar approach by comparing the spatial distribution of self-employment to other proxies for entrepreneurship. However, our work has the advantage of focusing on one single country, thus abstracting from problems with cross-country differences in institutions and culture, as well as legal and taxation

systems. Furthermore, we believe our measures of firm creation and innovation are better proxies for entrepreneurship as opposed to 'entrepreneurial stardom' (as captured by the incidence of billionaires). In fact, previous research shows that the density of all businesses – including *small* ones – is an important force determining agglomeration economies (Ellison *et al*., 2010, Glaeser, 2009 and Glaeser and Kerr, 2010) and spatial differences in economic performance. Nevertheless, if the aim of public policy is to promote a handful of very successful ventures, the evidence in Sanandaji (2010) is more relevant than ours.

The remainder of the paper is structured as follows. In the next section, we describe the data that we use in more details, while in Section 3 we provide general descriptive statistics. In Section 4, we present our analysis on the relation between self-employment, firm creation and innovation. Following that, in Section 5, we investigate some factors that could explain the urban/rural divide. In Section 6, we conclude.

2. Data construction

In this section, we briefly describe the data that we use to carry out our analysis. More details can be found in the working paper version of this article (Faggio and Silva, 2012).

2.1 UK Labour Force Survey (LFS)

The UK Labour Force Survey (LFS) is a quarterly representative survey of households living at private addresses in the United Kingdom and is conducted by the Office for National Statistics (ONS) to collect information about individuals' labour market experiences. For our analysis, we use the years between 1995 and 2009, and focus on the Spring quarter since this is the part of the survey where the richest and most consistent information is available.

Each Spring quarter of the LFS contains between 64,000 (earlier years) and 52,000 (later years) households, equivalent to about 120,000-150,000 individuals. In our analysis, we focus on people aged between 16 and 65 and on individuals either working as employees or as self-employed. We instead neglect individuals who are unemployed or out of the labour force. Since we are selecting individuals at the end of compulsory schooling (16) and before retirement age (65), we are not concerned by the latter restriction. However, we will come back to this issue when discussing our findings. Next, in order to assign each individual to a TTWA, we retain individuals living in England, Scotland and Wales (LFS data for Northern Ireland have poor coverage), and with a valid geographical identifier (ward of residence, roughly equivalent to a US census tract). Additionally, we select individuals with non-missing information on: *(i)* gender, age and ethnicity; *(ii)* marital status, household size and number of children; *(iii)* educational qualifications; *(iv)* housing tenure status; *(v)* working full-time or part-time; *(vi)*

holding or not a second job[4]. Finally, following previous work in the literature (Glaeser, 2009; and Glaeser and Kerr, 2010), we exclude individuals working in one of the following sectors: Agriculture; Hunting and Forestry; Fishing; Public Utilities (Electricity, Gas and Water); Public Administration and Defence; Private Households with Employees; and Extra-Territorial Organization and Bodies. These sectors either contain negligible amounts of self-employment (e.g., public administration) or are characterised by high self-employment rates dictated by sector-specific (contractual) features, not necessarily indicative of dense entrepreneurial environments (e.g., agriculture and fishing).

These restrictions leave us with a set of approximately 700,000 individuals, of which 540,000 and 160,000 live in urban and rural areas, respectively. Using this sample, we construct the following two measures of self-employment. First, we exploit information about methods of payments for self-employed workers to create a binary variable taking value one for individuals who reports that they: "Are a sole director of their own limited business"; "Run a business or a professional practice"; "Are a partner in a business or a professional practice"; "Work for themselves". This definition excludes self-employed workers who are "Paid a salary or wage by an agency", "Sub-contractors", or "Doing free-lance work", plus another residual category ("None of the above"). We label this group 'Independent Self-Employed'. Our second measure of self-employment exploits answers to the question: "Do you own the business or have a controlling interest in the company you work for?". Using this detail, we construct a second proxy labelled 'Owners'. Since information on methods of payments and on business ownership was not asked every year, we end up with approximately 500,000 individuals. Descriptive statistics for these variables aggregated at the TTWA level will be discussed in Section 3[5].

2.2 The Business Structure Database (BSD)

The second dataset we use is the Business Structure Database (BSD) over the period 1997 to 2008. The data is derived from the Inter-Departmental Business Register (IDBR), which consists of administrative data collected for revenues and taxation purposes. Any business liable for value-added taxation (VAT) and/or with at least one employee registered for tax collection will appear on the IDBR. For the year 2012, the VAT threshold for registration was a turnover of taxable goods and services of £77,000. This suggests that the BSD might not sample very

[4] See Appendix Table 2 for a detailed list of all control variables with descriptive statistics aggregated up to the TTWA level.

5 Note that in order to check the robustness of our results to other proxies previously used in the literature, in parts of our analysis we also consider all self-employed individuals and self-employed workers in professional and managerial positions. The latter are identified using the socio-economic classification of jobs provided by the LFS (SOC-2000) at the 1-digit level.

small-businesses and self-employed ventures. Nevertheless, the ONS estimated that for 2004 the businesses listed on the IDBR accounted for almost 99 per cent of economic activity in the UK.

The data is structured into enterprises and local units. An enterprise is the overall business organisation, whereas the local unit can be thought of as a plant or firm. Note that in the remainder of the paper, we use the words plant and firm interchangeably. In approximately 70 per cent of the cases, enterprises only have one local unit, with the remaining 30 per cent of the cases representing enterprises with multiple local units. These include large organisations, such as banks and supermarkets, but also small multi-office consultancies and other services, as well as smaller manufacturing enterprises. For each local unit, data is available on employment, industrial activity, year of birth (start-up date) and death (termination date), as well as postcodes. We use the latter detail to assign each local unit active in England, Wales and Scotland to a Travel-to-Work Area (TTWA). We neglect Northern Ireland because of poor data coverage.

The initial raw data includes approximately three million local units every year. However, we carry out a series of checks and drop a number of units. In particular, we drop cases where we identify establishments opening/closing in a specific year, disappearing/reappearing in a subsequent year only to open/close again in a subsequent wave. Stated differently, we only count firms' birth and death once. This approach follows Glaeser and Kerr (2010). Furthermore, we drop active units with zero employment (this figure includes the owners/managers of the establishment, so it cannot be zero for an active unit) and postcodes that include an anomalous number of units in the same industrial sector. Finally, we follow the approach used for the LFS, and exclude firms operating in one of the following sectors: Agriculture; Hunting and Forestry; Fishing; Public Utilities (Electricity, Gas and Water); Public Administration and Defence; Private Households with Employees; and Extra-Territorial Organization and Bodies.

After applying these restrictions, our dataset comprises of around 2.4 million plants annually over 12 years, which we use to derive proxies for gross and net firm creation. To begin with, we identify in each pair of adjacent years: *(i)* firms that were not present in $wave_{t-1}$, but are present in $wave_t$.; and *(ii)* firms that were present in $wave_{t-1}$, but are not present in $wave_t$. We then count the number of establishments in *(i)* and *(ii)* at the TTWA level, and construct some proxies for the local intensity of business creation. In particular, using information from the first group, we estimate the amount of *gross* firm creation in a given TTWA. Conversely, using data from both *(i)* and *(ii)*, and subtracting the number of establishments destroyed from the number of establishments created, we can proxy for the rate of *net* firm creation in a given TTWA. Note that when we aggregate our data at the TTWA level, we express net and gross firm creation as a share of the average number of firms existing at time *t-1* and *t*. This approach follows the

literature on job creation and destruction; see Davis and Haltiwanger (1992). More details are provided in Section 3, where we discuss the descriptive statistics of our proxies.

2.3 Community Innovation Survey (CIS)

The last dataset we use is the Community Innovation Survey (CIS) for the years 2001, 2005, 2007 and 2009. The CIS sample is meant to be representative of small, medium and large businesses, across all sectors. These features are important in reducing biases included in other samples that track innovation, e.g. patent data that focus on highly innovative sectors – but on manufacturing only and on firms of a larger size. However, it should be noted that the CIS still under-represents very small firms with less than 10 employees. Moreover, in terms of geographical coverage, the CIS is representative of broad geographical aggregates – e.g. regions – while its detail at a smaller level of aggregation is less precise (see the discussion in Iammarino *et al*., 2012). Since this is an important issue, we will return to this point when presenting our results. It is also worth noting that the survey is backed by the Department for Business, Skills and Innovation (BIS) and seen as an important tool for "measuring the level of innovation activity in the UK" (ONS, 2011). Moreover, the data has been extensively used in the analysis of firms' innovative activities (see D'Este *et al*., 2012 and Iammarino *et al*., 2012).

The original samples of the CIS varied between approximately 8000 firms in 2001 to approximately 15,000 firms in the following waves. One drawback of the CIS is that it does not include detailed geographical identifiers which are needed for our analysis. In order to recover this information, we use a unique firm identifier to match CIS firms to the BSD data described above. Given the quality of the BSD administrative data, the attrition from this matching is very small (below 1% in all years). However, the identifiers and the information contained in the CIS refer to the enterprise, as opposed to the local unit. This means that when we match data from the CIS to the BSD, we assign the same information about innovative behaviour to all units belonging to a single enterprise since it is impossible to identify the exact local unit where the innovation actually took place. While this is not ideal, we believe this procedure is better than assigning information based on the location of the headquarters of the enterprise. However, as a robustness check, we only use and match single-unit firms in the CIS with corresponding BSD firms, keeping approximately 75% of the sample. Reassuringly, we find that the correlation between our measures of innovation at the TTWAs obtained either using the sample of single-plant enterprises only or both single- and multi-plant enterprises is sufficiently high – at around 0.50. Moreover, our findings are not affected when considering the innovative behaviour of single-plant firms only. We will return to this point in Section 4.2. Note finally that for consistency, we exclude the same sectors that we dropped from the LFS and BSD.

In order to construct our proxies for innovative behaviour, we use firms' answers to the following questions: *(i)* "During the three year period (prior to the survey), did your enterprise introduce any technologically new or significantly improved products (goods or services)?"; and *(ii)* "During the three year period (prior to the survey), did your enterprise introduce any new or significantly improved processes for producing or supplying products (goods or services)?". To begin with, we combine answers from both questions to create a dependent variable taking value one if the firm created either an innovative product or an innovative process. We label this variable 'Innovation'. We then create two further proxies where we separately consider whether the company successfully engaged in either product or process innovation. These variables are labelled 'Product Innovation' and 'Process Innovation'. We finally collapse the data at the TTWA level so that our indicators can be interpreted as fractions of innovative firms in a given area. Descriptive statistics for these variables are discussed in Section 3.

2.3 Travel-to-work-areas (TTWAs) and other geographical details

The level of geographical aggregation that we use in our analysis is the Travel-to-Work Area (TTWA). TTWAs are groups of wards for which at least 75% of the resident economically active population works in the area, and for which at least 75% of the individuals working in the area also live there. TTWAs were devised by UK government agencies to delineate areas that can be considered as self-contained labour markets and economically relevant aggregates.

As from 2007, there were 243 TTWAs within the United Kingdom. In our analysis, we only focus on England, Scotland and Wales. Moreover, we follow Gibbons *et al*. (2010) and re-aggregate some areas so that our final partition splits Great Britain into 158 local economic areas, of which 79 are single urban TTWAs (with population in excess of 100,000 residents), and 79 are rural areas created by combining TTWAs with low population counts. Differently from Gibbons *et al.* (2010), we distinguish between Inner London and Outer London by splitting the London TTWA in two parts. We follow this approach because we believe the density of start-ups and innovation might differ between the core of London and its periphery. However, this distinction is not crucial to our analysis.

Urban TTWAs have substantially higher population density than rural areas. The average/median number of people per squared kilometre is 800.2/528.6 and 180.6/144.3 in urban and rural areas respectively, with standard deviations of 1073.7 and 140.8. Note that although there is more variation within the urban group, the 25th percentile of the population density distribution in urban areas (at 315.0) still lies above the 75th percentile of the density distribution in rural areas (at 250.7). These comparisons are not significantly affected if we

disregard London: the average and median urban population density become 651.8 and 510.7 respectively, with a standard deviation of 424.9.

It should be noted that data from the BSD and the CIS are assigned to TTWAs based on the postcode at which firms are active. On the other hand, individuals in the LFS are assigned to TTWAs using postcodes of residence since detailed information about their place of work is not available. We do not see this as a major drawback. First, given the way in which TTWAs are constructed, the TTWA of an individual's residence is also likely to be the TTWA of employment. Moreover, previous research shows that entrepreneurs tend to be local and set up their business in the location where they were born and grew up (Michelacci and Silva, 2007), further attenuating this problem. We shed some light on this issue by using LFS data at the individual level to run some regressions that estimate the probability that an individual: *(i)* works in the Local Authority/District (LAD) where he/she lives; *(ii)* works from the home address or uses home as the headquarters of his/her activities.[6] Our evidence is presented in Appendix Table 1. Columns (1) to (4) focus on individuals in urban TTWAs, whereas Columns (5) to (8) concentrate on rural areas.

Across all columns and irrespective of the inclusion of a detailed set of controls, we find that self-employed individuals are significantly more likely than employees to work in the LAD where they live or to use their home as their workplace or the headquarters of their business. These differences are economically sizeable. Self-employed are 40% to 50% more likely to work in the LAD of residence than employees, both in urban and rural areas. Similarly, self-employed in both urban and rural areas are between five and ten times more likely than employees to work from home or use it as their headquarters. These results suggest that assigning self-employed workers to areas on the basis of their TTWA of residence (as opposed to TTWA of work) does not introduce an important bias in the measurement of the density of entrepreneurial activities based on self-employed individuals in the LFS.

3. Self-employment, business creation and innovation: some descriptive facts

In this section, we present descriptive statistics of the various proxies for entrepreneurship created using the three datasets described here above. Our findings are presented separately for urban and rural TTWAs, and they are depicted in Figure 1 and tabulated in Table 1.

3.1 Self-employment in urban and rural TTWAs

We begin our discussion by presenting descriptive statistics for the two measures of self-employment obtained from the LFS. The figures in the top panel of Table 1 (for 'Independent

[6] There are approximately 400 Local Authorities and Districts in Great Britain for the time period we consider.

Self-Employed') confirm some stylised facts about self-employment in Great Britain previously obtained using the LFS (Blanchflower and Shadforth, 2007) or other data (e.g. Bracke *et al*., 2012 using BHPS): over the period spanning the mid-1990s to the late 2000s, approximately 10%-12% of workers are self-employed, with this number not being substantially different in urban and rural areas. However, there is quite a significant amount of heterogeneity across TTWAs, as shown in Columns (3) and (6). The coefficient of variation for the share of self-employed across TTWAs is approximately 19% and 24% in urban and rural areas, respectively. While the figures for rural areas might portray more variation than there actually is because of small numbers, this urban/rural ranking is repeated when we look at entrepreneurship measures derived from firm-level data.

Similarly, there is quite a substantial variation in the share of self-employed individuals when we consider manufacturing and services separately. First, we find that more individuals are self-employed in services than in manufacturing. This is consistent with previous evidence (Blanchflower and Shadforth, 2007; Hurst and Pugsley, 2010 and Glaeser, 2009). However, there is more variation across TTWAs in the share of self-employed in manufacturing than in services. The coefficient of variation in the share of self-employed is between 47% and 56% for manufacturing, and between 17% and 21% in services. One important caveat in interpreting these patterns is that the amount of variation in the incidence of self-employment in manufacturing might be inflated by the smaller number of individuals used to aggregate information at the TTWA level. Nevertheless, this finding is sufficiently intuitive: the geographical distribution of services activities – including retail trade, entertainment, professional and personal services – arguably follows more the distribution of the population than the distribution of manufacturing plants does. The latter is instead influenced to a larger extent by agglomeration forces (Dopeso-Fernandez, 2010).

In the next panel of Table 1, we present descriptive statistics of our alternative proxy for self-employment, namely 'Owners'. This alternative definition identifies fewer self-employed workers, but there are no marked differences between urban and rural areas. Once again, the amount of variation across TTWAs is substantial and more pronounced in rural areas – around 25% – than in urban areas – at approximately 21%. Note also that there are significantly fewer 'Owners' when focusing on manufacturing as opposed to services, with the shares of self-employed in manufacturing shrinking to 5.1% and 6.2% in urban and rural areas, respectively. The corresponding shares in services are 8.1% and 9.1%, in urban and rural areas respectively. Finally, for this definition too we document more spatial variation in manufacturing (40% and 49% in urban and rural areas respectively) than in services (at 20% and 25%).

A graphical impression of these patterns is presented in Figures 1, where we map the density of our proxies for self-employment across urban and rural TTWAs. The urban-area plots (left panels) confirm the common perception that London and the South-East are more 'entrepreneurial'. Although this is true for both definitions, the pattern is more marked for the definition of self-employment that excludes freelancers, subcontractors and agency workers ('Independent Self-Employed'). Some expected patterns also emerge when focusing on the rural maps (right panels). These show a high density of self-employment along the South-West coast, in Cornwall and in parts of Wales and Scotland, which might be explained by the tourist industry. However, there is also a high incidence of self-employment in some northern areas along the corridor running east to west, and north of Hull, York, Manchester and Liverpool. Another finding that emerges from these plots is that the two measures of self-employment tend to highlight hot-spots in similar areas. This is confirmed by the fact that the correlation between the two proxies is very high, at 0.92 and 0.85 in urban and rural areas, respectively.

3.2 Firm creation and innovation across TTWAs: main facts

In this section, we discuss the main features of the proxies for entrepreneurship that we have constructed by aggregating data on firm creation from the BSD, and business innovative activities from the CIS. Descriptive statistics are reported in the bottom three panels of Table 1.

Starting with firm entry or *gross* firm creation, approximately 14% new firms are created every year in both urban and rural areas. Nevertheless, the annual rate of *net* firm creation is around 0.5% in both urban and rural areas, implying that at every point in time nearly as many firms enter as exit the market.[7] Once again, the variation across TTWAs is very significant: the coefficients of variation for the net share of firm creation for urban and rural areas are respectively 89% and 93%. The larger dispersion in rural areas is in line with the findings discussed above for the LFS. We find a similar pattern when looking at the gross share of firm creation, although the extent of variation is much smaller at 4.3% and 6.3% in urban and rural areas, respectively. This suggests that a substantial part of the geographical differences in terms of firm density is explained by survival rates, and firms that enter the market only to exit one year later (i.e. churning).

Next, we partition our measures of firm creation between services and manufacturing. For services, we find that in both urban and rural areas, on average between 1997 and 2008, the number of establishments has been expanding. The gross rate of firm creation was in the order of 14% every year, while the net rate was 0.6%-0.7%. On the other hand, manufacturing activities have been shrinking, and more markedly so in urban areas. Although the gross rate of

[7] The correlation between *net* and *gross* firm creation is 0.65 and 0.67 in urban and rural TTWAs, respectively.

manufacturing firm creation in both urban and rural areas was approximately 10% per year, the net rate was -2.4% in urban areas and -1.5% in rural areas. Further, there is more variation across TTWAs in net firm creation in the service industries than in manufacturing, while the opposite is true for gross firm creation. The larger extent of spatial variation in services than manufacturing for net firm creation is in contrast with the results we obtained using the LFS, and might be partly explained by the general downward trend in manufacturing. Conversely, the more substantial variation across TTWAs in manufacturing than in services that we obtain looking at gross rates of firm creation is in line with the results documented using the LFS.

In the bottom panel of the Table 1, we report descriptive statistics for the fraction of firms that innovate in the TTWA. This proxy bundles together both process innovation and product innovation. Looking through the columns, the figures show that firms in urban areas innovate slightly more than those in rural areas – with shares of innovative firms at 30.4% and 29.5% respectively – but these differences are not marked. Furthermore, there is more dispersion in innovative activities across rural areas (coefficient of variation 12%) than urban areas (8.16%). This is in line with the picture presented so far. Next, more firms innovate in manufacturing (approximately 46% in both rural and urban areas) than in services (around 26.8% and 28.4% in rural and urban areas). This is true even if we focus on *process* innovation for service industries and *product* innovation for manufacturing. Finally, there is more variation across TTWAs in manufacturing than in services. Although these figures might be affected by fewer manufacturing firms than service firms in the CIS (due to the representative nature of the survey), this pattern follows the trend documented for our other proxies.

3.3 The sectoral distribution of self-employed workers and firms

To conclude this section, we present descriptive statistics for the sectoral distribution of self-employed individuals in the LFS and firms in the BSD. In order to do so, we append all plants active in the BSD in the various years to add up to about 29 million observations (or 2.4 million per year). Our findings are presented in Table 2. Note that we re-group sectors to match Glaeser (2009) and Hurst and Pugsley (2010). More details are provided in the note to the table.

Starting with the urban areas, the overall impression is that the match between the sectoral distribution of self-employed workers in the LFS and firms in the BSD is reasonably good. The biggest discrepancies are concentrated in Construction. The percentage of BSD units in Construction is 9.82%, while the corresponding figure is around 20% for self-employed workers in the LFS. Conversely, the incidence of Wholesale Trade; Finance, Insurance and Real Estate (FIRE); and Accommodation/Food Services is higher in the BSD than in the LFS.

As for rural areas, differences between the BSD and LFS are similar to those detected in the urban sample. However, there is a higher incidence of both self-employed workers (LFS) and firms (BSD) in Construction; Retail Trade; and Accommodation and Food Services; and a smaller incidence of Professional Services. Some of these urban/rural differences are slightly more pronounced when considering the 'Owner' definition of self-employment, but broadly speaking similar patterns emerge from the BSD and the LFS.

Before moving on, it is instructive to compare the sectoral incidence of UK self-employment with figures provided in Glaeser (2009) and Hurst and Pugsley (2010) for the US. Glaeser (2009) tabulates the incidence of self-employed workers in non-agricultural sectors. Our figures are broadly comparable to his, although we tend to over-sample self-employed workers in Construction and have more self-employment in High-Tech Manufacturing, Accommodation and Food, and Health services. Conversely, we have less self-employed in Low-Tech Manufacturing. Note that we also have a larger group of Professional and FIRE self-employed workers, which broadly speaking corresponds to Glaeser's High-Skill Information Services. Relative to Hurst and Pugsley (2010), the LFS self-employed workers tend to feature more prominently in Construction, but also in allegedly more entrepreneurial sectors such as manufacturing – in particular High-Tech Manufacturing – and Professional services. There are also some discrepancies in the share of self-employed workers in Transportation and Warehouse (more in the LFS, although this group also includes Communication Services in our data), and FIRE (less in the LFS). However, by and large, these comparisons reveal that the sectoral distribution of self-employed and small businesses in the US and the UK is remarkably similar. This suggests that our main results should easily extrapolate to the US economy.

4. The link between self-employment, firm creation and innovation: How good a proxy for entrepreneurship?

4.1 Main results on urban and rural areas

In this section, we exploit information from the three datasets discussed above combined at the TTWA level to investigate whether the area shares of self-employment are well aligned with business start-up rates and innovation density. Our results are presented graphically by cross-plotting shares of self-employed workers in the TTWAs against rates of firm creation and innovation. To assess the significance of the relations depicted in the graphs, we also report results from univariate regressions at the TTWA of either firm creation rates or the incidence of innovation on the shares of self-employment. Results are reported in the various panels of our figures and are organized as follows: Figures 2.a-2.b focus on urban areas, whereas Figures 3.a-

3.b focus on rural areas. Figures 2.a and 3.a focus on 'Independent Self-Employed'; whereas Figures 2.b and 3.b focus on 'Owners'.

Starting with the urban plots, the top left panels of Figures 2.a-2.b display the alignment of average TTWA self-employment rates up to 2002 and after 2002. These plots show that TTWAs with more self-employed workers up to 2002 remained more 'entrepreneurial' in the subsequent years. Interestingly, these graphs also confirm that the South East and in particular London and the surrounding areas are highly entrepreneurial: Brighton, Tunbridge Wells, Guilford, Inner and Outer London, Cambridge, Oxford and Slough always feature at the top. Conversely, Dudley, Dundee, Bradford, Glasgow and Newport always rank near the bottom.

Next, moving clockwise, we present the alignment of self-employment with: *(i)* net firm creation (top right panel); *(ii)* gross firm creation (bottom right panel); *(iii)* share of innovative firms (bottom left panel). All variables have been demeaned so that the scale on the axis is in deviations from sample means. The numbers at the bottom of each panel report regression coefficients of the demeaned variables on the vertical axis on the horizontal axis, and associated heteroskedasticity-robust standard errors.

The overall pattern presents a positive story: rates of self-employment are reasonably well aligned with firm creation and innovation intensity. The relation between the incidence of self-employed workers and net firm creation is always positive, and the regression coefficients reveal a significantly positive association for both self-employment proxies with t-statistics in the range of 3.5-4. The regression coefficient of net firm creation on 'Independent Self-Employed' is 0.081 with a standard error of 0.025, further climbing to 0.104 (s.e. 0.026) when considering 'Owners'. When looking at gross rates of firm creation, we find that the association with self-employment remains positive, although overall levels of significance are slightly attenuated. The regression coefficient of gross firm entry rates on 'Independent Self-Employed' is 0.060 with an s.e. of 0.035, significant at the 10% level. Similarly, the relation between gross firm creation and 'Owners' is significant at the 10% level, with a coefficient of 0.072 (s.e. 0.039). These findings are partly explained by a more compressed distribution in the rates of *gross* firm creation across TTWAs compared to the variation in *net* firm creation (as noted in Section 3.2), and suggest that the incidence of firm destruction in urban areas must be negatively correlated with the density of self-employment. Finally, in the bottom left plots of Figures 2.a-2.b, we present the relation between self-employment and innovation. In both figures, we find a positive relation between self-employment and the intensity of innovation, significant at the 1% level. When considering 'Independent Self-Employed' we find a coefficient of 0.373 (s.e. 0.155), further rising to 0.415 (s.e. 0.165) when focussing on 'Owners'.

The positive findings for urban TTWAs are completely reversed when focussing on rural areas. Our results are reported in Figures 3.a-3.b and follow the structure of Figures 2.a-2.b. Starting from the top left plots, we see that the intensity of self-employment before 2002 in rural areas is still reasonably well in-line with the share of self-employment after that date, although the alignment is less precise than for urban areas. Cornwall, Devon, Kendal, parts of Wales and Yorkshire feature at the top of the rankings, whereas Scottish TTWAs tend to be at the bottom of the self-employment distribution. This is true irrespective of the definition we consider.

More importantly, the share of self-employment in rural TTWAs is *not* positively and significantly associated with the share of net and gross firm creation. Starting with the former, although there is a positive association between net firm creation and our proxies for self-employment, this relation is much flatter than for the urban sample and not significant at conventional levels. The coefficient of the regression of the net share of firm creation on 'Independent Self-Employed' is 0.015 (s.e. 0.020), and this figure for 'Owners' is 0.028 (s.e. 0.020). As for gross firm creation, this is *negatively* linked to the share of self-employed workers in the TTWA. While this relation is not statistically significant, the pattern is clear for both measures of self-employment, with regression coefficients of -0.036 (s.e. 0.035) and -0.020 (s.e. 0.037) for 'Independent Self-Employed' and 'Owners', respectively. Similarly, the bottom left panels of Figures 3.a-3.b reveal that the share of self-employed workers in a TTWA is not positively associated with innovative activities. While for 'Independent Self-Employed' workers the relation remains positive (at 0.071) but insignificant (s.e. 0.133), the link between 'Owners' and innovation turns negative (insignificant) with a regression coefficient of -0.068 (s.e. 0.172).

Note that at the bottom of each panel we also report the R-squared from our simple TTWA-level regressions in urban and rural areas. Across all specifications, R-squared are substantially higher for the urban sample than for the rural one. For instance, the incidence of self-employment explains between 11%-16% of the overall variation in net firm creation in urban areas. The corresponding values for rural areas are 0.8%-2%. Similarly, urban self-employment rates explain approximately 9% of the spatial variation in innovation activities, but the corresponding figures for the rural sample are much lower, at 0.2%-0.4%.

All in all, these findings suggest that measures of self-employment derived from individual-level data act as good proxies for entrepreneurship as measured by start-up and innovation rates in urban areas. Conversely, the same self-employment measures applied to rural areas would give a distorted picture of the spatial distribution of entrepreneurial activities. Clearly, at this stage, we cannot rule out the possibility that even in urban areas self-employment captures a different – and less entrepreneurial – phenomenon than firm creation and innovation. For example, as noted in the Introduction, truly entrepreneurial ventures might drive up the local

population and thus generate demand for 'replicative' self-employment. We will return to these issues in Section 5, where we explore some explanations for the urban/rural divide.

4.2 Robustness checks and additional findings

In this section, we discuss a number of results that assess the robustness of our findings. To begin with, we check whether the patterns documented so far are affected by the exclusion of multi-plant enterprises from the BSD and the CIS, and find that this is not the case. For example, when dropping multi-plant firms from the BSD, the relation between net firm creation and 'Independent Self-Employed' remains positive in urban areas with a regression coefficient of 0.032 (s.e. 0.027), but turns negative in rural areas at -0.016 (s.e. 0.023). Similarly, if we consider the link between self-employment and innovation excluding multi-plant firms from the CIS, we find positive results for urban areas, but negative ones for rural TTWA: regressing the share of innovative firms on 'Independent Self-Employed' yields coefficients of 0.542 (s.e. 0.269) in urban areas, but this becomes negative at -0.288 (s.e. 0.310) for rural ones.

A second concern is that our results – in particular those for rural areas– might be driven by outliers based on very small numbers of individual-level observations used to calculate area-level self-employment rates. In order to address this issue, we re-run our analysis weighting our regressions by the number of workers used to measure the incidence of self-employment in the TTWA. This change does not affect our results. For example, we find that the relation between 'Independent Self-Employment' and net firm creation in rural areas is still small at 0.022, not significant (s.e. 0.021) and close to the one documented in Figure 3.a. Further, the link between 'Independent Self-Employment' and either firm entry or the incidence of innovative firms is close to what we found before at -0.018 (s.e. 0.035) and 0.146 (s.e. 0.150), respectively. Similarly, the relation between self-employment rates and both firm creation and innovative behaviour remains positive and largely unaffected in urban areas when using weights.[8]

Next, as discussed in Section 2.3, the structure of the CIS makes it representative of broad geographical areas, but analysis at smaller levels of aggregation might be problematic. Although this might affect our results on innovation, it is important to notice that the urban/rural divide documented so far is clearly evident even when focussing solely on start-up rates derived from the BSD. However, in order to tackle this concern directly, we re-run some of our analysis at the regional level using the 18 macro-areas provided by the LFS (further partitioned into their urban and rural parts). Although the results from this investigation are less conclusive given the very

[8] Another lesser concern is that some of our rural areas are more disconnected than others. In order to investigate this issue, we identified rural TTWAs surrounded by other rural TTWAs and included a dummy identifying these isolated areas in our regressions analysis. Our results were not affected by this change. Similarly, our results for rural areas are not affected by the presence of seasonal workers in the tourist industry in sparsely populated rural areas since these are predominantly excluded from our 'Independent Self-Employed' measure.

limited number of observations, we find patterns which are broadly consistent with our previous findings. For example, the link between 'Independent Self-Employed' and innovation is substantially larger in urban areas (0.333, s.e. 0.245) than in rural areas (0.077, s.e. 0.209).

Finally, we investigate the robustness of our results to other self-employment measures adopted in the literature by using either all self-employed individuals or individuals in professional and managerial occupations (i.e. those identified as "Managers and senior officials" or in "Professional occupations" or in "Associate professional and technical occupations" by the LFS Socio-Economic Classification at the 1-digit level). When we do this, we find patterns that are fully consistent with those discussed above. These results are not reported for space reasons, but are available in the working paper version of this article (Faggio and Silva, 2012).

4.3 Sectoral heterogeneity: manufacturing versus services

As already noted, the share of firms in manufacturing sectors has been declining steadily in Great Britain during the period 1997-2008, but this decline was more marked in urban areas than in rural areas, leaving more room for services to flourish. It might also be argued that self-employment is a better proxy for entrepreneurship in service sectors, where individuals leading consultancies and professional services, or setting up wholesale and retail chains, might still view themselves as self-employed, and yet be highly entrepreneurial. On the other hand, entrepreneurs who founded a larger manufacturing plant – despite being innovative and entrepreneurial – might not identify themselves as self-employed. If this was the case, the lack of alignment between the share of self-employed workers and both firm creation and innovative activities in rural areas might be related to sectoral considerations.

In order to explore this issue, we repeat the analysis carried out in Section 4.1, but considering service and manufacturing industries separately. Our results are presented in Appendix Figures 1 and 2, where we only consider 'Independent Self-Employed'. Results obtained using self-employed 'Owners' are similar and are available upon request. Note that when calculating the shares of self-employed workers in urban and rural areas, and separately for services and manufacturing, our individual-level data becomes thin. This is particularly true for manufacturing in rural areas (the number of individuals working in rural manufacturing is about 30,000, climbing to 90,000 for urban manufacturing). Therefore, we regard the evidence in this section as more 'noisy' than the findings discussed above.

Appendix Figure 1 concentrates on individuals and firms operating in service industries. The left panels of the figure refer to individuals and firms located in urban areas, whereas the right panels concentrate on rural areas. The three different panels present evidence on the link between self-employment and: *(i)* net firm creation (top panel); *(ii)* gross firm entry (middle

panel); *(iii)* innovation (bottom panel). Notice that since we are focussing on services, we concentrate on *process* innovation.

Starting with the urban graphs, the share of 'Independent Self-Employed' is positively aligned with all three firm-data proxies for entrepreneurship in urban areas, although this relation is significant for net firm creation (coeff. 0.073; s.e. 0.036) and process innovation (coeff. 0.414; s.e. of 0.118), but not for gross firm creation (coeff. 0.055; s.e. 0.045). On the other hand, the relation between self-employment in rural areas and firm creation is flat when considering net rates of business start-ups (coeff. -0.008; s.e. 0.028), and significantly negative when focusing on gross firm creation (coeff. -0.099; s.e. 0.042). Finally, the link between self-employment rates and the share of innovative firms is positive in rural areas, but less precisely estimated and sizeable than for urban areas (coeff. 0.224; s.e. 0.081).

In Appendix Figures 2, we replicate this analysis for manufacturing. Once again, the reader should bear in mind that our self-employment rates are calculated over a small number of individuals, which makes our findings more tentative. Note also that the proxy for innovation now considers only firms that engage in *product* innovation.

Starting again with the urban panels, we find that a larger share of 'Independent Self-Employed' is positively associated with net firm creation (coeff. 0.074; s.e. 0.032), gross firm creation (coeff. 0.080; s.e. 0.042) and innovation (coeff. 0.695; s.e. 0.386). However, this is not the case for rural areas. The link between self-employment rates and net firm creation remains positive, but insignificant (coeff. 0.055; s.e. 0.022), while the relation between 'Independent Self-Employed' and firm entry is negative but insignificant at -0.003 (s.e. 0.035). Finally, the incidence of self-employment is negatively correlated with the share of innovative firm, although this relation is not significant (coeff. -0.384; s.e. 0.229).

All in all, the evidence gathered in this section suggests that the stark urban/rural divide cannot be explained by differences in the incidence of manufacturing and services in urban and rural TTWAs.

5. What explains the urban/rural divide? Some evidence

5.1 Individual reasons for choosing self-employment

In order to shed some light on the urban/rural divide documented above, in this section we start by investigating individuals' self-reported reasons for choosing self-employment. This data comes from the LFS and information was collected for self-employed individuals in 1999, 2000 and 2001 only, so the number of observations is small and approximately 9,000 in the urban sample and 3,000 in the rural group.

Our findings are tabulated in Table 3. A number of reasons were listed by the LFS which we have regrouped as follows: 'Non Pecuniary Reasons'; 'Generate Income'; 'Business Idea/New Product'; 'Join Family Business'; 'Lack of Employment Opportunities'; and 'Other Reasons'. More details are reported in the note to the table. Note also that individuals could report up to four reasons for choosing self-employment, although only few did.[9] So in the table we report both the percentage of people reporting a given category in their first answer, as well as in any of their answers. The two left columns refer to urban TTWAs, while the two right columns focus on rural areas.

Approximately 37%-39% of self-employed workers in urban areas reported 'Non Pecuniary Reasons' as their first motive for choosing self-employment, while these figures are slightly smaller (between 36%-37%) in the rural sample. Note that 'Non Pecuniary Reasons' include 'Wanted to be independent/experience a change' and 'Wanted better working conditions', so that it is hard to gauge whether these figures should predict that more entrepreneurial types choose self-employed in urban rather than rural areas.

The percentage of urban workers who chose self-employment because they wanted more money ('Generate income') is approximately 7%-7.5% when only considering the first reason given, and 13.5%-14.5% when all reasons are considered. Interestingly, these figures do not substantially vary between the urban and the rural sample. This result is somewhat puzzling given that we have documented in Section 4 that self-employed workers in urban areas seem to be more entrepreneurial than those in rural areas. A similar intuition can be obtained when focusing on the category 'Business Idea/New Product', including individuals who chose self-employment because 'The opportunity arose (capital, space and equipment was available)' or because 'They saw some demand/a market' for their business idea. Across both definitions of self-employment, the percentages of individuals who report this type of motivations is slightly *larger* in rural areas.

Further down, we see that around 4% of self-employed workers in urban areas report joining the family business as their first reason, with this percentage rising to 5% if we consider all answers. These figures are slightly larger in rural areas, where they range between 5.8% and 6.7%. This could suggest that more self-employed workers in rural areas join low-productivity, non-innovative 'mom-and-pop businesses' – such as shops and small retail units – or become second generation entrepreneurs – which are often less innovative and talented than their predecessors (Bertrand and Schoar, 2006 and Bertrand *et al*., 2008).

[9] The percentage of people who gave multiple answers is very small. On average over the three years under consideration, the figures were as follows: about 17% gave two answers; 6% three answers; and 2% four answers.

These results could also suggest that some individuals decide to join their family businesses because of lack of job opportunities. Further evidence on this issue can be gathered looking at the incidence of individuals who became self-employed because of lack of alternative opportunities. In urban areas, the share of self-employed out-of-necessity is 11% considering only first answers, and 13% when considering all answers. The corresponding figures for rural areas are slightly larger at 12% and 14%, respectively.[10]

Before moving on, we compare our results with those of Hurst and Pugsley (2010) who tabulate nascent entrepreneurs' reasons for starting a business. Relative to our findings, a significantly larger share of their entrepreneurs report that they opened an activity to 'Generate income' – at 19.5%-21% considering the first reason only – or because they had a 'Business idea or created a new product' – at 28%-32%. On the other hand, the share of individuals who became entrepreneurs because of lack of other employment opportunities is smaller for Hurst and Pugsley (2010) – at 2.2%-2.6% considering the first reason only – than for us. Finally, the share of nascent entrepreneurs motivated by 'Non pecuniary reasons' is similar to ours, at approximately 35%-38% considering the first reason only.

To summarise, the results in this section suggest that UK self-employed workers are less entrepreneurial than small business owners in Hurst and Pugsley (2010) across all areas. However, the fact that we find no substantial differences between urban and rural TTWAs when looking at self-reported reasons for becoming self-employed contrasts with our previous findings presenting a clear urban/rural divide. This casts doubts about the validity of looking at individuals' self-reported reasons to become self-employed to identify entrepreneurial types.

5.2 Lack of employment opportunities and the urban/rural divide

In this section, we explore more systematically whether self-employed individuals in rural areas chose to start their activity because of lack of employment opportunities, and this explains the misalignment of self-employment with firm-level proxies for entrepreneurship. In order to do so, we use additional LFS information that extensively captures the pervasiveness of lack of employment opportunities among workers over several years (and not just for self-employed workers over three years as in the previous section).

Our first proxy is based on information about workers who would like to work longer hours (in their current job), but are not offered the possibility to do so. Using this detail, we construct the share of workers who are 'underemployed' in urban and rural TTWAs. Next, we identify individuals whose job is not permanent, but fall in one of the following categories: seasonal; fixed-period; fixed-task; agency temping; casual type; other. We then aggregate this data at the

[10] Note also that the fraction of individuals who chose self-employment because of 'Other reasons' is slightly larger in urban areas than in rural ones. However, it is impossible to attach any meaningful interpretation to this category.

TTWA level to measure the incidence of 'temporary employment'. Finally, we identify individuals who work part-time because they could not find full-time jobs and calculate the pervasiveness of 'lack of full time employment' opportunities in the TTWA. Descriptive statistics for these proxies are presented in Appendix Table 3.

We think these measures are better than those we could obtain by aggregating information on self-employed workers' reasons to start a business at the TTWA (discussed above). This is because these proxies can be calculated over a much larger number of individuals and over an extended time period, allowing us to reduce the 'noise' in our measures.[11] Nevertheless, the correlation between our three proxies and the share of self-employed workers who started their activity because of lack of employment opportunities is positive, although small at around 0.10-0.20. This low correlation can be most likely explained by the thinness of the data used to compute the latter variable.

In order to shed some light on the urban/rural divide, we use our three proxies for lack of employment opportunities to predict the differences between the incidence of self-employment and either net firm creation or firms' innovative behaviour, separately for urban and rural areas. Our results are presented in Table 4. Panel A focuses on urban TTWAs, while Panel B presents evidence for rural areas. Each cell in the table reports regression coefficients (with robust standard errors) from separate regressions, where the dependent variable is one of the following measures: *(i)* the difference between the standardized share of 'Independent Self-Employed' and the standardized share of net firm creation (Columns 1 and 2, Panel A and B); or *(ii)* the difference between the standardized share of 'Independent Self-Employed' and the standardized share of innovative firms (Columns 3 and 4, Panel A and B). The explanatory factors of interest are the proxies derived above, namely: *(i)* the incidence of underemployment; *(ii)* the incidence of temporary employment; and *(iii)* the incidence of lack of full-time employment. Note that these explanatory factors have been standardized too. Columns (1) and (3) do not include controls, whereas Columns (2) and (4) add individual characteristics aggregated from the LFS at the TTWA level. These include individuals' education levels, as well as the incidence of unemployment and inactivity. More details are provided in the note to the tables.[12]

Panel A of Table 4 reveals that our proxies for lack of employment opportunities do not have a strong relation with differences in self-employment rates and either net firm creation or innovation in urban areas: only one out of twelve regression coefficients is significant. This is

[11] The incidence of underemployment and temporary employment are constructed aggregating information from approximately 2.8 million observations, while the pervasiveness of lack of full time-employment uses information for approximately 800,000 part-time workers. Conversely, the proxies obtained by aggregating self-employed individuals' responses would rely on only about 12,000 observations.

[12] Results using self-employed 'Owners' and/or gross firm creation provided a similar intuition, but are not reported for space considerations.

not surprising given the good mapping between individual-level and firm-related proxies for entrepreneurship documented in Section 4.1. On the other hand, as shown in Panel B of the table, lack of employment opportunities is a strong predictor of differences between the incidence of self-employment and either net firm creation or firms' innovative behaviour in rural areas. Nearly all of the regression coefficients on our proxies for poor labour market conditions are statistically significant, and larger than in the urban sample (coefficients are comparable since all variables are standardized). Note also that although precisely quantifying these effects is beyond the scope of this study, the R-squared of the (unconditional) regressions carried out in Columns (1) and (3) of Tables 4 are always larger for the rural sample than for the urban one. For urban TTWAs, these range from virtually zero to 1.2%, while for rural areas, they are between 13% and 20%.

Before moving on, some additional results are worth discussing. First, local unemployment rates do not significantly enter the regressions in Table 4 as controls. Similarly, they are not strong predictors of the TTWA differences in self-employment and firm-derived measures of entrepreneurship when used as explanatory factors, unconditional on other controls. For example, local unemployment enters the regression of the difference between 'Independent Self-Employment' and net firm creation in rural TTWAs with a coefficient of 0.060 and an associated s.e. of 0.134. The corresponding number for urban areas is -0.123 (se. 0.112). Second, the controls for the share of individuals with different education levels do not enter the regressions in a consistently-signed fashion: while higher average educational attainments tend to reduce the difference between the incidence of self-employment and rates of business creation in both urban and rural areas, they slightly increase the misalignment between self-employment and innovation. However, most of these effects are insignificant. Finally, we try to include in our specifications a Herfindahl-index based on the employment shares across the sectors listed in Table 2. Our concern is that rural areas have more specialized industrial structures, limiting the scope for small-business entrepreneurship as captured by self-employment. However, we find no evidence that the industrial concentration of urban and rural areas significantly explains the misalignment of self-employment and either net firm creation or firm innovative activities. Moreover, the coefficients on the three proxies for lack of employment opportunities are not affected by the inclusion of the Herfindahl index.

5.3 Replicative and innovative entrepreneurship in urban and rural areas

The geographical divide presented above could also be rationalised by the distinction between 'replicative' and 'innovative' entrepreneurs and their differential incidence in urban and rural areas. As discussed in the Introduction, innovative entrepreneurs generate new economic

opportunities by creating new products and processes, while replicative entrepreneurs respond to local demand by providing required goods and services.

In order to test whether replicative entrepreneurship can explain some of the disparities between self-employment rates and the incidence of net firm creation and innovation, in the bottom rows of Panels A and B of Tables 4, we investigate whether these differences are significantly linked to the population density of the TTWA.[13] According to Baumol (2011), a larger population base should be associated with a larger incidence of replicative entrepreneurship, since higher population density results in higher demand for goods and services, including those provided by routine entrepreneurs.

Starting with urban areas, the top panel of Table 4 shows that the association between population density and the difference between the incidence of self-employment and net firm creation is positive overall, but not significant. Similarly, we find no evidence of a significant relation between population density in urban areas and the difference between the share of self-employment and the incidence of innovative firms. Conversely, Panel B of Table 4 shows that the relation between population density in rural areas and the difference between net firm creation and the share of 'Independent Self-Employed' is negative and significant. This is true irrespective of whether further controls are included in our analysis. Similarly, we find that the relation between population density and the difference in the incidence of self-employment and innovative firms is negative and significant in Column (4) when controls are added.

The evidence for rural areas is hard to reconcile with the notion that some of the self-employment spells in the densest rural areas can be considered routine entrepreneurship. For this to be the case, one should observe that as a large number of firms cluster in certain rural areas – thus attracting workers and pushing up population density – a larger number of routine entrepreneurs is pulled into the market by the increased demand for their goods and services. However, the increase in the share of replicative entrepreneurs as the population density increases should be smaller than the increase in the incidence of net firm creation or innovative enterprises, so that the differences between these proxies shrink. Digging deeper, we find that this is not the case: while the incidence of net firm creation and innovation is not significantly related to population density in rural areas, the share of self-employment is significantly and *negatively* associated with this variable, showing that the least populated rural areas have larger shares of self-employed workers. This finding reinforces our previous conclusion that a high

[13] This is measured by the number of people recorded in the GB Census 2001 per squared kilometre.

incidence of self-employment in rural areas mostly captures last-resort choices dictated by lack of employment opportunities.[14]

On the other hand, the evidence for urban areas could be consistent with the distinction between innovative and replicative entrepreneurship if the incidence of both increases by a similar amount as population density rises. If this was the case, self-employment would capture a different – and less entrepreneurial – phenomenon than firm creation and innovation even in urban areas. However, we note that the good alignment between self-employment rates and firm creation and innovation was evident for both manufacturing and services in urban areas. This is partly inconsistent with an explanation based on replicative entrepreneurship which mainly holds for self-employment in the services sector. To further dispel this possibility, we carry out some additional analysis. To being with, we the re-run the analysis in Columns (1) and (3) of Table 4 adopting a less restricting specification and regressing either the share of net firm creation or the incidence of innovative firms on self-employment rates, while controlling for population density. The results show that 'Independent Self-Employment' remains strongly and significantly associated with both firm-based proxies for entrepreneurship, while population density is insignificant. Further, we find the same patterns if we use population density of adults in their working age (16 to 65 year-old), which should be more directly linked to replicative entrepreneurship. Finally, we investigate whether population density is significantly associated with self-employment, net firm creation and innovation in some univariate regressions, but fail to find robust evidence. All in all, our findings suggest that the positive link between self-employment and both firm creation and innovative behaviour in urban areas is genuine: urban self-employment does not simply capture replicative entrepreneurship, rather it is an expression of innovative entrepreneurship as both firm creation and innovative behaviour are.

6. Conclusions

Economists and policy makers consider entrepreneurs a crucial 'ingredient' in determining a country's or a region's economic prosperity. This is because entrepreneurs are thought to be conveyors of innovation, engines for job creation and sparks for technological change, economic growth and development. Unsurprisingly, a large empirical and theoretical literature on the characteristics and functions of the entrepreneurs, as well as on the effects of dense entrepreneurial environments, has emerged over the recent decades.

Similarly, policy makers' interest in studying small business creation and designing interventions that stimulate entrepreneurial start-ups is always very high, and more so in the

[14] Note that the relation between population density and self-employment, firm creation and innovation is always positive in urban areas, although only significant for the share of 'Independent Self-Employed'.

aftermath of the Great Recession. With the possibility of fiscal stimuli being progressively eroded by the need for a sustainable long-term path in public finances, the dynamics of private sector entrepreneurs are even more tightly associated with the prospects of different countries' swift recoveries or long lasting period of sluggish growth.

Despite the self-evident interest and importance of the figure of the entrepreneur in policy making and economics thinking, relatively little conclusive evidence has been gathered on the subject. This is because research in the field is hampered by the fundamental issue of defining and identifying who the entrepreneurs are. While the vast majority of the empirical investigations in this area rely on self-employment data to study entrepreneurship, the link between these two variables is far from proven.

In this paper, we have shed some light on this issue by looking at the correlation between the incidence of self-employment at the TTWA level and some of the most noticeable aspects of entrepreneurship, namely business creation and firms' innovative behaviour. To the best of our knowledge, our study is the first to systematically investigate whether the common practice of using self-employment rates as a proxy for entrepreneurship has any validity using variation within-country and across economically relevant areas (i.e. TTWAs) in the incidence of self-employment, business start-up rates and innovation.

Our results show that there is a positive and significant correlation between the incidence of self-employment and business creation as measured by gross and net firm creation rates in urban TTWAs. Similarly, we find a positive and significant correlation between self-employment and innovation in urban areas. However, none of these results holds for rural TTWAs, where we find that self-employment does not 'line up' with firm creation and innovation. This pattern is not driven by the sectoral composition of business activities across urban and rural areas. When we replicate our analysis separately for services and manufacturing across urban and rural TTWAs, we observe very similar patterns: a high incidence of self-employment in urban areas in either manufacturing or services is still positively correlated with firm creation, and either process (for services) or product (for manufacturing) innovation, but this is not true for rural areas.

In order to explain the urban/rural dichotomy, we have exploited additional information contained in the LFS and constructed proxies for lack of employment opportunities. Our evidence shows that these measures significantly predict the misalignment between self-employment, business creation and innovation in rural areas, but not in urban areas. This pattern suggests that the urban/rural divide is related to lack of employment opportunities in rural areas which might push some workers into self-employment out-of-necessity. Previous studies have documented that some self-employment spells can be explained by lack of alternative employment opportunities. Nevertheless, no previous studies have linked this phenomenon to an

urban/rural divide. Furthermore, we find little evidence that high self-employment rates can be explained by replicative entrepreneurship in either urban or rural areas.

We believe our results carry important implications for the academic debate in the field which has widely used information on individuals' self-employment status to identify entrepreneurs. As long as the analysis focuses on urban labour markets – roughly speaking equivalent to the US Metropolitan Statistical Areas (MSAs) – our results suggest that self-employment could provide a relatively good proxy for entrepreneurship. On the other hand, our findings suggest that this is not true for rural TTWAs, and that self-employment rates could provide a distorted picture of the spatial distribution of entrepreneurship in more rural regions.

Our findings also carry implications for public policies that promote self-employment with the aim of stimulating business creation and innovation. Indeed, this paper has documented an important urban/rural divide in individuals' motivation behind the decision to become self-employed. Our results therefore challenge the current policy stance that tends to consider the incidence of self-employment in both urban and rural TTWAs as an expression of the same positive economic phenomenon.

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Tables

Table 1: Geographical Distribution of Self-Employment and Entrepreneurship – Urban and Rural Areas

	URBAN AREAS			RURAL AREAS		
	Mean	Std.Dev.	C. of V.	Mean	Std.Dev.	C. of V.
Self-Employed, No Freelance/Subcontractors ('Independent Self-Employed'; LFS)						
All sectors	0.104	0.020	18.91%	0.120	0.028	23.75%
Manufacturing only	0.048	0.022	46.76%	0.062	0.034	55.89%
Services only	0.098	0.017	17.09%	0.111	0.023	21.00%
Self-Employed Owning/Controlling Business ('Owners'; LFS)						
All sectors	0.086	0.018	21.35%	0.097	0.024	25.13%
Manufacturing only	0.051	0.021	40.25%	0.062	0.030	48.93%
Services only	0.081	0.016	20.02%	0.091	0.023	25.17%
Net Firm Creation (as Share of Existing Firms; BSD)						
All sectors	0.005	0.005	89.40%	0.005	0.005	92.69%
Manufacturing only	-0.024	0.007	29.93%	-0.015	0.008	49.10%
Services only	0.007	0.005	71.07%	0.006	0.005	94.71%
Firm Entry (as Share of Existing Firms, BSD)						
All sectors	0.146	0.006	4.31%	0.140	0.009	6.12%
Manufacturing only	0.101	0.008	7.92%	0.102	0.009	8.95%
Services only	0.144	0.006	4.32%	0.137	0.008	6.26%
Share of Innovative Firms (Product and Process Innovation; CIS)						
All sectors	0.304	0.025	8.16%	0.295	0.035	12.01%
Manufacturing only	0.461	0.055	11.96%	0.462	0.079	17.21%
Services only	0.284	0.028	9.78%	0.268	0.034	12.83%

Note: Shares calculated using Labour Force Survey (LFS), Spring Quarters 1995-2009; Business Structure Database (BSD) for the years 1997 to 2008; and Community Innovation Survey (CIS) 2001, 2005, 2007 and 2009. Exact number of years in LFS changes for alternative definitions and depending on data availability. Sectors excluded from calculations as follows: Agriculture, Hunting and Forestry; Fishing; Public Utilities (Electricity, Gas and Water); Public Administration and Defence; Private Households with Employees; and Extra-Territorial Organization and Bodies. There are 79 Urban and 79 Rural Travel To Work Areas (TTWAs; some TTWAs were regrouped following Gibbons *et al.*, 2010).

Table 2: Sector Distribution of Self-Employment and Entrepreneurial Ventures – Urban and Rural Samples

	URBAN AREAS			RURAL AREAS		
Industry:	'Independent Self-Emp.' (LFS)	'Owners' (LFS)	Share of Firms (BSD)	'Independent Self-Emp.' (LFS)	'Owners' (LFS)	Share of Firms (BSD)
Mining and Quarrying	0.13	0.17	0.11	0.13	0.15	0.23
Construction	21.36	19.81	9.82	23.63	21.54	11.96
High-Tech Manufacturing	2.69	4.36	3.60	3.07	4.53	3.19
Low-Tech Manufacturing	4.18	5.58	4.69	4.92	6.23	5.04
Transport/Warehouse/Comm.	7.97	5.93	4.45	6.13	5.28	5.01
Wholesale Trade	5.54	6.91	9.20	6.16	7.51	9.60
Retail Trade	9.34	11.00	11.81	10.51	12.03	13.20
FIRE	3.97	4.43	7.51	3.63	3.99	6.31
Accommodation/Food Services	3.62	3.94	6.82	5.50	6.34	9.22
Entertainment Services	5.33	4.50	4.16	4.55	3.93	3.75
Professional and R&D Services	18.85	20.80	24.42	15.20	15.84	18.33
Health Care Services	8.21	5.67	5.42	8.01	5.74	5.91
General Services	8.80	6.90	7.98	8.55	6.89	8.24

Note: Cells tabulate percentages of self-employed people (LFS) and firms (BSD) operating in one of the listed sectors. Sectors have been regrouped using 2-digit SIC Code as follows. Mining and Quarrying: codes 10-14; Construction: code 45; High-Tech Manufacturing: codes 22-24, 29-35; Low-Tech Manufacturing: codes 15-21, 25-28, 36-37; Transport/Warehouse/Communication: codes 60-64; Wholesale Trade: codes 50-51; Retail Trade: code 52; FIRE: codes 65-71; Accommodation/Food Services: code 55; Entertainment Services: code 92; Professional Services: codes 72-74; Health Care Services: codes 85, 90; General Services: codes 80, 91, 93.

Table 3: Reasons for Choosing Self-Employment – Urban and Rural Samples

	URBAN AREAS		RURAL AREAS	
	First Reported Reason	Any Reported Reason	First Reported Reason	Any Reported Reason
Self-Employed, No Freelance/Subcontractors ('Independent Self-Employed')				
Non Pecuniary Reasons	37.03	40.73	36.62	40.10
Generate Income	7.14	13.59	7.15	13.81
Business Idea/New Product	11.78	18.79	12.92	19.70
Join Family Business	4.25	4.94	5.78	6.70
Lack Emp. Opportunities	11.10	13.03	11.92	13.96
Other Reasons	28.70	36.85	25.62	34.69
Self-Employed Owning/Controlling Business ('Owners')				
Non Pecuniary Reasons	38.77	42.76	37.10	40.73
Generate Income	7.52	14.54	7.35	14.05
Business Idea/New Product	12.46	20.15	13.32	20.55
Join Family Business	4.33	5.04	5.77	6.66
Lack Emp. Opportunities	11.06	13.01	12.23	14.21
Other Reasons	25.87	34.36	24.22	32.98

Note: Cells tabulate percentages of self-employed people reporting they chose self-employment for one of the listed reasons. Groups of reasons created as follows. Non Pecuniary Reasons include: 'Wanted independence/a change'; 'Better conditions of work'; 'Family commitments/wanted to work at home'. Generate Income includes: 'Wanted more money'. Business Idea/New Product includes: 'Opportunity arose - capital, space, and equipment available'; 'Saw the demand/market'. Lack of Employment Opportunities includes: 'No jobs available (locally)'; 'Made redundant'. Join Family Business includes 'Joined the family business'; Other Reasons include: 'Nature of the occupation'; 'Other'; 'No other reason given'. Information only available for LFS Spring Quarters 1999, 2000 and 2001.

Table 4: Explaining Differences Between Self-Employment Incidence and Other Measures of Entrepreneurship

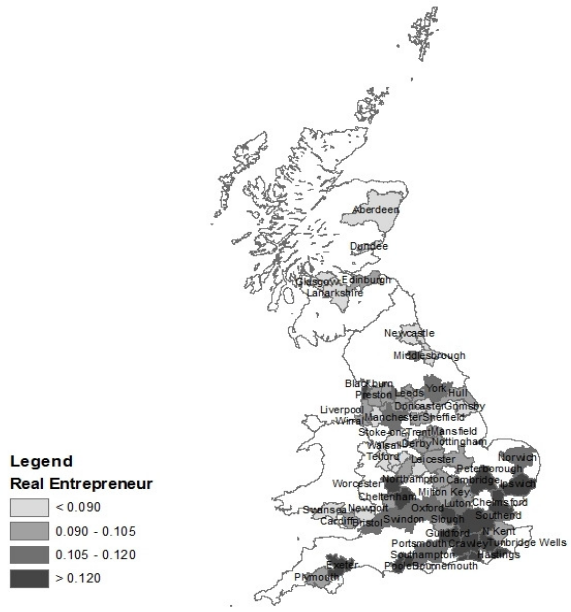
	Dependent Variable is the difference between:			
	(1)	(2)	(3)	(4)
	Self-Employment Incidence - Net Firm Creation	Self-Employment Incidence - Net Firm Creation	Self-Employment Incidence - Share of Innovative Firms	Self-Employment Incidence - Share of Innovative Firms
Panel A: 'Independent Self-Employed' in Urban Areas				
Incidence of Underemployment	0.077	0.369	0.045	0.332
	(0.144)	(0.182)*	(0.151)	(0.200)
Incidence of Temporary Employment	-0.048	-0.116	-0.058	-0.101
	(0.102)	(0.195)	(0.148)	(0.197)
Lack of Full Time Employment	-0.033	0.206	-0.129	0.364
	(0.112)	(0.240)	(0.135)	(0.212)
Population density	0.097	0.254	0.103	0.224
	(0.079)	(0.153)	(0.080)	(0.166)
Panel B: 'Independent Self-Employed' in Rural Areas				
Incidence of Underemployment	0.405	0.683	0.149	0.326
	(0.168)*	(0.179)*	(0.150)	(0.179)*
Incidence of Temporary Employment	0.272	0.337	0.299	0.242
	(0.179)	(0.195)*	(0.153)*	(0.197)
Lack of Full Time Employment	0.610	0.691	0.244	0.419
	(0.140)*	(0.206)*	(0.129)*	(0.195)*
Population density	-0.495	-0.491	-0.212	-0.354
	(0.162)*	(0.174)*	(0.198)	(0.182)*
Controls	No	Yes	No	Yes

Note: Regressions at the Travel to Work Area (TTWA) level. Number of observations: 79 in both urban and rural areas. Table reports coefficients from regressions of the dependent variable on the explanatory factors and robust standard errors in round parenthesis. *: 10% significant or better. Each cell corresponds to a different regression. Explanatory factors included one at the time. Descriptive statistics for the explanatory factors provided in Appendix Table 2. Controls include: unemployment rate; inactivity rate; share of adults with higher education; share of adults with A-level education (or equivalent); share of adults with O-level education (or equivalent); share of adults with other education (regressions using 'Lack of Full-Time Employment' further control for the incidence of part-time jobs). The dependent variables are constructed as the difference between the incidences of self-employment ('Independent Self-Employed') standardized within the sample of urban areas and rural areas separately, and either net firm creation or share of innovative firms standardized within the same sample. The explanatory factors have also been standardized.

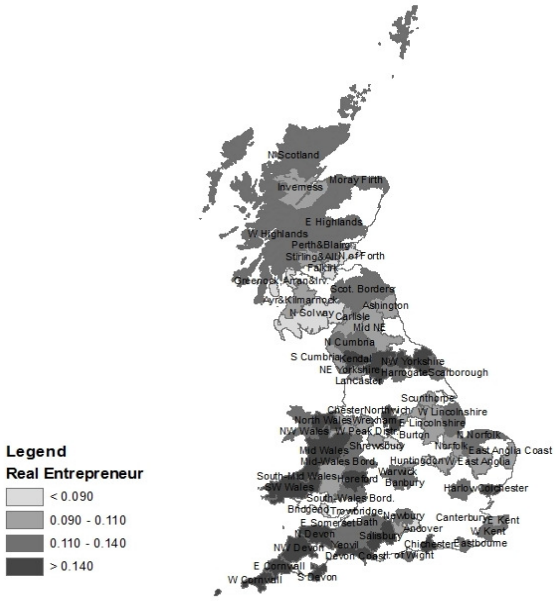
Figures

Figure 1: The Spatial Distribution of Self-Employment

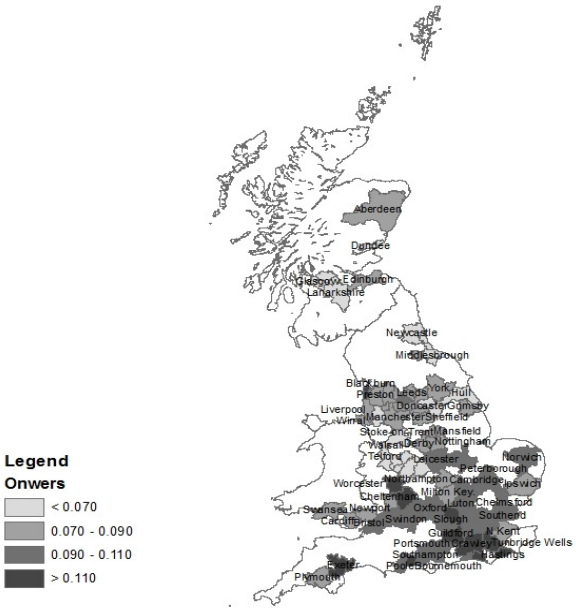
Independent Self-Employed – Urban Areas



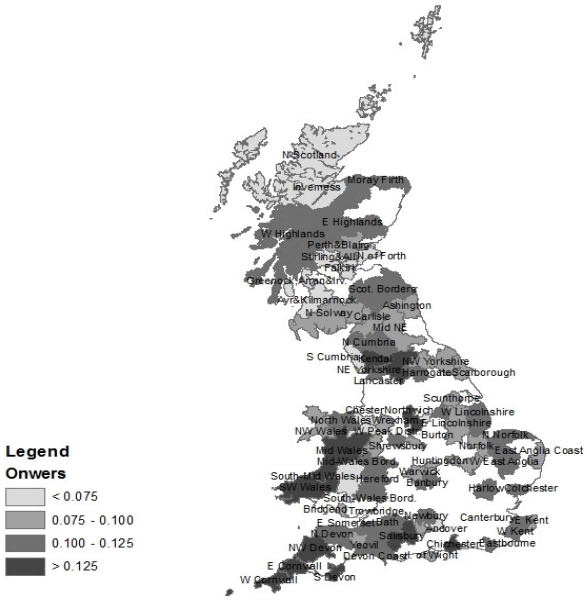
Independent Self-Employed – Rural Areas



Owners – Urban Areas



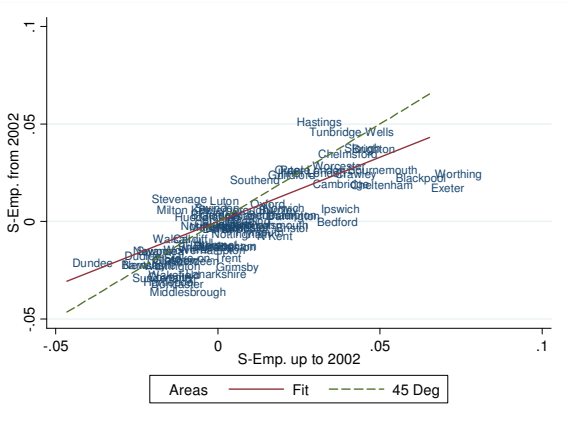
Owners – Rural Areas



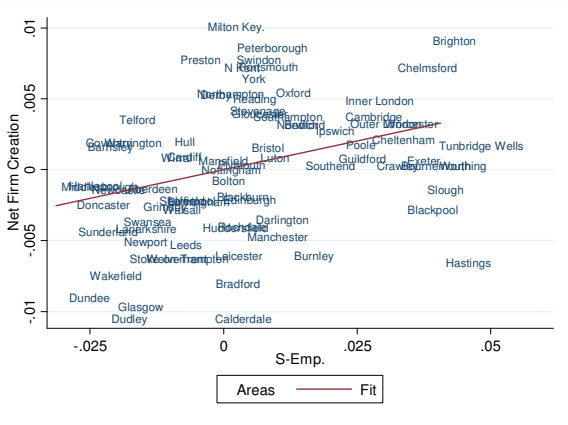
Note: Shares calculated using Labour Forces Survey, Spring Quarters 1995-2009. The exact number of years used changes for alternative definitions and depending on data availability. Different definitions of self-employment explained in the body-text. Sectors excluded from calculations as follows: Agriculture, Hunting and Forestry; Fishing; Public Utilities (Electricity, Gas and Water); Public Administration and Defence; Private Households with Employees; and Extra-Territorial Organization and Bodies. Sample includes 79 Urban and 79 Rural Travel To Work Areas (TTWAs; TTWAs were regrouped following Gibbons *et al*., 2010; further: Inner and Outer London have been separated).

Figure 2.a: 'Independent Self-Employed' in Urban Areas

Time Alignment: up to and after 2002

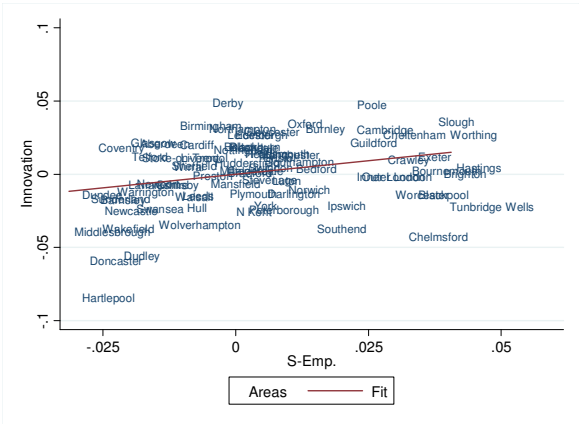


Self-Employment and Net Firm Creation



$y = 0.081\ (0.025)\ x + \varepsilon\ (R^2=0.110)$

Self-Employment and Innovation



$y = 0.373\ (0.155)\ x + \varepsilon\ (R^2=0.088)$

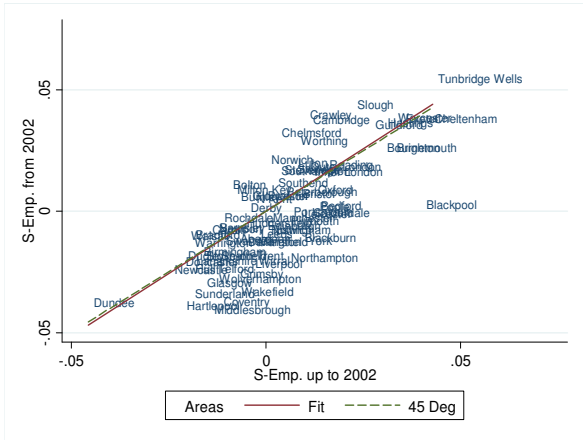
Self-Employment and Firm Entry

$y = 0.060\ (0.035)\ x + \varepsilon\ (R^2=0.035)$

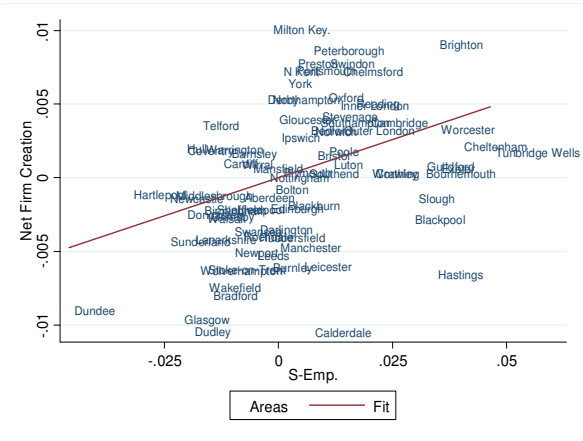
Note: Analysis includes 79 urban TTWAs only. All variables displayed in the panels have been demeaned. Equations report regressions coefficient and standard errors of a regression of the variable on the vertical axis (y, e.g. share of innovative firms) on variable on the horizontal axis (x, i.e. a given measure of self-employment) plus a constant. Robust standard errors used.

Figure 2.b: 'Owners' in Urban Areas

Time Alignment: up to and after 2002

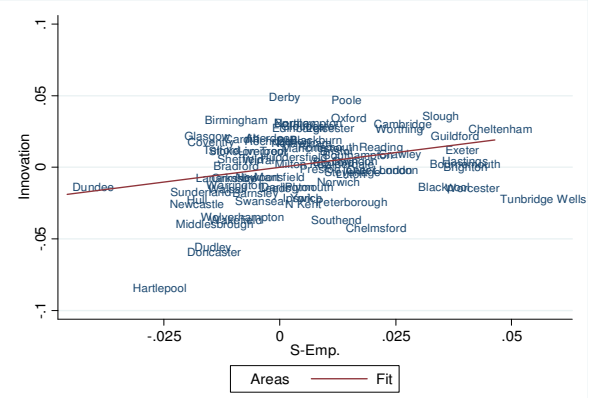


Self-Employment and Net Firm Creation



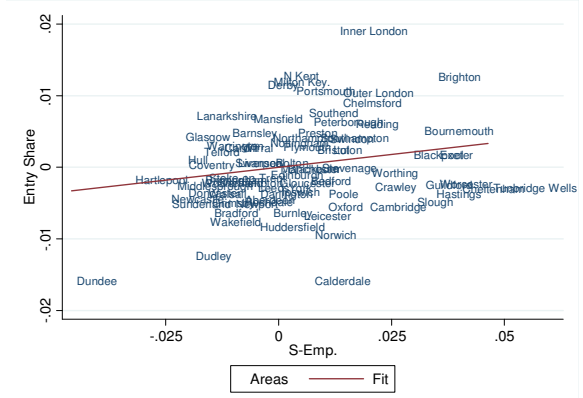
$y = 0.104\ (0.026)\ x + \varepsilon\ (R^2=0.156)$

Self-Employment and Innovation



$y = 0.415\ (0.165)\ x + \varepsilon\ (R^2=0.094)$

Self-Employment and Firm Entry

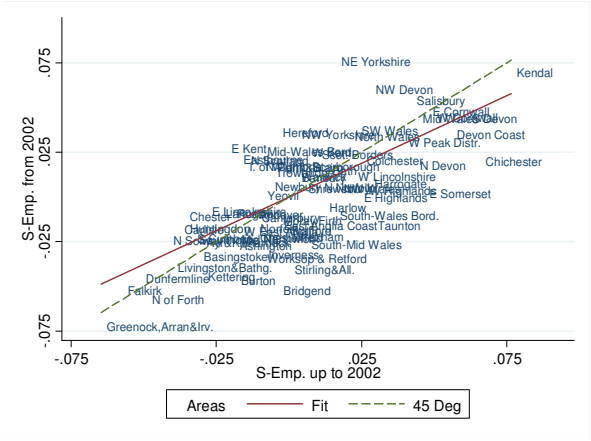


$y = 0.072\ (0.039)\ x + \varepsilon\ (R^2=0.044)$

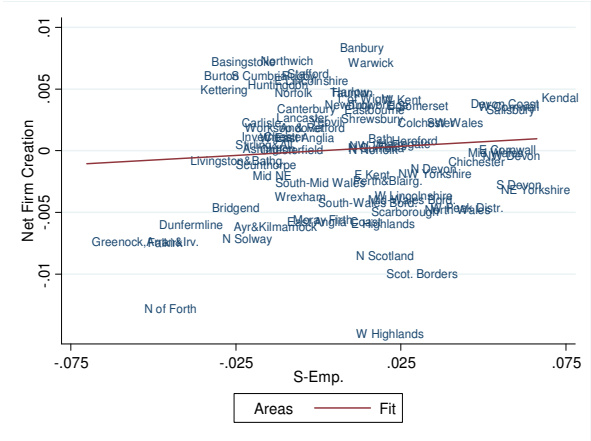
Note: Analysis includes 79 urban TTWAs only. All variables displayed in the panels have been demeaned. Equations report regressions coefficient and standard errors of a regression of the variable on the vertical axis (y, e.g. share of innovative firms) on variable on the horizontal axis (x, i.e. a given measure of self-employment) plus a constant. Robust standard errors used.

Figure 3.a: 'Independent Self-Employed' in Rural Areas

Time Alignment: up to and after 2002

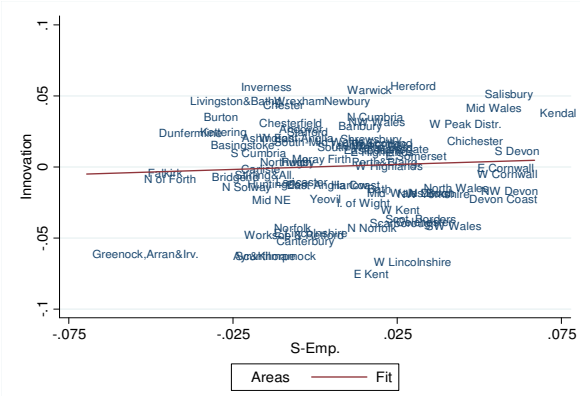


Self-Employment and Net Firm Creation



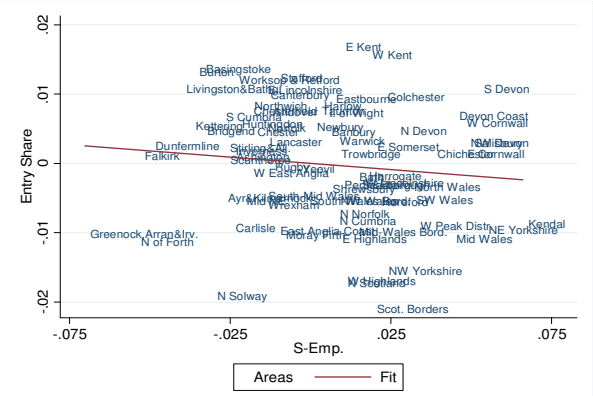
$y = 0.015\ (0.020)\ x + \varepsilon\ (R^2=0.008)$

Self-Employment and Innovation



$y = 0.071\ (0.133)\ x + \varepsilon\ (R^2=0.004)$

Self-Employment and Firm Entry

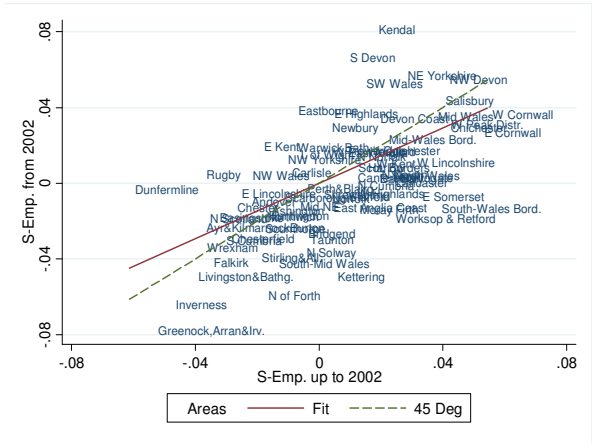


$y = -0.036\ (0.035)\ x + \varepsilon\ (R^2=0.014)$

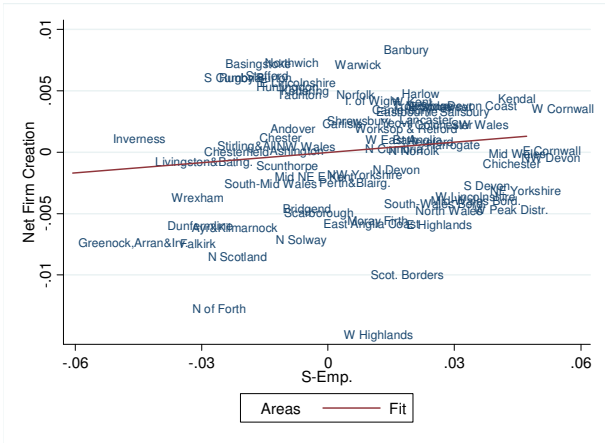
Note: Analysis includes 79 rural TTWAs only. All variables displayed in the panels have been demeaned. Equations report regressions coefficient and standard errors of a regression of the variable on the vertical axis (y, e.g. share of innovative firms) on variable on the horizontal axis (x, i.e. a given measure of self-employment) plus a constant. Robust standard errors used.

Figure 3.b: 'Owners' in Rural Areas

Time Alignment: up to and after 2002

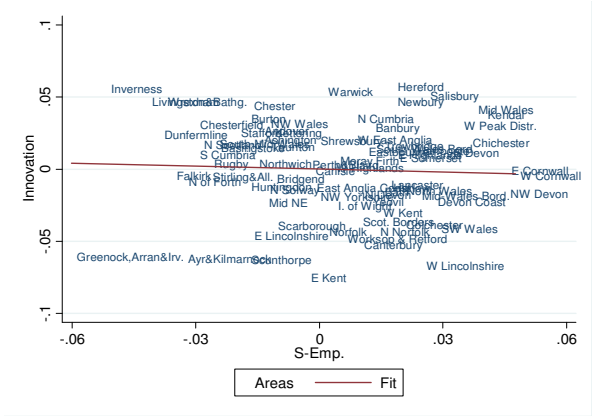


Self-Employment and Net Firm Creation



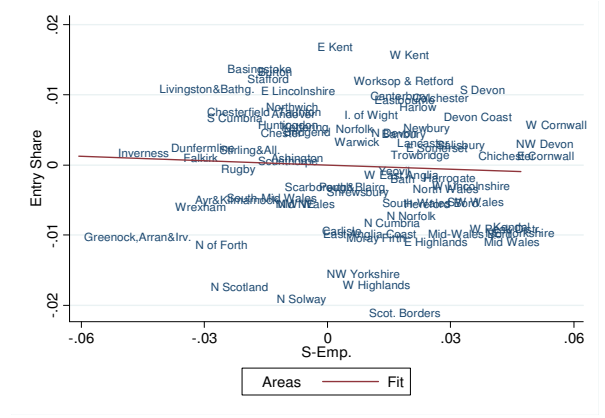
$y = 0.028\ (0.021)\ x + \varepsilon\ (R^2=0.020)$

Self-Employment and Innovation



$y = -0.068\ (0.172)\ x + \varepsilon\ (R^2=0.002)$

Self-Employment and Firm Entry



$y = -0.020\ (0.037)\ x + \varepsilon\ (R^2=0.003)$

Note: Analysis includes 79 rural TTWAs only. All variables displayed in the panels have been demeaned. Equations report regressions coefficient and standard errors of a regression of the variable on the vertical axis (y, e.g. share of innovative firms) on variable on the horizontal axis (x, i.e. a given measure of self-employment) plus a constant. Robust standard errors used.

Appendix Tables and Figures

Appendix Table 1: Self-Employed and Work Location –Urban and Rural Samples

	URBAN AREAS ONLY				RURAL AREAS ONLY			
	(1)	(2)	(3)	(4)	(5)	(6)	(9)	(8)
	Same LAD	Same LAD	Work/Use Home	Work/Use Home	Same LAD	Same LAD	Work/Use Home	Work/Use Home
Panel A: 'Independent Self-Employed'								
Self-Employed (dummy 0/1)	0.238	0.275	0.508	0.467	0.181	0.209	0.544	0.497
	(0.013)	(0.013)	(0.006)	(0.005)	(0.008)	(0.008)	(0.006)	(0.005)
Panel B: Owners								
Self-Employed (dummy 0/1)	0.189	0.240	0.443	0.392	0.146	0.181	0.479	0.419
	(0.013)	(0.013)	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)
Year/Month Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demo + Job Controls	No	Yes	No	Yes	No	Yes	No	Yes
SIC 92 (2 digits) Effects	No	Yes	No	Yes	No	Yes	No	Yes
TTWA Effects	No	Yes	No	Yes	No	Yes	No	Yes

Note: See Appendix Table 2 for list of controls. Sample includes employees and self-employed workers only. Total number of observations as follows. Urban sample: approximately 397,000 for 'Independent Self-Employed' and 313,000 for 'Owners'. Rural sample: approximately 118,000 for 'Independent Self-Employed' and 93,000 for 'Owners'. Differences are due to variables not being available for all years. Standard errors clustered at the travel to work area (79 TTWAs for both urban and rural areas). All coefficients significant at 5% level or better. Share of people working and living in the same Local Authority/District: urban areas= 0.582 (std.dev.=0.493); rural areas=0.726 (std.dev.=0.446). Share of people working from home/using it as 'base': urban areas= 0.105 (std.dev.=0.307); rural areas=0.121 (std.dev.=0.326).

Appendix Table 2: Descriptive Statistics of Control Variables – Urban and Rural Sample

Variable	URBAN AREAS ONLY		RURAL AREAS ONLY	
Demographic Controls:	*Mean*	*Standard Deviation*	*Mean*	*Standard Deviation*
Female	0.477	0.012	0.490	0.018
Head of Household	0.525	0.013	0.513	0.015
Age	39.69	0.649	40.53	0.753
White	0.954	0.044	0.987	0.009
Status: single/cohabiting	0.305	0.032	0.273	0.019
Status: married	0.576	0.030	0.603	0.022
Status: separated	0.026	0.005	0.027	0.007
Status: divorced	0.080	0.010	0.084	0.013
Status: widowed	0.013	0.002	0.013	0.003
Skills: No Qual.	0.119	0.024	0.122	0.021
Skills: Other	0.237	0.027	0.242	0.029
Skills: O-Levels and Equiv.	0.274	0.033	0.277	0.030
Skills: A-Levels and Equiv.	0.183	0.026	0.194	0.036
Skills: Higher Education	0.187	0.056	0.165	0.038
N. of Children: 0	0.553	0.026	0.555	0.023
N. of Children: 1	0.192	0.017	0.190	0.018
N. of Children: 2	0.187	0.014	0.188	0.017
N. of Children: 3+	0.068	0.009	0.067	0.011
Household size: 1	0.136	0.023	0.126	0.017
Household size: 2	0.558	0.020	0.574	0.025
Household size: 3	0.195	0.017	0.199	0.018
Household size: 4+	0.111	0.014	0.100	0.015
			0.199	0.018
Job and Home Ownership Controls:				
Full Time	0.733	0.024	0.715	0.028
Second Job	0.043	0.008	0.052	0.013
Home Owners	0.821	0.045	0.812	0.033
Public Renter	0.095	0.033	0.098	0.036
Private Renter	0.083	0.032	0.090	0.030

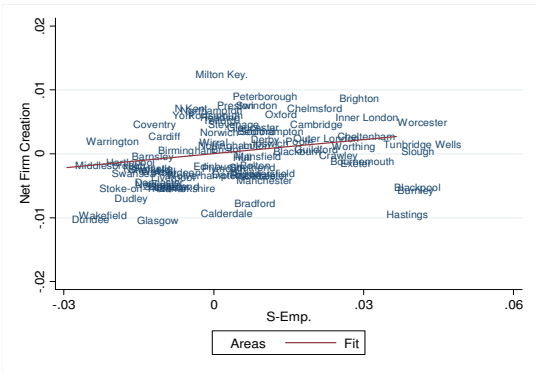
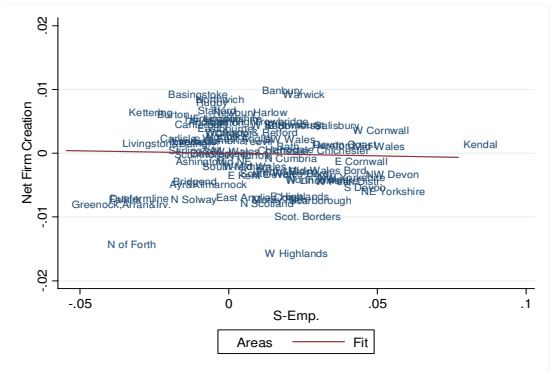
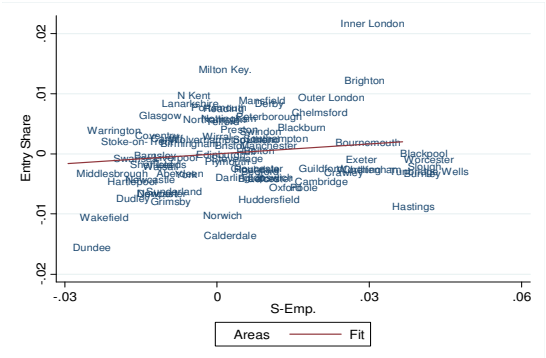
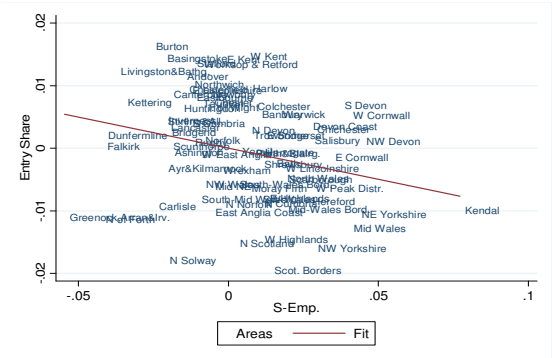
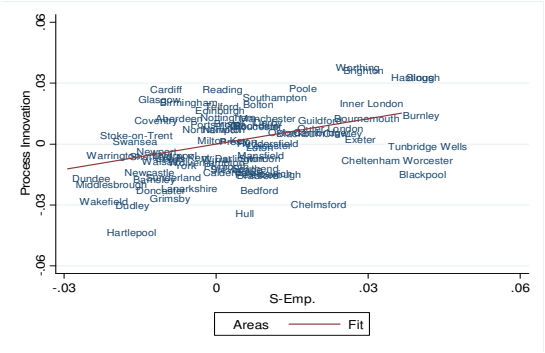
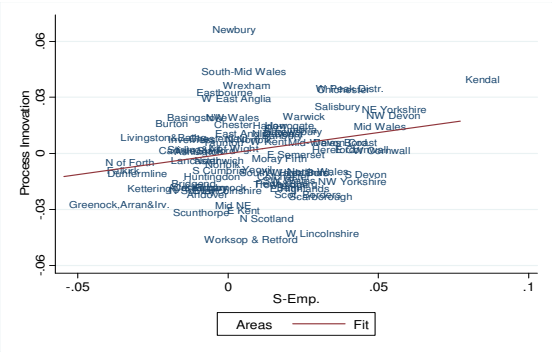
Note: There are 79 urban TTWAs and 79 rural TTWAs. Number of underlying individual-level number of observations: approximately 536,000 (urban) and 159,000 (rural). Individual controls averaged at the TTWA level from individual data. Age controlled in regression analysis using shares of categorical variables constructed as follows: group 1 (16-25); group 2 (26-30)**;** group 3 (31-35); group 4 (36-40); group 5 (41-45); group 6 (46-50); group 7 (51-55); group 8 (56+).

Appendix Table 3: Descriptive Statistics of Explanatory Variables for Self-Employment Incidence – Urban and Rural Sample

Variable:	Mean	Std.Dev.	C. of V.
Urban Sample Only:			
Incidence of Underemployment	0.085	0.009	10.92%
Incidence of Temporary Employment	0.062	0.010	16.89%
Lack of Full Time Employment	0.100	0.028	28.07%
Population density	800.2	1073.7	134.18%
Rural Sample Only:			
Incidence of Underemployment	0.091	0.014	15.57%
Incidence of Temporary Employment	0.064	0.012	18.47%
Lack of Full Time Employment	0.117	0.034	28.71%
Population density	180.6	140.1	77.57%

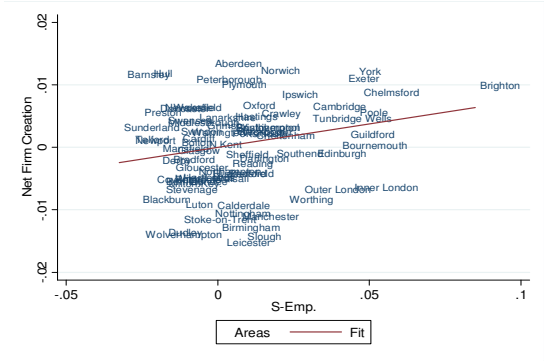
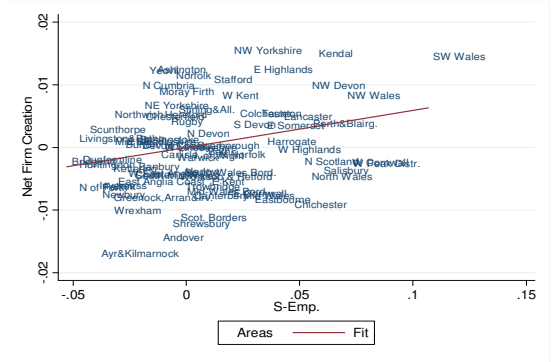
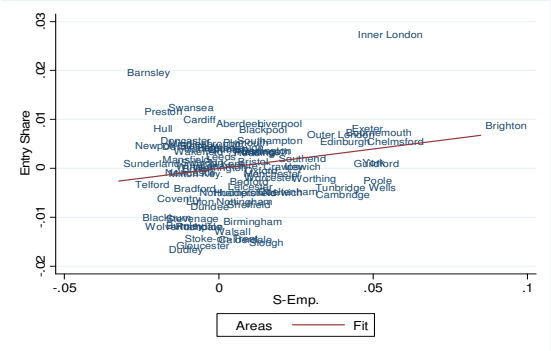
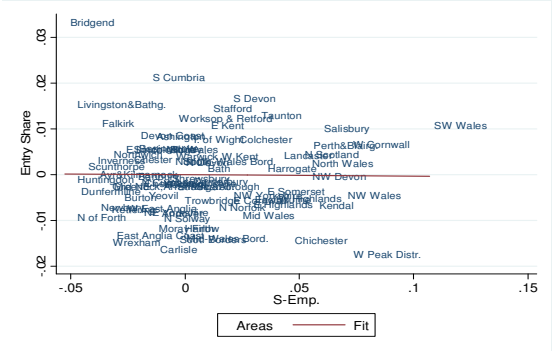
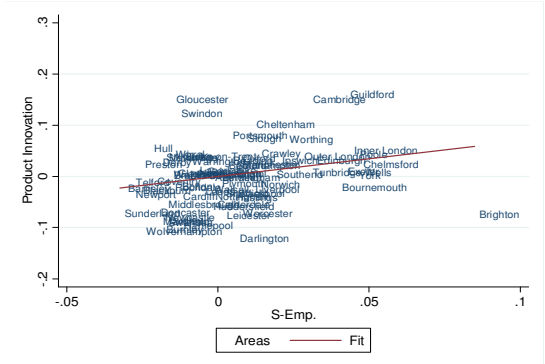
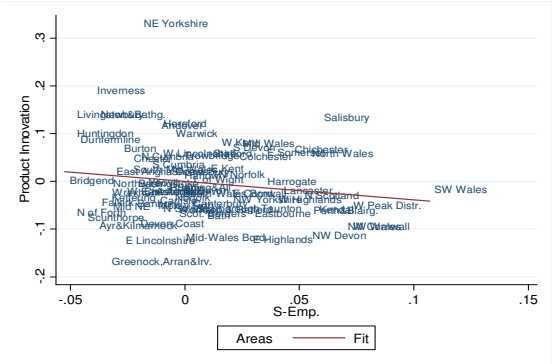
Note: Data at the TTWA level and aggregated from LFS individual level data. There are 79 urban TTWAs and 79 rural TTWAs. Variables constructed as follows. Incidence of Underemployment refers to the fraction of workers not looking for a job who would like to work longer hours given the opportunity. Incidence of Temporary Employment refers to the fraction of workers whose job is not permanent (seasonal; fixed period, fixed task; agency temping; casual type; other reasons). Lack of Full Time Employment refers to the fraction of part-time workers who chose to work part-time because they could not find full-time employment. Population density is defined as number of people as recorded by the GB Census 2001 per square kilometres.

Appendix Figure 1: 'Independent Self-Employed' Working in *Services* in Urban and Rural Areas

URBAN AREAS	RURAL AREAS
Self-Employment and Net Firm Creation	*Self-Employment and Net Firm Creation*
	
y = 0.073 (0.036) x + ε	*y = -0.008 (0.028) x + ε*
Self-Employment and Firm Entry	*Self-Employment and Firm Entry*
	
y = 0.055 (0.045) x + ε	*y = -0.099 (0.042) x + ε*
Self-Employment and Process Innovation	*Self-Employment and Process Innovation*
	
y = 0.414 (0.118) x + ε	*y = 0.224 (0.081) x + ε*

Note: See notes to Figures 2 and 3 (various panels). Descriptive Statistics for Process Innovation as follows. Urban areas: mean=0.163; std.dev.=0.025. Rural Areas: mean=0.151; std.dev.=0.074.

Appendix Figure 2: 'Independent Self-Employed' Working in *Manufacturing* in Rural and Urban Areas

URBAN AREAS	RURAL AREAS
Self-Employment and Net Firm Creation	*Self-Employment and Net Firm Creation*
	
$y = 0.074\ (0.032)\ x + \varepsilon$	$y = 0.055\ (0.022)\ x + \varepsilon$
Self-Employment and Firm Entry	*Self-Employment and Firm Entry*
	
$y = 0.080\ (0.042)\ x + \varepsilon$	$y = -0.003\ (0.035)\ x + \varepsilon$
Self-Employment and Product Innovation	*Self-Employment and Product Innovation*
	
$y = 0.695\ (0.386)\ x + \varepsilon$	$y = -0.384\ (0.258)\ x + \varepsilon$

Note: See notes to Figures 2 and 3 (various panels). Descriptive Statistics for Product Innovation as follows. Urban areas: mean=0.404; std.dev.=0.057. Rural Areas: mean=0.385; std.dev.=0.074.