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Persistence and change in interregional differences in entrepreneurship: England and Wales, 1921–2011

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Abstract
The paper explores time-persistence in interregional differences of self-employment rates in England and Wales in the 1921–2011 period by using census data. The results suggest a strong path-dependence in entrepreneurship as past self-employment rates have strong bearing on future ones. However, there is also some rank mobility reflected in the upward movements of London boroughs and downward movements of primarily coastal areas. Rank mobility relates to structural changes, changes in human capital, regional age structures and immigration.

Keywords
Entrepreneurship, institutions, path dependence/evolutionary economic geography, rank mobility, spatial econometrics

Introduction

Recent studies of Germany (Fritsch and Mueller 2007; Fritsch and Wyrwich, 2014), Sweden (Andersson and Koster, 2011) and the U.K. (Fotopoulos, 2014; Stuetzer et al., 2016) have shown that, although entrepreneurship rates (new firm formation and/or self-employment rates) rise considerably over time at a national level, there remains a striking stability in the regional rankings.

The aim of this paper is to investigate whether, using self-employment rates as a measure of entrepreneurship, there is support for the stability hypothesis from Census data covering England and Wales between 1921 and 2011, or whether there are notable deviations from this persistence. To achieve this, two alternative theoretical perspectives are put forward: one that underpins stability and another that underpins change.

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The evidence is broadly in line with spatial stability, particularly in low-enterprise areas, but the paper places more emphasis than has been the case to date upon the scale and nature of *changes* in the self-employment spatial league table. So, whilst regional stability over long periods of time is the norm – especially for low enterprise areas – some areas rise and others descend a 'league table' based on self-employment rates. In the 1971–2011 period in particular, the key upward rank mobility changes are those of the London boroughs, while the downward movement is characteristic of coastal towns.

The paper is organized as follows. In the following section, two competing theoretical frameworks are set out – the first explaining stability and the other change in self-employment rankings at a local or regional level. In section 'Using census data for intertemporal and interregional comparisons', regional self-employment rates based on Census data are compared over time using different administrative geographies. In Section 'Econometric analyses of self-employment rates', an econometric analysis of regional self-employment rates is carried over different decades followed by an econometric account for rank mobility and changes in self-employment rates between 1971 and 2011. The final section provides concluding remarks, a discussion of policy implications and areas for further work.

Persistence and change in regional entrepreneurship: The theory

The case for persistence

Andersson and Koster (2011) identify two mechanisms that explain time persistence in interregional entrepreneurship rates. The first is that the regional determinants of entrepreneurship are spatially sticky and durable. The second is that of path-dependence (see Arthur, 1994; David, 1985) in regional entrepreneurship, in the sense that current regional start-up rates are affected by past rates. The importance of history is not something new in economic geography as it is found in cumulative causation models that attempt to replace equilibrium with historical processes (Setterfield, 1997). It is also explicitly described in the writings of Massey (1995: 114) where '*spatial structures of different kinds can be viewed historically... as emerging in a succession in which each is superimposed upon, and combined with, the effect of spatial structures that came before'*.

Path dependence is based on four related causes: increasing returns (network externalities), self-reinforcement, positive feedbacks and lock-in (Page, 2006). The idea of lock-in emphasizes continuity and stability, implying the need for processes that break-up and de-lock paths (Martin and Sunley, 2006, 2010). The latter completes the concept within an evolutionary context where the economy becomes self-transformed from within (Witt, 2003). Key to the process by which paths de-lock and break and new paths emerge has been theorised to be the role of the entrepreneur (Garud and Karnøe, 2001; Setterfield, 2001).

Path dependence in the regional entrepreneurship literature has been associated with entrepreneurship culture (Andersson and Koster, 2011; Fritsch and Wyrwich, 2014). Andersson (2013: 8) sees regional entrepreneurship culture as:

> spatially localized informal institutions that have to do with the general social acceptance and encouragement of entrepreneurs and their activities in a region [and argues that] if informal institutions such as regional entrepreneurship cultures are historically rooted and evolve in slow processes over time, so should the phenomena dependent on it.

Theorising entrepreneurship culture as an informal institution helps in addressing criticisms that prior work on entrepreneurship has paid insufficient attention to institutional theory and the social construction of entrepreneurship (Sine and David, 2010), whereas the

integration of the institutional theory and entrepreneurship literatures helps address two fundamental questions: (a) how institutions affect entrepreneurial choices and (b) how entrepreneurship relates to changes in institutions (Tolbert et al., 2011). Setterfield (1993) proposes a model of institutional hysteresis where institutions act as exogenous constraints in the short-term workings of the economy and become endogenous in the long-term. A crucial factor in resolving the paradox of 'embedded action', i.e. the possibility of institutional change when the intentions, actions and rationalities of individuals are conditioned by the institutions they wish to change, relates to dynamic social, cultural and economic relations that bind people in different ways (friends, neighbours, business partners, etc.) resulting in a '*creative* "*field*" *that stimulates entrepreneurship, learning, and innovation, and leads to positive spatial externalities*' (Bathelt and Glückler, 2014: 4).

The key element that links entrepreneurship culture with informal institutions is that of local embeddedness, in that values and attitudes towards entrepreneurship are locally embedded and exert a strong influence on the regional rates of entrepreneurial activity. Indeed, as Williamson (2000) argues, the social embeddedness level is where the customs, mores and traditions reside and informal institutions at this level change the slowest.

A number of authors associate the spatial embeddedness of entrepreneurship with entrepreneurial opportunity identification and emphasise the role of prior work experience in the same industry (Buenstorf and Klepper, 2009; Sorenson and Audia, 2000), which, in turn, keeps spin-out entrepreneurs in the same area (Dahl and Sorenson, 2009) and reinforces existing geographical concentrations of particular sectors (Sorenson and Audia, 2000).

In addition, knowledge of an industry facilitates potential entrepreneurs in acquiring specific human and social capital (Sorenson and Audia, 2000). Social capital is not spatially transferable and plays a significant part in the opportunity identification process (Davidsson and Honig, 2003) through interaction with others (Dahl and Sorenson, 2012).[1] Social ties to capital holders may also facilitate financing a new business (Dahl and Sorenson, 2012; Sorenson, 2003; Stam, 2007). To these factors one may also add the entrepreneur's emotional affinity to the location, her/his relatives and friends (Dahl and Sorenson, 2009; Stam, 2007).

Sectoral but also spatial inertia could also be the outcome of a class-constrained intergenerational transfer of entrepreneurship (Burrows, 1991; Massey, 1995) and passing on of family businesses that cannot easily be relocated (Michelacci and Silva, 2007).

The above discussion offers arguments in support of the view that entrepreneurial activity is, to a large extent, spatially bound. However, for this to contribute towards path-dependence of regional entrepreneurship, an additional feedback or self-reinforcing mechanism is required within an evolutionary economic geography framework.

Fritsch and Wyrwich argue that regional entrepreneurship cultures tend to be persistent due to: 'the intergenerational transmission of entrepreneurial role models and values; (the) social acceptance of entrepreneurship; the existence of entrepreneurial supporting services and institutions' (Fritsch and Wyrwich, 2014: 958). Recently, Andersson and Larsson (2016) provided evidence from Sweden at the neighbourhood level suggesting that a local presence of entrepreneurs influences the emergence of new local entrepreneurs.

Further potent self-reinforcing mechanisms are based on previous acts of entrepreneurship. This directly creates further entrepreneurial opportunities (Holcombe, 2003) and is more indirectly enhanced by the additional wealth generated by prior entrepreneurs (Stam, 2010).

The case for change

The case for change is based upon seeing individuals making labour market choices between being an employee and being an entrepreneur, with the latter 'state' being more risky than the former. Individuals are generally free to move between these states as their perception of the returns – both monetary and non-monetary – change. Entrepreneurs therefore respond to changes in economic conditions – shifting towards entrepreneurship when the returns from that state become more favourable than those of the alternatives (Parker, 2009).

To provide an explanation of spatial change in rates of entrepreneurship we take two regions, A and B. Region A experiences a rise in entrepreneurship rates and Region B experiences a fall. In both cases, this arises due to an exogenous change, rather than an endogenous flowering or withering of entrepreneurship.

Let us assume, that Region A experiences an exogenous, as in the Ghatak et al. (2007) model, increase in wages. This, by increasing the opportunity cost of self-employment, initially encourages existing marginal, less talented, entrepreneurs to consider wage employment, with some making the transition. The first round effect of a rise in wages is therefore to reduce self-employment rates in Region A.

However, in their model, Ghatak et al argue that the exit of the marginal low-entrepreneurial talented self-employed raises the average talent of the remaining 'entrepreneurial pool'. Under the assumption that the entrepreneurial talent of an individual is not observable by lenders, whereas the average quality level of remaining pool is, those remaining in the entrepreneurial pool get better financed. The subsequent expansion of their businesses further increases the wage rate through increased labour demand.

Although the Ghatak et al. (2007) model assumes a fixed number of potential entrepreneurs and a fixed ratio of high to low entrepreneurial-talented, further theorisation could suggest that the improved quality of the pool of entrepreneurs may have positive supply side (Fritsch, 2011) effects fostering economic growth and increasing entrepreneurship rates. Conversely, the net effect of increasing wages on self-employment rates would depend on the balance between the negative effect due to increased self-employment opportunity costs and the positive effect of the implied higher aggregate demand faced by entrepreneurs (Georgellis and Wall, 2000) at the regional level.

Assume further, that the demand for goods and services cannot be met by the existing labour force in Region A, and consequently attracts labour, of varying skill-levels, from outside the region, i.e. low skill labour in sectors such as construction, which is dominantly self-employed (Behling and Harvey, 2015) and high skill labour, some of which enters high-grade self-employment in business and professional services. If, however, the local labour market in Region A is segmented, so preventing the take-up of high wage jobs by those either without formal qualifications or where their qualification are viewed by employers as invalid or being discriminated, then such individuals will enter self-employment where the barriers are lower.[2] As shown later, London exhibits many of the characteristics of Region A.

Explaining the decline in self-employment rates in Region B is less complex. Assume Region B initially has very high rates of self-employment – i.e. areas dominated by fishing and/or by tourism – and that there is subsequently a decline in demand for these services which is beyond the control of those working in the sector – i.e. declining fish stocks or the imposition of quotas; improvements in technology giving people greater choice in where and when to take their holidays (Beatty et al., 2010). The effect of falling incomes for the self-employed, combined with reduced opportunities to obtain wage employment in the locality, directly leads to self-employment rates falling in Region B, leading to out-migration and increased unemployment.

The core commonality is that, in both Region A and Region B, external factors are the underlying cause of either rises or falls in the proportion of self-employment. Entrepreneurship – as measured by self-employment – is hence a response to changed external circumstances. This point is developed further on when the policy implications of our findings are considered.

Using census data for intertemporal and interregional comparisons

The only UK data source that can be used for long-term comparisons of regional entrepreneurship rates is population Census self-employment data. Although Census data were collected on the self-employed in 1881, their accuracy was questioned (even by the Registrar General), and so it was not until 1921 that data on this form of employment reached acceptable levels of reliability.[3] To make comparisons over time, and between geographical areas of different size, we calculate a self-employment rate.[4]

The only excluded sector is agriculture because (a) the main areas of population concentration have minimal agricultural employment (although there are areas of Wales in particular where agriculture is a significant employer); and (b), over the 1921–2011 period, agricultural employment falls radically – particularly in areas where it was initially high – thus distorting overall spatial self-employment patterns.

Our first comparison uses the 1971 counties to compare self-employment rates in 1921, 1971 and 2011, but this comes at the expense of having only 59 spatial observations for England and Wales. Our second comparison uses 2011 Census geography to compare 1971 and 2011 self-employment rates. This is very relevant because it is during this period that entrepreneurship policy begins to be implemented by the government, enabling us to observe changes using both the 59 counties and the 348 Local Authority Districts (LADs).

Pre-1974 county boundaries: 1921–1971–2011

The striking rise in the self-employment rate in England and Wales from 1921 to 2011 is captured by empirical probability density estimates of regional self-employment rates presented in Figure 1. The entire distribution clearly shifts to the right and the extent of overlap between densities diminishes with time. It also demonstrates that the probability mass is heavily concentrated in a narrow band, but this range expands over time.

Table 1 shows the 10 counties with the highest and the 10 counties with the lowest self-employment rates in 1921, 1971 and 2011.

Over almost an entire century, 60% of the top 10, and 50% of the bottom 10, counties remain in their respective groups. This evidence on persistence is further corroborated by Spearman rank correlation coefficients. The Spearman rank correlation coefficient between 1921 and 1971 is 80.26%. The corresponding correlation between 1971 and 2011 is 83.05%. Increasing the time distance to 90 years produces a Spearman rank correlation coefficient of 77.59%. The reduction in the degree of association, when compared with those corresponding to the closest points in time, is, therefore, only modest.

Current administrative and political boundaries: 1971–2011

We next compare changes in self-employment rates between 1971 and 2011 using the 348 LADs. The Spearman rank correlation coefficient between self-employment rates in 1971 and 2011 for LADs is 76.5%, suggesting very strong persistence even at this more disaggregated spatial level.

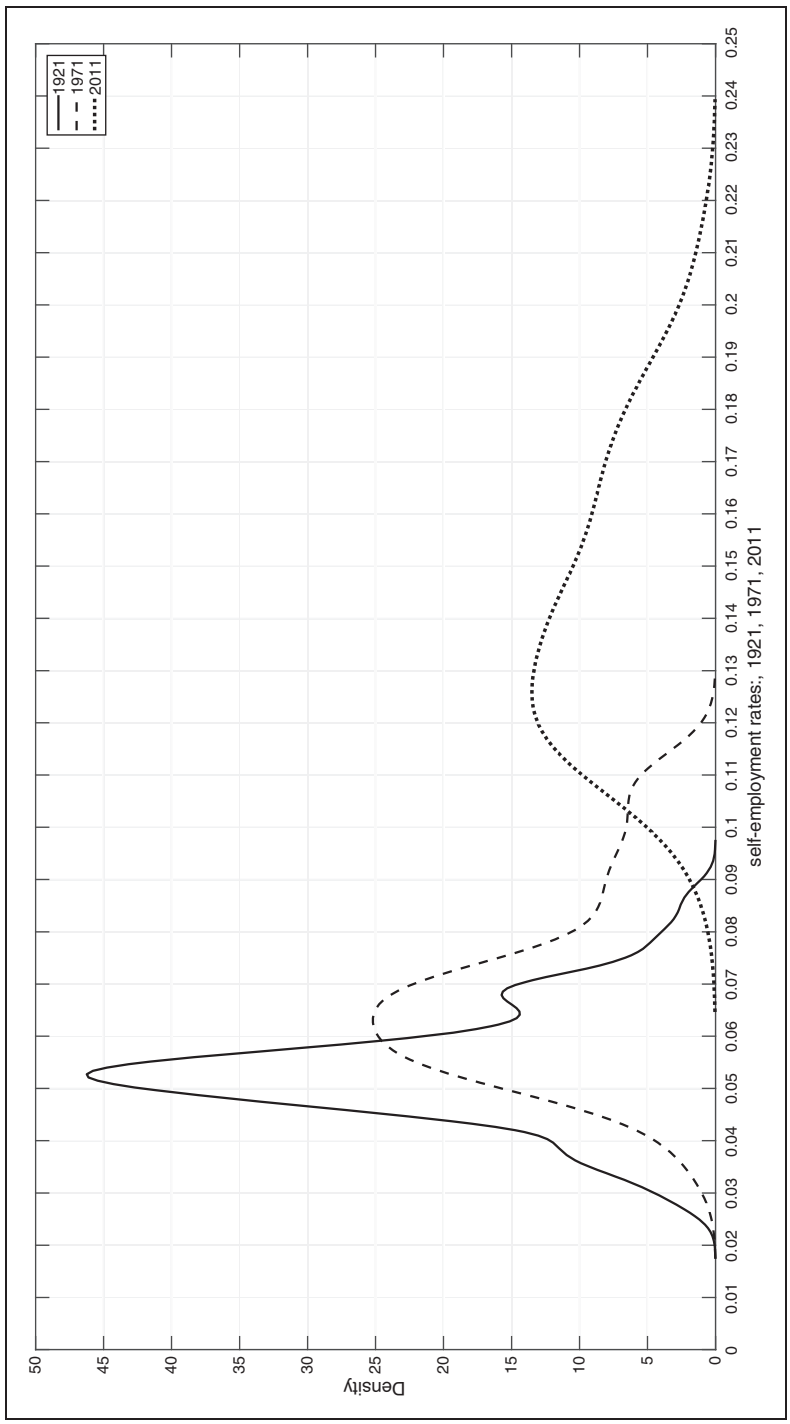

Figure 1. Empirical probability density estimates: Self-employment rates 1921, 1971, 2011 based on 1971 census administrative counties geography.

Table 1. County league tables: self-employment rates 1921, 1971, and 2011 compared based on 1971 census counties geography.

	1921	1971	2011
	Top 10 counties		
1	Cardiganshire	Wight, Isle of	Radnorshire
2	Wight, Isle of	Cardiganshire	Merionethshire
3	Sussex East	Cornwall	Westmorland
4	Radnorshire	Merionethshire	Cornwall
5	Pembrokeshire	Caernarvonshire	Sussex East
6	Sussex, West	Sussex East	Cardiganshire
7	Westmorland	Dorset	Montgomeryshire
8	Caernarvonshire	Westmorland	Herefordshire
9	Anglesey	Pembrokeshire	Wight, Isle of
10	Cornwall	Devon	Pembrokeshire
	Bottom 10 Counties		
1	Durham	Durham	Durham
2	Monmouthshire	Northumberland	Monmouthshire
3	Carmarthenshire	Warwickshire	Glamorgan
4	Northumberland	Monmouthshire	Northumberland
5	Derbyshire	Staffordshire	Staffordshire
6	Glamorgan	Yorkshire, North Riding	Lancashire
7	Staffordshire	Glamorgan	Huntingdonshire and Peterborough
8	Huntingdonshire and Peterborough	Yorkshire, East Riding	Nottinghamshire
9	Wiltshire	Nottinghamshire	Flintshire
10	Essex	Lincolnshire, parts of Kesteven	Yorkshire, West Riding

Figure 2 provides a scatter plot for all 348 LADs for the 1971–2001 period, where the base year rank is shown on the horizontal axis and the end year rank on the vertical. This implies that LADs above the 45-degree line ascend, and those below the 45-degree line descend, the rankings. LADs on the 45-degree line are unchanged in terms of rank position.

The heavy concentration of observations on, and close to, the diagonal emphasizes the issue of stability or persistence. This is most apparent amongst districts in the bottom left corner – those that occupied places 340–348 in 1971. Of these nine low enterprise LADs, only three escaped beyond place 339 in the subsequent forty-year period – Newcastle upon Tyne being the most successful escapee, moving to position 306.

In contrast, there is movement amongst other LADs. The rank improvement of London is clear, as is the deterioration for the vast majority of the coastal areas. In some cases these descents were considerable, with seaside holiday resorts such as Blackpool and Bournemouth falling by 141 and 139 places, respectively.

The broad pattern that has emerged from this analysis is that, although self-employment rates have risen considerably in England and Wales over 90 years, there is strong spatial stability – particularly in the geographical areas that had low rates even in 1921. Within this broadly stable pattern, however, there are some important changes that have taken place since 1971, the most striking being that of the rise of London and the decline of the coastal towns.

Econometric analyses of self-employment rates

This section analyses the factors that explain the spatial variation in self-employment rates in England and Wales in both 1971 and 2011 as a precursor to explaining the stability and

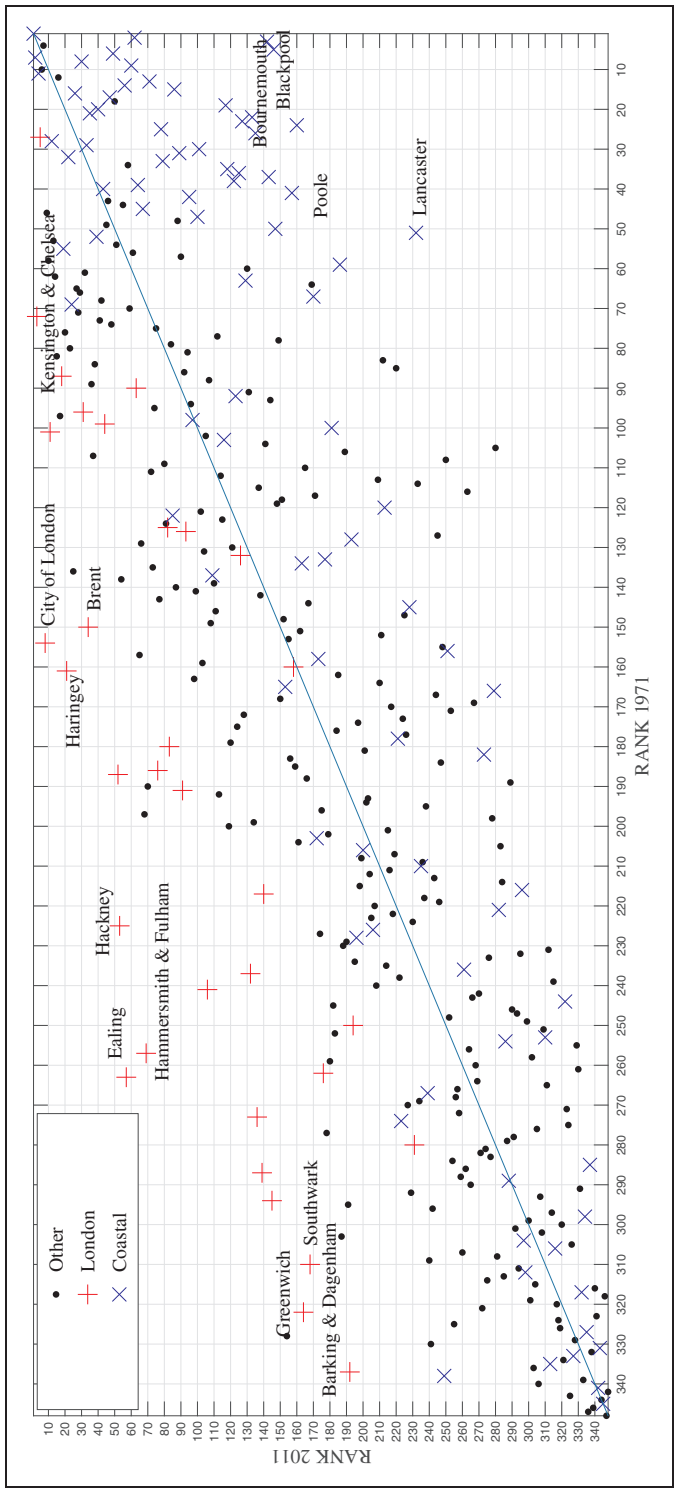

Figure 2. Rank changes between 1971 and 2011: reference geography 2011 Census LADs.

change that take place over the intervening 40 years. We begin by defining the independent variables that provide this explanation. Further detail is provided in Appendix 1.

Defining the variables

Meager and Bates (2004) maintain that there have been significant sectoral differences in the propensity to be self-employed accompanied by a shift from low self-employment sectors such as manufacturing to high self-employment sectors as services. To account for the effect of local industry mix on self-employment rates, an expected regional self-employment rate defined as

$$EXPSELFR_r = \sum_j \frac{employment_{jr}}{employment_r} \times \frac{self-employed_j}{employment_j}$$

(where r stands for region and j for economic sector)[5] has been used in the present research.

It essentially defines self-employment rates over the number of those in employment and not over economically active population.

Variables MAN, $SERV$ and PUB refer to employment shares in manufacturing, services and the public sector respectively. The first two account for the effect of a shift in the economy towards the services sector. Public sector employment PUB captures two separate effects likely to inhibit self-employment: (a) a lack of awareness of potential business opportunities amongst public sector workers in comparison to those working in the private sector; and (b) a possible link between public sector employment and more left-wing political philosophies which may view entrepreneurship less favourably.

A regional human capital proxy $HUMANCAP$ captures the theory that knowledge created by human capital is both a source of entrepreneurship opportunities and a contributor to regional entrepreneurship absorptive capacity (Acs and Armington, 2004; Qian and Acs, 2013). The latter is defined as the ability to comprehend new knowledge and its potential value and commercialize it. The definition of $HUMANCAP$ is based on the regional share of those in employment with a degree or higher qualification.

Different ethnic groups vary considerably in their likelihood to choose self-employment (Clark and Drinkwater, 1998). Changes in the ethnic composition of in-migrants can therefore influence aggregate and spatial variations in self-employment rates. Recent evidence from England and Wales suggests that a higher regional cultural diversity (measured based on the country of birth and ethnic group), and in particular diversity among the highly skilled, positively impacts new firm formation. Rodríguez-Pose and Hardy (2015) argue that a higher diversity expands the regional knowledge base as well as its absorptive capacity. The $IMMIGR$ definition is based on the share of non-U.K. born over resident population.[6]

The regional age structure and its impact on entrepreneurship have been examined by Robson (1998) and Georgellis and Wall (2000) for the UK regions, and Bönte et al. (2009) for Germany. Parker (2009: 113–114) makes the case that older founders are likely to have more and better human and physical capital, better social and business networks as well as easier identification of business opportunities due to experience, the ability to control one's pace and effort in one's own work, and the avoidance of mandatory retirement provisions. Conversely, entrepreneurship at an older age is deterred by higher risk aversion, diminishing information gains over time in relation to the business, and time related constraints deterring the amortization of possible entrepreneurship entry sunk-costs. The $AGES$ variable therefore identifies three age bands: 20–34, 35–54, and 55–64.

The regional rate of home ownership *HOMEOWN* has been used to proxy access to capital as houses can be used as collateral (Mason, 1991). Population density *POPDEN* is used a proxy for agglomeration positive spillovers, market opportunities, skillsets and information benefits found in urban areas (Bosma and Sternberg, 2014).

The effect of unemployment on entrepreneurship has been extensively discussed but the empirical work has produced contradictory results, with time series data pointing to a negative effect and cross-sectional data pointing to a positive effect (Storey, 1991). Meager (1992) argues that the same 'push' and 'pull' factors may co-exist as in a recessionary period. Increases in unemployment may lead to increases in self-employment levels, which, in turn, could be moderated by the counteracting effect of the lack of 'prosperity-pull' associated opportunities. It is therefore vital to include the *UNEMPLR* variable to capture what could be conflicting influences.

It has been argued that regions dominated by small firms are particularly conducive to entrepreneurship because their employees, and entrepreneurs-to-be, gain experience in a wider spectrum of operations (Storey, 1982), have direct contact with the business proprietor who can serve as role model (Mason, 1991), and reflect lower entry barriers at the local level (Gudgin, 1978).[7] To capture this, *SMFP* takes the ratio of employers and managers in small establishments over the corresponding figure for large establishments.[8] A time-persistent positive effect of this variable may be seen as an additional proxy for the effect of local entrepreneurship culture.[9]

The analysis

First, we examine the extent to which self-employment rates in 2011 are explained by prior self-employment rates in 2001, along with two other factors that have emerged from earlier sections of the paper – the London and the coastal town effects. This is shown in the first column of Table 2.

However, because self-employment rates over time are highly correlated, alternative model formulations are also used. All three formulations show that the effect of lagged self-employment rates is positive and significant suggesting strong path-dependence in self-employment rates. The effect of the London variable is positive and statistically significant, whereas the coastal towns' variable is significantly negative.

Next, we include the variables identified in section 'Defining the variables' but, because several have modest to high correlations with each other, different model permutations for each census year were used in order to make them structurally comparable.

Although the literature reviewed in section 'Persistence and change in regional entrepreneurship: The theory' suggests that entrepreneurship is a local phenomenon, since the spatial units considered here (LADs) are comparatively small, the effect of some structural conditions and unmeasured entrepreneurship-culture related factors may spread more widely across space.[10] This possibility needs to be explored using spatial econometric techniques.

The spatial econometric literature adopts different approaches depending on whether a spatially lagged dependent variable is included in the model, whether the error term is modelled as a spatially autoregressive process, and/or whether spatially lagged explanatory variables are included. Gibbons and Overman (2012) critically argue that different spatial econometric models are hard to distinguish without prior knowledge of the data generating process, something that is rarely available to the empirical researcher.

An important property of the reduced form of models including a spatially lagged dependent variable, is that the dependent variable depends not only on its own spatial

Table 2. Self-employment rates 2011: The effect of lagged self-employment rates and geography.

	(1) SELFR 2011	(2) SELFR 2011	(3) SELFR 2011
SELFR_2001	1.0507***		
	(0.0206)		
LONDON	0.0147***	0.0335***	0.0274***
	(0.0026)	(0.0031)	(0.0029)
COASTAL	−0.0035***	−0.0148***	−0.0114***
	(0.0008)	(0.0024)	(0.0017)
SELFR_1971		1.3876***	
		(0.0632)	
SELFR_1991			0.7874***
			(0.1298)
SELFR_1981			0.3288**
			(0.1502)
CONSTANT	0.0129***	0.0490***	0.0310***
	(0.0024)	(0.0040)	(0.0044)
N	348	348	348
R^2	0.9564	0.7128	0.8466
F	994.7865***	215.4430***	297.9768***

Note: Heteroskedasticity robust standard errors in parentheses.
***Significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.10 level.

lag, but also on the spatial lags of all other explanatory variables in a fashion that involves not only immediate neighbouring regions but also their neighbours and so on. This property has been termed as global-spillover (see LeSage, 2014). Nevertheless, a number of authors such as Pinske and Slade (2010) and Partridge et al. (2012) are very critical of the theoretical justification for such global spillovers in practice. Corrado and Fingleton (2012) provide evidence that a statistically significant coefficient of the spatially lagged dependent variable can also pick the effect of other omitted spatially lagged independent variables.

Within the entrepreneurship literature (Hong et al., 2015; Plummer, 2010), the severe limitations regarding the spatially lagged dependent variable model discussed above have not been adequately acknowledged nor has the global nature of the implied spillovers been sufficiently discussed and justified in this research context. In contrast, the present research assesses the potential effect of spatially dependent omitted variables and the effect of structural conditions in neighbouring regions within a local-spillovers framework.[11] After all, the discussion in section 'Persistence and change in regional entrepreneurship: The theory' offered strong arguments about the local nature of entrepreneurship.

LeSage (2014) points out that if the relationship under investigation can be assumed as reflecting a local spillover, then the Spatial Durbin Error Model (SDEM) is the only model requiring estimation. The general expression for the SDEM is

$$Y = a\boldsymbol{\iota}_N + \boldsymbol{X\beta} + \boldsymbol{WX\gamma} + \boldsymbol{u}$$

$$\boldsymbol{u} = \lambda \boldsymbol{Wu} + \boldsymbol{\varepsilon}$$

where W is a spatial weights matrix and $\boldsymbol{\iota}_N$ is a vector of ones. When $\lambda = 0$, the spatially lagged independent variable model (SLX).[12] That is

$$Y = a\boldsymbol{\iota}_N + \boldsymbol{X\beta} + \boldsymbol{WX\gamma} + \boldsymbol{\varepsilon}$$

Our approach has been to use contemporaneously defined explanatory variables to account for regional self-employment rates in each census year. The only exception is the small firm presence variable (*SMFP*), which is defined using values from the preceding census when possible. A prefix of W signifies a spatially weighted variable. The spatial weight matrix used here is a row standardised based on the 5-closest regions. The local character of entrepreneurship discussed in section 'Persistence and change in regional entrepreneurship: The theory' justifies this choice.[13]

Table 3 presents the results of the econometric estimation of the SDEM for the 2011 and 1971 self-employment rates.[14] These show that small firm presence *SMFP*, human capital *HUMANCAP*, home ownership *HOMEOWN*, and the employment share in services *SERV* have a significant and positive effect on self-employment rates in both census years. The unemployment rate *UNEMPLR*, the employment share in the public sector *PUB*, and the employment share in manufacturing industries *MAN* have consistently negative signs in both periods. The significant effect of the industry-mix on regional self-employment rates is summarized by the positive coefficient of *EXPSELFR*.

However, several independent variables change their sign between 1971 and 2011. These include immigration, *IMMIGR* and population density, *POPDEN,* both of which are negative in 1971 but positive in 2011. Our earlier results are confirmed with the London dummy moving from negative to positive. In contrast, the coastal town dummy, *COASTAL*, although positive and significant in 1971, becomes insignificant (even negative in one permutation) in 2011.

The effect of the age share variables is very interesting.[15] The sign for *AGES_35-54* changes from negative in 1971 to positive in 2011, whereas the coefficient of *AGES_55-64* is positive and significant in both years, being larger for 2011 and always larger than for the 33–54 age group. These results confirm a shift in self-employment amongst older individuals (ONS, 2014) implying that the over-50 age group possess characteristics favourable to business proprietorship (Blackburn et al., 1999).

In the second section of Table 3, the spatial error autocorrelation coefficient lambda is always positive and statistically significant with a value ranging from 0.4347 to 0.6810 depending on the permutation and year, with the 2011 values being larger. Of the spatially lagged explanatory variables, *WSMFP* is either insignificant or negative, possibly implying a 'competition' entrepreneurship effect from nearby LADs characterised by extensive small firm structures. The effect of the spatially lagged unemployment rate *WUNEMPLR* is negative when statistically significant in both years. Again, the evidence leans against unemployment-pushed entrepreneurship, and a higher unemployment rate indicates adverse economic conditions in neighbouring LADs.

The effects of the spatial lags in immigration and human capital proxies are statistically insignificant. The latter offers no support for spatial spillover effects when it comes to human capital. In most other cases of spatially lagged explanatory variables, the signs, when significant, concur with those of their non-spatially lagged counterparts. In 2011, the effect of average population density in nearby LADs appears to be particularly significant and positive, whereas the effect of the spatially lagged expected self-employment rate (*EXPSELFR*) is only marginally significant. An interesting exception is the effect of the spatially lagged employment share in manufacturing industries (*WMAN*) found in one model permutation for 1971. This may be seen as reflecting an advantage over more industrialised neighbours.

Table 3. Econometric analyses of self-employment rates (SELFR) in 1971 and 2001: Spatial Durbin Error Model (SDEM).

Row standardised spatial weights matrix based on the five closest neighbours

	SELFR 1971				SELFR 2011			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IMMIGR	−0.0778***				0.1504***			
	(0.0147)				(0.0205)			
SMFP	0.0044***	0.0058***	0.0060***	0.0043***	0.005***	0.0122***	0.0066***	0.0053***
	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0007)	(0.0007)	(0.0006)	(0.0007)
HUMANCAP		0.0783***				0.3200***		
		(0.0249)				(0.0186)		
HOMEOWN		0.0005***				0.0845***		
		(0.0001)				(0.0194)		
UNEMPLR	−0.1561***		−0.2650***	−0.1675***	−0.6044***		−0.3958***	−0.4210***
	(0.0513)		(0.0587)	(0.0563)	(0.0687)		(0.0640)	(0.0704)
AGES_55–64	0.1573***		0.1665***	0.1577***	0.7458***		0.7033***	0.7142***
	(0.0251)		(0.0333)	(0.0284)	(0.0565)		(0.0482)	(0.0532)
AGES_35–54	−0.1184***	−0.0378	−0.0730**	−0.1146***	0.0168	0.3219***	0.0350	0.0586
	(0.0000)	(0.0324)	(0.0350)	(0.0328)	(0.0437)	(0.0499)	(0.0367)	(0.0405)
POPDEN				−0.0027***				0.0021***
				(0.0004)				(0.0008)
EXPSELFR	0.6491***				0.7569***			
	(0.0393)				(0.1862)			
MAN		−0.0746***		−0.0933***		−0.0407		−0.2900***
		(0.0081)		(0.0079)		(0.0353)		(0.0324)
SERV			0.1078***				0.2619***	
			(0.0111)				(0.0217)	

(continued)

Table 3. Continued.

Row standardised spatial weights matrix based on the five closest neighbours								
	SELFR 1971				SELFR 2011			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PUB				−0.1008***				−0.0804***
				(0.0167)				(0.0268)
LONDON			−0.0212***				0.0115**	
			(0.0039)				(0.0057)	
COASTAL	0.0054***	0.0047***		0.0055***	0.0016	0.0011		−0.0020
	(0.0016)	(0.0017)		(0.0017)	(0.0023)	(0.0023)		(0.0021)
CONSTANT	0.0455	0.1020***	0.0133	0.1502***	−0.1141	−0.1737***	−0.1389**	0.0353
	(0.0405)	(0.0361)	(0.0400)	(0.0417)	(0.0752)	(0.0608)	(0.0595)	(0.0630)
Spatially lagged explanatory variables								
WIMMIGR	−0.0194				0.0448			
	(0.0235)				(0.0373)			
WSMFP	−0.0030*	−0.0009	−0.0023	−0.0034*	−0.0036**	−0.0028	0.0002	−0.0024
	(0.0018)	(0.0022)	(0.0021)	(0.0020)	(0.0018)	(0.0018)	(0.0015)	(0.0016)
WHUMANCAP		−0.0218				0.0393		
		(0.0550)				(0.0414)		
WHOMEOWN		0.0003***				0.0071		
		(0.0001)				(0.0483)		
WUNEMPLR	−0.3638***		−0.0193	−0.2361**	0.0878		−0.0003	−0.2554*
	(0.0958)		(0.1048)	(0.1021)	(0.1639)		(0.1423)	(0.1515)
WAGES_55–64	0.1451***		0.2617***	0.2589***	0.0785		−0.0758	0.0676
	(0.0566)		(0.0731)	(0.0628)	(0.1373)		(0.1079)	(0.1186)
WAGES_35–54	−0.0742	−0.1084	−0.0430	−0.1507**	−0.1821*	−0.0740	−0.0519	0.0486
	(0.0688)	(0.0689)	(0.0742)	(0.0721)	(0.1017)	(0.1365)	(0.0791)	(0.0945)

(continued)

Table 3. Continued.

Row standardised spatial weights matrix based on the five closest neighbours

	SELFR 1971				SELFR 2011			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WPOPDEN				−0.0009				0.0087***
				(0.0007)				(0.0016)
WEXPSELFR	0.0441				0.5984*			
	(0.0856)				(0.3643)			
WMAN		−0.0043		0.0372**		−0.0672		0.0198
		(0.0159)		(0.0156)		(0.0730)		(0.0577)
WSERV			−0.0258				0.1197***	
			(0.0204)				(0.0382)	
WPUB				0.0564				−0.0635
				(0.0391)				(0.0544)
Lambda	0.5246***	0.5605***	0.4347***	0.5158***	0.6048***	0.6810***	0.5114***	0.5455***
	(0.0604)	(0.0575)	(0.0672)	(0.0611)	(0.0536)	(0.0465)	(0.0615)	0.0587
R^2	0.8297	0.7693	0.7304	0.7994	0.8588	0.8467	0.8811	0.8741
Log-likelihood	1143.404	1089.0076	1066.6584	1115.2345	1004.5739	985.70147	1038.757	1027.3764
N	348	348	348	348	348	348	348	348

Note: Asymptotic standard errors in parentheses.
***Significant at the 0.01 level, **significant at the 0.05 level, *significant at the 0.10 level.

Given the importance of the sign changes noted above, Table 4 identifies the decades in which the changes occurred. The population density *POPDEN* and the *LONDON* dummy variable changed signs in 1991 whereas the *IMMIGR* variable and *AGE_35-54* changed signs a decade earlier.

This change of sign on *IMMIGR* is consistent with changes in both the country of origin and the skill composition of the immigrants in the 1980s (Dustmann and Fabri, 2005). Immigration in the 1960s was heavily Caribbean-based with these individuals frequently becoming employees. In later decades, there were greater numbers from India, Pakistan and other East Asian countries. Further compositional changes took place in the most recent decades, with increased numbers from elsewhere in the EU.[16]

In the lower section of Table 4, the spatial error autocorrelation coefficient lambda is again positive and statistically significant across all years and model permutations. The effect of spatially lagged explanatory variables, when they are statistically significant, concurs in most cases with that of their non-spatial lagged counterpart. An interesting exception is the effect of spatially lagged structural variables such as *WEXPSELFR* and *WMAN*, the former being negative and statistically significant for all years considered, and the latter being positive and statistically significant in 2001. Both could be interpreted as an outcome of spatial competition in which factors inducing entrepreneurship (favourable industry mix and low manufacturing share) in a local authority's neighbours reduce entrepreneurship in that particular local authority.

Taken together, Tables 3 and 4 also demonstrate that, over time, the same independent variables account for a sizeable proportion of the variation in the self-employment rates. So, if these are the underlying causes of entrepreneurship rates, and they change very little, then it is unsurprising that the rates are persistent.

The effect of lagged values of key independent variables is traced in Table 5 where 2011 self-employment rates are regressed on lagged values of key explanatory variables. This time we focus on the effect of lagged in time, and not on spatially lagged, explanatory variables. Hence, there is no estimation of spatial econometric models.

Although the independent variables have been lagged by up to 40 years, they continue to exert a statistically significant effect and retain their sign. For example, the 1971 values of key explanatory variables account for 57–62% of the 2011 regional self-employment rates variation. This provides strong evidence of considerable time-persistence in the effect of key determinants of regional entrepreneurship rates that extends beyond that of other studies using shorter time periods (Andersson and Koster, 2011; Fotopoulos, 2014).

Towards an interpretation of change

The econometric evidence presented above demonstrated that self-employment rates are path-dependent and that the effect of their key determinants is time-persistent. However, we also saw that self-employment rates rose four-fold and that, when a comparison of self-employment ranks in 1971 and 2011 was shown in Figure 2, changes were clearly evident – most notably in London and in the coastal towns. Our first metric is a novel, but simple, Rank Mobility Index (*RMI*) for each individual spatial unit

$$RMI = \frac{RANK_{t-\tau} - RANK_t}{n-1}$$

The numerator counts the rank change in positions and the denominator adjusts the index by using the number of observations (n) minus 1 so as to confine the index in the [−1,1]

Table 4. Econometric analyses of self-employment rates (SELFR) in 1981, 1991, and 2001: Spatial Durbin Error Model (SDEM).

Row Standardised Spatial Weights Matrix based on the 5 closest neighbours

	SELFR 1981				SELFR 1991				SELFR 2001			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
IMMIGR	0.0169				0.0624***				0.1262***			
	(0.0228)				(0.0226)				(0.0254)			
SMFP	0.0037***	0.0066***	0.0064***	0.0055***	0.0160***	0.0247***	0.0231***	0.0223***	0.0142***	0.0202***	0.0194***	0.0178***
	(0.0006)	(0.0007)	(0.0006)	(0.0006)	(0.0014)	(0.0016)	(0.0014)	(0.0014)	(0.0015)	(0.0013)	(0.0013)	(0.0014)
HUMANCAP		0.0869***				0.0983***				0.1947***		
		(0.0257)				(0.0253)				(0.0197)		
HOMEOWN		0.0396***				0.0175				0.0183		
		(0.0095)				(0.0135)				(0.0155)		
UNEMPLR	−0.1440***		−0.2053***	−0.1278***	−0.2013***		−0.1665***	−0.2176***	−0.7201***		−0.5761***	−0.5786***
	(0.0294)		(0.0331)	(0.0335)	(0.0351)		(0.0388)	(0.0412)	(0.0712)		(0.0707)	(0.0787)
AGES_55–64	0.3049***		0.3745***	0.3512***	0.2932***		0.3697***	0.3488***	0.1086***		0.1001***	0.0828***
	(0.0422)		(0.0485)	(0.0459)	(0.0425)		(0.0443)	(0.0473)	(0.0282)		(0.0266)	(0.0278)
AGES_35–54	0.1435***	0.1460***	0.2300***	0.1038**	0.2662***	0.3596***	0.3004***	0.3382***	0.3040***	0.4207***	0.3402***	0.3549***
	(0.0402)	(0.0442)	(0.0417)	(0.0457)	(0.0380)	(0.0424)	(0.0398)	(0.0435)	(0.0412)	(0.0424)	(0.0402)	(0.0447)
POPDEN				−0.0040***				0.0030***				0.0010
				(0.0008)				(0.0011)				(0.0008)
EXPSELFR	0.7146***				1.3513***				1.1499***			
	(0.0614)				(0.1177)				(0.1433)			
MAN		−0.0928***		−0.0810***		−0.0924***		−0.0930***		−0.1183***		−0.2314***
		(0.0143)		(0.0124)		(0.0201)		(0.0168)		(0.0260)		(0.0271)
SERV			0.0559***				0.1008***				0.2372***	
			(0.0130)				(0.0140)				(0.0261)	
PUB												−0.0978***
												(0.0283)
LONDON			−0.0061				0.0119**				0.0074	
			(0.0057)				(0.0058)				(0.0068)	
COASTAL	0.0067***	0.0047**		0.0044**	0.0056***	0.0083***		0.0061***	0.0012	0.0017		0.0015
	(0.0019)	(0.0022)		(0.0021)	(0.0020)	(0.0024)		(0.0022)	(0.0026)	(0.0024)		(0.0025)
CONSTANT	−0.1581**	−0.0477	−0.1977***	0.0049	−0.2217***	−0.1563***	−0.1926***	−0.1819***	−0.0309	−0.1246**	−0.1132	−0.0930

(continued)

Table 4. Continued.

Row Standardised Spatial Weights Matrix based on the 5 closest neighbours

	SELFR 1981				SELFR 1991				SELFR 2001			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	(0.0654)	(0.0459)	(0.0602)	(0.0699)	(0.0653)	(0.0370)	(0.0594)	(0.0594)	(0.0889)	(0.0532)	(0.0787)	(0.0729)
Spatially Lagged Explanatory Variables												
WIMMIGR	0.0804**				0.0882**				0.0912**			
	(0.0401)				(0.0386)				(0.0454)			
WSMFP	0.0054**	0.0065***	0.0054**	0.0021	0.0065*	0.0085**	0.0073**	0.0075**	0.0087***	0.0090***	0.0117***	0.0127***
	(0.0025)	(0.0025)	(0.0022)	(0.0023)	(0.0034)	(0.0037)	(0.0032)	(0.0031)	(0.0032)	(0.0032)	(0.0032)	(0.0032)
WHUMANCAP		0.0351				0.0390				0.0186		
		(0.0494)				(0.0452)				(0.0393)		
WHOMEOWN		0.0230				0.0066				0.0633*		
		(0.0186)				(0.0286)				(0.0337)		
WUNEMPLR	−0.0140		−0.1093**	−0.0455	−0.1092		−0.1755**	−0.2636***	−0.2711**		−0.1714	−0.6179***
	(0.0515)		(0.0522)	(0.0557)	(0.0666)		(0.0694)	(0.0683)	(0.1333)		(0.1404)	(0.1495)
WAGES_55–64	0.0108		−0.0137	0.0234	0.0678		0.0467	0.0371	0.0367		−0.0073	−0.0182
	(0.0962)		(0.1078)	(0.1108)	(0.0977)		(0.0914)	(0.0948)	(0.0666)		(0.0625)	(0.0622)
WAGES_35–54	0.1420	−0.0166	0.0804	−0.0418	0.0084	0.0683	−0.0481	0.1343	−0.2123**	−0.2177**	−0.2265**	0.0129
	(0.1063)	(0.0968)	(0.0974)	(0.1209)	(0.0983)	(0.0997)	(0.0960)	(0.1059)	(0.1065)	(0.1033)	(0.1022)	(0.1154)
WPOPDEN				0.0020				0.0070***				0.0110***
				(0.0016)				(0.0017)				(0.0021)
WEXPSELFR	−0.2835**				−0.3587*				−0.7245*			
	(0.1366)				(0.2154)				(0.4233)			
WMAN		0.0102		0.0098		−0.0283		0.0042		−0.0692		0.1115**
		(0.0246)		(0.0228)		(0.0347)		(0.0265)		(0.0472)		(0.0441)
WSERV			0.0478**				0.0440*				0.0236	
			(0.0230)				(0.0254)				(0.0472)	
WPUB												0.0603
												(0.0585)
Lambda	0.5288***	0.4522***	0.4226***	0.5678***	0.5134***	0.5406***	0.4233***	0.4043***	0.5569***	0.6025***	0.5046***	0.4770***
	(0.0601)	(0.0659)	(0.0680)	(0.0568)	(0.0613)	(0.0591)	(0.0680)	(0.0693)	(0.0578)	(0.0538)	(0.0620)	(0.0641)
R^2	0.7868	0.6978	0.7109	0.7527	0.8529	0.7838	0.8177	0.8211	0.7972	0.7930	0.7909	0.7990
Log-likelihood	1057.3891	999.5438	1008.1937	1029.8969	1045.7647	977.5785	1011.5376	1015.3571	975.6673	969.9121	972.5495	980.4618
N	348	348	348	348	348	348	348	348	348	348	348	348

Note: Asymptotic standard errors in parentheses.

***Significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.10 level.

Table 5. Regression analysis of self-employment rates in 2011: Lagged explanatory (right-hand side, RHS) variables.

	R.H.S lagged 10 years		R.H.S lagged 20 years		R.H.S lagged 30 years		R.H.S lagged 40 years	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HOMEOWN	0.1785***	0.1810***	0.1013***	0.0981***	0.0555***	0.0504***	0.0004***	0.0003**
	(0.0134)	(0.0134)	(0.0195)	(0.0202)	(0.0092)	(0.0096)	(0.0001)	(0.0001)
HUMANCAP	0.2468***	0.2456***	0.3046***	0.3143***	0.3363***	0.3695***	0.3529***	0.3317***
	(0.0233)	(0.0233)	(0.0350)	(0.0407)	(0.0347)	(0.0407)	(0.0496)	(0.0626)
SMFP	0.0101***	0.0112***	0.0209***	0.0228***	0.0262***	0.0300***	0.0087***	0.0110***
	(0.0011)	(0.0015)	(0.0030)	(0.0030)	(0.0023)	(0.0021)	(0.0020)	(0.0027)
IMMIGR	0.0845***	0.0623**	0.1159***	0.1057***	0.0717***	0.0571**	0.1157***	0.0550**
	(0.0216)	(0.0244)	(0.0246)	(0.0269)	(0.0225)	(0.0244)	(0.0186)	(0.0217)
MAN	−0.1549***		−0.1135***		−0.0904***		−0.1271***	
	(0.0243)		(0.0196)		(0.0133)		(0.0156)	
PUB	−0.1637***						−0.1129***	
	(0.0524)						(0.0265)	
SERV		0.1533***		0.0701**		0.0474***		0.1301***
		(0.0315)		(0.0219)		(0.0177)		(0.0248)
CONSTANT	−0.0314*	−0.1344***	−0.0085	−0.0749***	0.0355***	−0.0218*	0.1104***	0.0168*
	(0.0140)	(0.0146)	(0.0136)	(0.0157)	(0.0092)	(0.0093)	(0.0120)	(0.0073)
N	348	348	348	348	348	348	348	348
R^2	0.6996	0.6954	0.6274	0.6069	0.6683	0.6399	0.6227	0.5747
F	134.2791***	149.1138***	124.5153***	102.1658***	144.6233***	123.6704***	87.0116***	74.6001***

Note: Heteroskedasticity robust standard errors in parentheses.
***Significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.10 level.

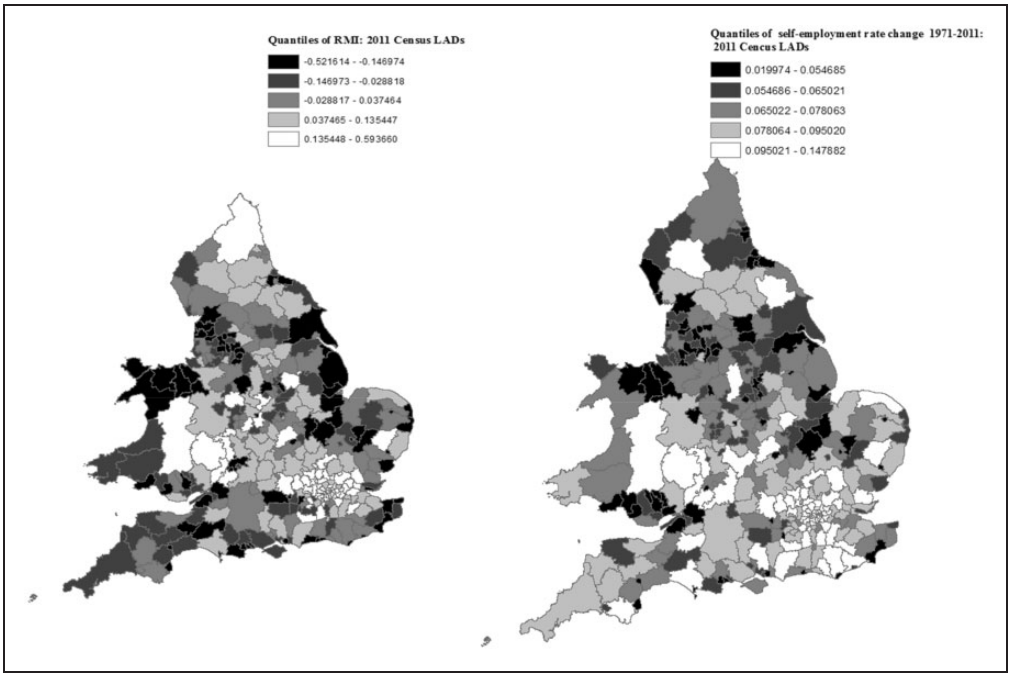

Figure 3. Quantiles of the RMI and ΔSELFR: 2011 Census LADs.

interval. The index is symmetrical in the sense that an equal number of places increase or decrease results in the same, in absolute value terms, value of the index. A value of zero indicates no change in the ranking of a LAD between two points in time. The core merit of *RMI* is that it effectively holds constant the overall national rise in self-employment rates. Our second metric is the changes in self-employment rates over time ($\Delta SELFR$).

What has to be emphasised is that these two variables, although positively correlated, are conceptually different. If $\Delta SELFR$ were uniformly distributed across space then *RMI* for all regions would be zero, implying perfect ranking immobility. Conversely, to the same value of *RMI* correspond different values of $\Delta SELFR$ depending on the initial rank. It is also important to note that *RMI* assumes the same value for an equal number of places moving independently on the initial ranking position. Figure 3 maps the quantiles of *RMI* and $\Delta SELFR$ both for changes taking place between 1971 and 2011.

The spatial distributions of the two variables exhibit similarities, but also remarkable differences.[17] The match between the *RMI* and the $\Delta SELFR$ distributions is about 63% in their top 20% while about 50% of this match is accounted for by London Boroughs. The corresponding match rate in the bottom 20% of both distributions is about 58% and coastal areas account for about 49%.

Table 6 presents the econometric analysis results for both *RMI* and $\Delta SELFR$. The Δ prefix shows changes over time. We also introduce a new variable *CRR,* to capture the effect of regional restructuring over time

$$CRR_r = \frac{1}{2}\sum_i \left| \left(\frac{E_{ir}}{E_r}\right)_t - \left(\frac{E_{ir}}{E_r}\right)_{t-\tau} \right|$$

Table 6. Regression analysis of changes in self-employment rates (ΔSELFR) and Rank Mobility Index (RMI) over 1971–2011.

	(1) ΔSELFR	(2) ΔSELFR	(3) ΔSELFR	(4) ΔSELFR	(5) ΔSELFR	(6) RMI	(7) RMI	(8) RMI	(9) RMI	(10) RMI
SELFR71	0.3900***	0.1505***	0.1502***			−1.7853***	−3.3492***	−3.3512***		
	(0.0637)	(0.0556)	(0.0546)			(0.3751)	(0.4609)	(0.4523)		
LONDON	0.0333***		0.0267***			0.2810***		0.2328***		
	(0.0032)		(0.0045)			(0.0264)		(0.0392)		
COASTAL	−0.0150***			−0.0041	−0.0055**	−0.0819***			−0.0542**	−0.0645***
	(0.0024)			(0.0027)	(0.0027)	(0.0188)			(0.0217)	(0.0222)
POPGR	−0.0011	−0.0013	−0.0011*	−0.0011	−0.0010	−0.0096	−0.0072	−0.0054	−0.0095	−0.0103
	(0.0011)	(0.0008)	(0.0006)	(0.0006)	(0.0006)	(0.0079)	(0.0051)	(0.0045)	(0.0071)	(0.0069)
ΔHUMANCAP		0.2736***	0.2307***	0.2816***	0.2747***		2.0419***	1.6678***	1.6750***	1.5734***
		(0.0220)	(0.0218)	(0.0225)	(0.0225)		(0.1925)	(0.1902)	(0.1986)	(0.1976)
ΔIMMIGR		0.1201***	0.0462*	0.0951***	0.0932***		0.6969***	0.0522	0.8041***	0.7991***
		(0.0239)	(0.0276)	(0.0248)	(0.0246)		(0.2213)	(0.2519)	(0.2110)	(0.2144)
ΔAGES_55–64		0.3022***	0.3178***	0.2999***	0.2949***		1.6748***	1.8109***	1.4787***	1.4772***
		(0.0339)	(0.0320)	(0.0345)	(0.0345)		(0.2611)	(0.2458)	(0.2736)	(0.2778)
ΔSMFP		0.0016*	0.0015*	0.0023**	0.0024***		0.0240***	0.0229***	0.0209***	0.0212***
		(0.0008)	(0.0008)	(0.0009)	(0.0009)		(0.0072)	(0.0071)	(0.0058)	(0.0059)
ΔHOMEOWN				−0.0000	−0.0000				0.0027***	0.0028***
				(0.0001)	(0.0001)				(0.0006)	(0.0006)
CRR				−0.0126					0.2756***	
				(0.0089)					(0.0852)	
ΔSERV					−0.0474**					0.4185**
					(0.0195)					(0.1863)
CONSTANT	0.0492***	0.0132***	0.0220***	0.0262***	0.0325***	0.1180***	−0.1842***	−0.1073***	−0.3070***	−0.2469***
	(0.0040)	(0.0039)	(0.0040)	(0.0091)	(0.0094)	(0.0243)	(0.0315)	(0.0315)	(0.0795)	(0.0802)
N	348	348	348	348	348	348	348	348	348	348
R^2	0.3435	0.5192	0.5636	0.5068	0.5136	0.3623	0.4547	0.5067	0.4243	0.4141
F	54.4398	72.6006	82.0973	50.4066	53.6458	53.3657	44.6927	54.0157	32.0743	31.0264

Note: Heteroskedasticity robust standard errors in parentheses.
***Significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.10 level.

where r stands for region and i for industrial sector (see Dixon and Thirlwall, 1975: 16 and Appendix 1 for details).[18] It ranges from zero (indicating no change) to one (suggesting a complete reallocation of regional employment across sectors within a region over the period considered.

The left-hand side of Table 6 shows that the change in self-employment rates was higher in regions with higher self-employment rates in the base year (*SELFR71*). This is consistent both with path-dependency and with diverging self-employment rates across space and over time.[19]

Interestingly, the effect of regional restructuring (*CRR*) and the increasing share of the services sector in the regional economy ($\Delta SERV$) was negative in both cases, but significant only in the latter case.[20] The effect of population growth is marginally significant and negative.[21] In contrast, increases in human capital ($\Delta HUMANCAP$), immigration ($\Delta IMMIGR$), and in the 55–64 age-bracket population have a positive and statistically significant effect. The coefficient of the LONDON dummy variable is positive and significant indicating that the change in self-employment rates was higher in London, whereas the opposite is the case for the coastal LADs.

However, the negative sign for *SELFR71* sharply contrasts with its sign when $\Delta SELFR$ was the dependent variable.[22] Moreover, both *CRR* and $\Delta SERV$ become positive and statistically significant, contrasting with their signs on the left hand side of the table.

Several other factors also positively influence *RMI*. These include changes in human capital, homeownership, small firm presence, and the proportion of the population of (late) working age. The effect of changes in the ratio of immigrants is positive and significant, but only when the *LONDON* dummy variable is not included in the same regression, suggesting that the effect of immigration might be heavily concentrated in London.[23]

Finally, to assess whether the drivers of RMI and $\Delta SELFR$ are the same across their distribution of rank mobility,[24] an *unconditional quantile regression* (Firpo et al., 2009) approach was followed. As pointed out by Baltagi and Ghosh (2015), an important difference between the conditional and unconditional quantile regression is that the conditional quantiles do not average up to their unconditional quantile counterparts.[25] In terms of ease of interpretation and policy-relevance, the unconditional quantile regression approach is preferred.

The unconditional quantile regression is based on transforming the dependent variable by using the re-centred influence function $RIF : (Y : q_\theta, F_Y) = q_\Theta + \left(1 - \theta\left\{Y \leq q_\theta\right\}\right)/f_Y(q_\theta)$, where q_θ stands for the θth quantile, $1\left\{Y \leq q_\theta\right\}$ is a dummy variable generating function assuming the value of 1 when the value of the dependent variable Y is smaller or equal to the one that corresponds to its θth quantile, and $f_Y(q_\theta)$is the density at the point q_θ.

Since the results obtained for middle parts of the corresponding distributions are more uniform and consistent with those already presented, Table 7 shows unconditional quantile regression results only for the tails (10th and 90th quantiles) of both the *RMI* and $\Delta SELFR$ distributions.[26]

The positive effect of changes in human capital, small firm presence, home ownership, and population growth is larger in the right tail of the *RMI* distribution. In contrast, the effect of structural change as reflected by the *CRR* and $\Delta SERV$ variable is much larger, and the effect of population ageing is positive and significant in the left tail. Changes in immigration appear to have no significant effect on either tail.

This contrasts with the result obtained for $\Delta SELFR$ where the effect of changes in the immigration variable were positive and of marginal statistical significance for the top end of the unconditional distribution. As with *RMI*, the $\Delta SELFR$ results show the effect of changes in human capital are more pronounced for the right tail of the distribution of the dependent variable, whereas the effect of population ageing is clearer for the left tail.

Table 7. Unconditional quantile regression analyses of changes in self-employment rates (ΔSELFR) and Rank Mobility Index (RMI) over 1971–2011.

	(1) RMI	(2)	(3) RMI	(4)	(5) RMI	(6)	(7) ΔSELFR	(8)	(9) ΔSELFR	(10)	(11) ΔSELFR	(12)
	Q_10	Q_90	Q_10	Q_90	Q_10	Q_90	Q_10	Q_90	Q_10	Q_90	Q_10	Q_90
SELFR71	−5.4059***	−3.7117***					−0.0218	0.4897***				
	(1.0890)	(0.8840)					(0.0668)	(0.1348)				
LONDON	0.1417**	0.6099***					0.0050	0.0345**				
	(0.0565)	(0.1504)					(0.0053)	(0.0161)				
ΔHUMANCAP	1.9363***	2.2509***	1.6822***	2.6808***	1.5797***	2.5395***	0.1418***	0.1968**	0.1671***	0.2471***	0.1609***	0.2448***
	(0.4089)	(0.5150)	(0.4132)	(0.4912)	(0.3987)	(0.4844)	(0.0282)	(0.0777)	(0.0328)	(0.0742)	(0.0315)	(0.0739)
ΔIMMIGR	−0.2069	−1.0471	0.3460	0.8141	0.3520	0.7973	0.0417	0.0631	0.0524*	0.0993	0.0524*	0.0954
	(0.4675)	(0.7449)	(0.3947)	(0.6884)	(0.3974)	(0.6927)	(0.0354)	(0.1005)	(0.0279)	(0.0919)	(0.0282)	(0.0910)
ΔAGES_55–64	3.2094***	−0.2930	2.7182***	−0.7753	2.7499***	−0.8066	0.2559***	0.1483*	0.2508***	0.1482	0.2515***	0.1367
	(0.6593)	(0.5657)	(0.6666)	(0.6311)	(0.6727)	(0.6359)	(0.0506)	(0.0923)	(0.0495)	(0.0987)	(0.0500)	(0.0983)
ΔSMFP	0.0271*	0.0566***	0.0241*	0.0537***	0.0241*	0.0543***	0.0011	−0.0018	0.0012	−0.0001	0.0012	0.0000
	(0.0145)	(0.0164)	(0.0124)	(0.0159)	(0.0125)	(0.0160)	(0.0008)	(0.0029)	(0.0008)	(0.0030)	(0.0008)	(0.0030)
POPGR	0.0184**	0.0256*	0.0119	0.0193**	0.0103	0.0190**	−0.0031**	−0.0023	−0.0031**	−0.0016	−0.0032**	−0.0013
	(0.0093)	(0.0158)	(0.0100)	(0.0083)	(0.0100)	(0.0080)	(0.0014)	(0.0029)	(0.0013)	(0.0025)	(0.0013)	(0.0025)
COASTAL			−0.1061**	−0.0358	−0.1119**	−0.0541			−0.0003	−0.0045	−0.0008	−0.0063
			(0.0523)	(0.0474)	(0.0529)	(0.0485)			(0.0040)	(0.0068)	(0.0040)	(0.0067)
ΔHOMEOWN			0.0027*	0.0043**	0.0027**	0.0045***			−0.0000	0.0002	−0.0000	0.0002
			(0.0014)	(0.0017)	(0.0014)	(0.0017)			(0.0001)	(0.0002)	(0.0001)	(0.0002)
CRR			0.4941***	0.1929					0.0222	−0.0681***		
			(0.1824)	(0.1885)					(0.0142)	(0.0210)		
ΔSERV					0.9448**	0.1219					0.0385	−0.1702***
					(0.3925)	(0.4162)					(0.0298)	(0.0468)
CONSTANT	−0.2178***	−0.0781	−0.5906***	−0.2734	−0.5452***	−0.1766	0.0258***	0.0400***	0.0085	0.1026***	0.0118	0.1091***
	(0.0663)	(0.0859)	(0.1878)	(0.1756)	(0.1832)	(0.1770)	(0.0076)	(0.0139)	(0.0144)	(0.0229)	(0.0139)	(0.0233)
N	348	348	348	348	348	348	348	348	348	348	348	348
R^2	0.2033	0.3942	0.1705	0.3075	0.1670	0.3055	0.1573	0.2063	0.1674	0.1727	0.1648	0.1805
F	6.0708	16.3840	4.8285	10.3733	4.7045	10.3022	7.3021	7.4933	6.8093	5.9840	6.7439	6.3605

Note: Robust standard errors in parentheses.

***Significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.10 level.

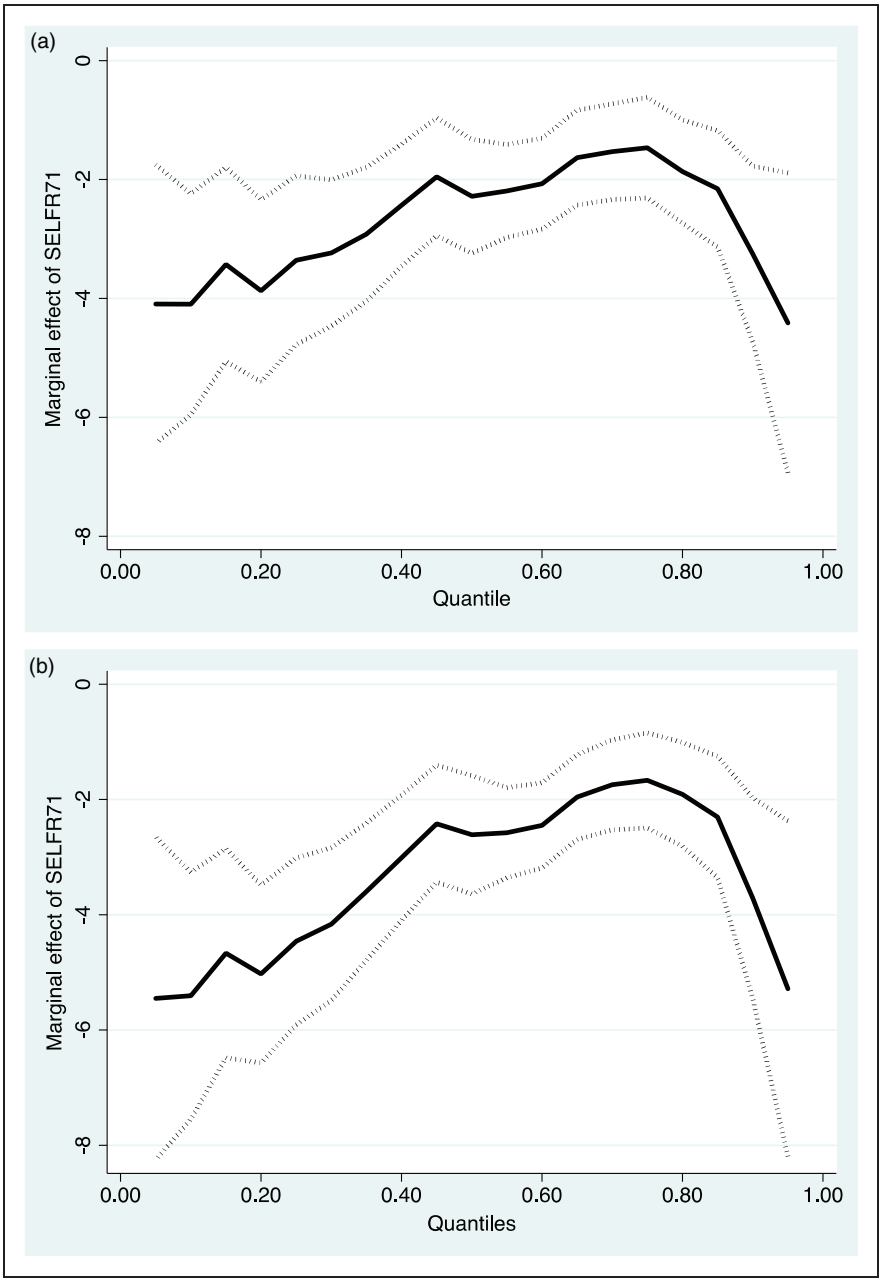

Figure 4. Marginal effect of SELFR71 on RMI based on unconditional quantile regressions: (a) Unconditional quantile regressions of RMI on SELFR71 and a constant. (b) Unconditional quantile regression of RMI on SELFR71 a constant and other explanatory variables as in column 8 of Table 7. A 95% confidence interval has been used.

The effect of population growth is negative and of moderate statistical significance for the low end of the $\Delta SELFR$ distribution. In contrast, the effect of variables relating to structural changes is negative for the top end of the dependent variable distribution.

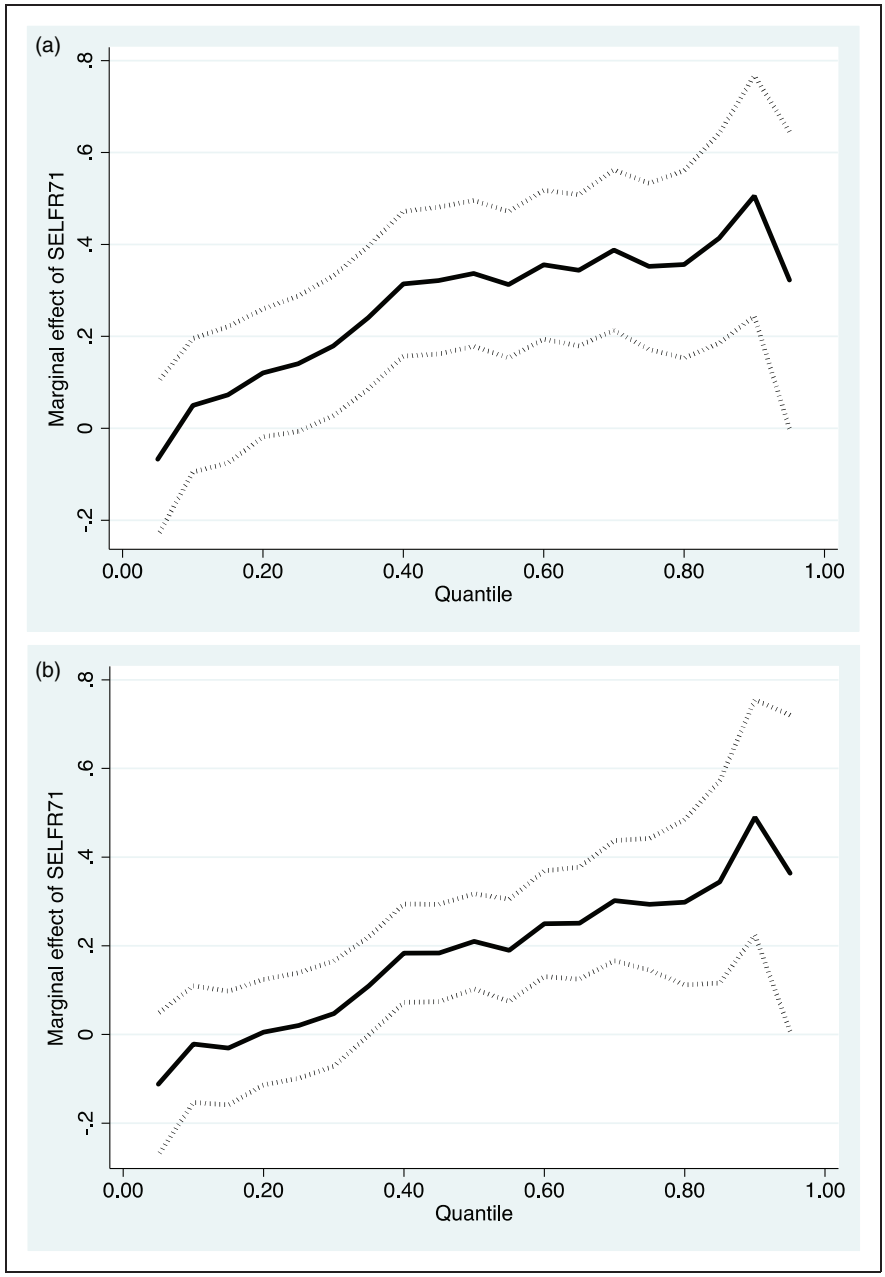

Figure 5. Marginal effect of SELFR71 on ΔSELFR based on unconditional quantile regressions: (a) Unconditional quantile regressions of ΔSELFR on SELFR71 and a constant. (b) Unconditional quantile regression of ΔSELFR on SELFR71 and a constant and other explanatory variables as in column 3 of Table 7. A 95% confidence interval has been used.

The marginal effect of the base year self-employment rate on RMI across its different quantiles is graphed in Figure 4, whereas the corresponding marginal effects in the case of $\Delta SELFR$ are graphed in Figure 5.

Overall, these marginal effects are consistent with the patterns of persistence and change emerging from the earlier analysis.

Conclusion

This paper takes a long-term perspective and examines regional variations in entrepreneurship in England and Wales over 90 years between 1921 and 2011. It finds evidence of striking persistence and limited, yet nonetheless important, change.

Using self-employment as a measure of entrepreneurship, it confirms that, overall, rates have risen considerably, doubling between 1921 and 1971 and doubling again between 1971 and 2011. However, despite the scale of these changes, the geographical areas with high (low) self-employment rates in 1921 continued to have high (low) rates 90 years later. This spatial stability is particularly characteristic of areas with low self-employment rates in either 1921, 1971 or both. It is, however, somewhat less characteristic of the post-1971 period than of the earlier period.

Stability can be interpreted as reflecting the powerful role played by cultural factors in explaining spatial patterns of entrepreneurship. This is based on the effect of lagged regional self-employment rates that accounts for a high proportion of the observed variation and the effect of lagged values of the variable that captures the extent to which local economic structures are dominated by small firms, as the latter is in line with explanations that emphasise a powerful role for entrepreneurship culture. In addition, the spatial econometric modelling approach followed here suggests that the effect of omitted factors is spatially autocorrelated, which might also be related (although not exclusively so) with unmeasured cultural factors spreading across space. Moreover, the evidence produced suggests that structural variables in nearby local authorities matter for entrepreneurship in a regional context.

Potentially serving in reinforcing stability is our finding that the key determinants of the 2011 regional self-employment rates were the spatial economic circumstances of that area 40 years previously. This concurs with the view that part of the explanation for the time-persistence of regional entrepreneurship differences lies in time-persistent differences in their determinants (Andersson and Koster, 2011; Fotopoulos, 2014).

Despite this pattern of overall stability there are two very important groups of movers between 1971 and 2011: the London boroughs (all of which improve their rank position) and the coastal towns (which, as a group, decline in rank position – in many cases catastrophically).

Our econometric results suggest that regional restructuring favouring the services sector, population ageing, and increases in human capital, homeownership and immigration all have a positive effect on rank mobility and change, although the latter seems to be dominated by the London effect. The results on both human capital and immigration accord with recent evidence produced for entrepreneurship in England and Wales over the 1991–2001 (Rodríguez-Pose and Hardy, 2015).

The London-based changes reflect the growth of financial services in the capital, particularly in the last two decades. This exogenous increase in wages stimulates in-migration which, with labour market imperfections, leads to many individuals working as self-employed.

The decline of self-employment in the coastal towns is more simple, reflecting a decline in seaside tourism (Gale, 2005) and fishing – sectors dominated by the self-employed. To this may be added a downward trend in self-employment in the distribution, hotels and restaurants sector, partially attributable to the replacement of small family-owned

establishments by larger chains (Meager and Bates, 2004). The theorizing common to both explanations is that entrepreneurship is a response to changed (good or bad) economic circumstances.

Our view is that enterprise policy in the UK emerges with little credit from these findings. One key objective of such policies, which have been in operation since the late 1970s in the UK, has been to promote enterprise in low-enterprise areas (Greene et al., 2008). We show that, although self-employment rates have risen in these areas, they have not 'moved up the league table'. Instead, places such as Middleborough, Kingston upon Hull and Gateshead remain resolutely amongst the 10 areas with the lowest rates of self-employment in 1971 and 2011. This dimension of policy clearly has not worked.

Perhaps equally disconcerting for policy-makers is that the areas that have clearly improved their league position are those that have not been the focus of policy – most notably London. Finally, the areas that have declined in terms of league-table position – the Coastal Towns – have also not been the subject of explicit enterprise policy attention.

To address this, we offer suggestions of policy routes that are compatible with our theories and findings. All see spatial entrepreneurship levels as a response, either to external changes, or to stability.

The first acknowledges the powerful role clearly played by local human capital. In low enterprise areas such capital could be supplemented by retaining the university graduates within the area and/or attracting highly educated and financially robust immigrants to peripheral regions. In reality, however, these effects are likely to be only marginally effective when the human capital of those living in the area remains low.

The second is more radical. It involves acknowledging that low or high rates of entrepreneurship might be symptoms, rather than causes of, the economic performance of a locality. Treating the symptoms – such as seeking to raise enterprise rates – by policies such as small scale grants, awareness raising, information and advice – have been in place for more than thirty years or more with little observable effect. The lessons learned from the paper are that where change has happened – most notably London – it has come about for reasons not clearly related to enterprise policy. The case of London therefore merits much closer attention.

A third group worthy of further investigation are the Coastal Towns. Our results show that, as a group, they experienced a substantial fall in their position in the self-employment league table. However, this average performance masks a diversity that merits further investigation.

Developing a richer understanding of the deviants would provide case material that could be used to benefit others and lead to the framing of more effective entrepreneurship policy during the next 40 years.

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Notes

1. According to Putnam (1993: 167), social capital refers to 'features of social organizations, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions'. For a good overview of research on social capital and entrepreneurship see Westlund et al. (2014).
2. Coate and Tennyson (1992) develop a model where if becoming self-employed necessitates borrowing and the individual entrepreneurial ability cannot be observed by banks, then the labour market discrimination can spill over to financial markets resulting in lower expected returns (because of higher interest rates) for those being discriminated. The latter, would result in lower incentive for becoming self-employed for this category of potential entrepreneurs.
3. See http://www.visionofbritain.org.uk/census/Cen_Guide/4
4. See Appendix 1 for details regarding the calculation of self-employment rates across census years.
5. Fritsch (1997), Renski (2014), and Fotopoulos (2014) also account for the effect of industry structure by deriving a hypothetical entry rate that would have resulted based on a region's industry mix and sectoral entry rates at the national level.
6. A possible explanation for higher self-employment rates among immigrants could be related to the discrimination they face within the labour market (Clark and Drinkwater, 1998). This factor, in turn, could lower the opportunity cost of self-employment.
7. Westlund et al. (2014) use the local share of small businesses to define their business-related entrepreneurship social capital.
8. For 2001 and 2011, the definition of this variable is based on the ratio of small employers and own account workers over large employers and higher managerial and administrative occupations.
9. Stuetzer et al. (2016) use distance to coalfields to instrument the presence of large-scale industries and they use the extent of the latter as an indirect (and inverse) proxy of entrepreneurship culture. Their analysis suggests that British regions historically dominated by large-scale industries are characterized by lower contemporary entrepreneurial rates and weaker entrepreneurship culture.
10. We thank an anonymous referee for emphasizing this point.
11. Only independent variable value changes taking place in immediate neighbouring regions affect the value of the dependent variable in a particular location.
12. The SLX model is the preferred point of departure for Gibbons and Overman (2012) when the natural experiments option is not possible.
13. Alternative spatial weight matrices based on 10 closest neighbours and inverse distance have also been tried and results are available upon request.
14. Corresponding SLX models were also estimated. In all cases, however, a log-likelihood ratio test offered evidence in favour of the SDEM. Regarding the effect of non-spatially lagged independent variables, the results herein using non-spatially lagged explanatory variables are similar to those of non-spatial econometric models which were presented and discussed in an earlier version of the paper. These are available upon request.
15. The share of the 20–34 age group has also been tested separately with its effect being weaker and negative. To avoid multicollinearity problems, this particular age-band share variable was not included with the other two used in the analyses presented here. Rodríguez-Pose and Hardy (2015) find a negative affect for the share of the 20–44 age band on regional new firm formation in England and Wales from 1991 to 2001.
16. The country of origin matters for entrepreneurship as, expressed as a proportion of all employees, the Chinese, Pakistanis, Bangladeshis and Indians are considerably more likely to be self-employed than whites, whereas Black Caribbean, Black African, and Black Other have substantially lower self-employment rates (Clark and Drinkwater, 1998).

17. The rank correlation coefficient between *SELFR71* and *RMI* is −0.2845, between *SELFR71* and $\Delta SELFR$ is 0.3113, whereas between *RMI* and $\Delta SELFR$ is 0.775.
18. An alternative approach for the assessment of the effect of regional restructuring on changes in the self-employment rate and *RMI*, was the use of the change in the expected, based on regional industry-mix, self-employment rate. The results are available upon request.
19. Re-emphasising our findings in Figure 1.
20. The correlation between the initial regional share in the services sector and its change over the 1971–2011 period is −0.75.
21. These results hold even when the London and coastal areas observations were dropped from the analysis in subsequent steps. The partial correlation coefficient between population density in 1971 and population growth over the 1971–2011 period is −0.168.
22. An alternative to *SELFR71* could have been the base year regional rank. However, the interpretation of *SELFR71* is more straightforward and its correlation with the initial rank is high.
23. According to Dustmann and Fabri (2005), 45% of the foreign born were living in London in comparison to 8% of the working age British-born whites whereas the education level of the former is higher than that of the latter. This result and its interpretation were further checked by dropping the London observations from the analysis.
24. An anonymous referee suggested exploring this possibility.
25. So a quantile regression cannot be used to assess the effect of an explanatory variable on the *unconditional quantile* of the dependent variable.
26. Unconditional regression estimation was performed with Fortin's rifreg routine in STATA.

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Appendix 1. Data sources for variable construction

The data from the 1921 census is drawn from the Online Historical Population Reports (http://www.histpop.org/ohpr/servlet/Browse?path=Browse/Census%20(by%20date)&active=yes&treestate=contract&titlepos=0), the data for the 1971, 1981, 1991, and 2001 censuses come from the UK Data Service Census Support Service site (http://casweb.mimas.ac.uk/), whereas the 2011 census data are sourced from the NOMIS site (https://www.nomisweb.co.uk/census/2011). Digital boundary data were obtained from the UK Data Service Census Support (http://borders.edina.ac.uk/html/boundary.html).

SELFR*:* It comprises those who state they are self-employed both with, and without, employees in all sectors of the economy, excluding agriculture. The denominator includes both those in, and out of, employment of working age.

For 1921, the numerator is the sum of those working for their own account plus employers. Whereas this sum incorporates both males and females, data for agriculture were available only for males. In consequence, the number of males working on their own account in agriculture and the male employers in agriculture was subtracted in order to correct the figure for the agriculture effect. The denominator for the 1921 self-employment rate is the sum of those in employment (males and females) plus the number of those unoccupied (males and females). The rest of the Census data used do not encounter the above problems. The census tables used for constructing self-employment rates are: 1971 Tables 28 and 23; 1981 Tables 51 and 50; 1991 Tables 79 and LBS92; for 2001 Tables CS038 and KS09a; 2011 Tables LC6602EW and KS601EW-KS603EW.

HOMEOWN 1971 Census Table 18; 1981 Census Table SAS 10; 1991 Census Table SAS20; 2001 Census Table KS018; 2011 Census Table QS405EW.

HUMANCAP: 1971 Census Table 23; 1981 Census Tables 48 and 44; 1991 Census Table 84; 2001 Census Table KS013; 2011 Census Table WD501EW.

IMMIGR**:** 1971 Census Table 8; 1981 Census Table 4; 1991 Census Table 7; 2001 Census Table KS005; 2011 Census Table KS304EW.

POPDEN**:** This is the population density defined as population per square kilometre. For all censuses data were drawn for the corresponding Census Table 1.

AGES: **P**opulation age shares for age bands in the range of 20-64: 1971 Census Table 05; 1981 Census Table SAS09; 1991 Census Table 08; 2001 Census Table CS028; 2011 KS102EW.

SMFP**:** Census Table 23; 1981census Table 49; 1991 Census Table LBS92; 2001 Census Table KS014a; 2011 Census Table QS607EW-NS-SeC.

UNEMPLR: This is the ratio of unemployed individuals over those economically active. Data were drawn from the following census tables: 1971 Table 05; 1981 Table 09; 1991 Table S08; 2001 Table KS009a; 2011Tables KS601EW toKS603EW.

MAN, SERV, and ***PUB:*** 1971 Census Table 28; 1981 come Census Table 44; 1991 Table 73; 2001 Table KS011a; 2011 Tables KS605EW to KS607EW.

EXPSELFR: 1971 Census Table 05; 1981 Census Table SAS 05; 1991 Census Table SAS08; 2001 Census Table KS011a; 2011 Census Tables KS605EW-KS607EW. For data on self-employed by industry see sources used for *SELFR*

CRR: defined over the 1981–2011 period using data for broad the broad sectors of energy, services, manufacturing, agriculture and construction coming from the 1981 Census Table SAS44 and the 2011 Census Tables KS605EW-KS607EW.