Persistence and Change in Regional Entrepreneurship Performance – A Three Country Comparison

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Abstract

This paper analyzes the level and causes of persistence and change in regional entrepreneurship performance in the United States, England and Wales, and Germany. We find that all three economies experience comparable levels of long-term persistence of regional start-up and self-employment rates. In all three countries, long-term increase in the regional level of new business formation is related to human capital, regional 'openness' and population density. Regions with low levels of new business formation in the base year are more likely to experience an increase. We draw out conclusions regional policy and propose an agenda for further research.

Keywords: Entrepreneurship, start-ups, self-employment, regional development

JEL codes: L26, L53, R11, R58

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1. Regional entrepreneurship and development

Entrepreneurship has been shown to have several positive effects on economic welfare and growth in countries and regions.[1] Therefore, it has become an important target for policies seeking to develop regional prosperity and level up regional economic performance. However, key questions remain about how far policies can improve the entrepreneurship performance of lagging regions and the policy levers to achieve this. Recent research has found that in a number of countries the relative entrepreneurship rates of regional economies tend to be highly persistent over long periods of time (Fritsch & Wyrwich, 2023). Empirical evidence clearly indicates a significant role for historical factors that can shape regional entrepreneurial activity. Understanding the factors that determine the level and evolution of regional entrepreneurial activity is important for the design of an effective regional development policy.

Entrepreneurial activity is embedded in a regional context and is also considerably shaped by national framework conditions (Wurth, Stam, & Spigel, 2023; Baker & Welter, 2020). While recent research has considerably furthered our knowledge about the effect of the regional context on entrepreneurial activity (Sternberg, 2022), we still know very little about differences in the role of regional factors across countries. To what extent are the same factors important for regional entrepreneurship in different national contexts? How important is the national context compared to regional factors?

This paper explores the role of regional and national factors in regional entrepreneurial activity in two main ways. First, it examines whether the overall finding of persistence in the entrepreneurship rankings of regions suggested by a nascent literature in this area (Fritsch & Wyrwich, 2023) is common across three very different economies, England and Wales, Germany and the United States. This helps us to understand whether persistence may be a more general feature of advanced economies. The comparison of the two European economies with the United States is particularly interesting given the considerably stronger dynamics

[1] These include intensified competition, accelerated structural transition, greater innovation, increased product variety and new solutions to environmental and social challenges, knowledge spillovers, the generation of new employment and economic growth (Fritsch, 2013). Moreover, studies suggest that self-employed people tend to experience higher levels of job and life satisfaction (Wiklund et al., 2019; Fritsch, Sorgner, & Wyrwich, 2019).

and flexibility of the US economy overall (Frydman, Khan, & Rapaczynski, 2011). Second, the article explores long-term changes in regional new business formation in the three countries over a period of about forty years, from 1980 to 2019 by means of multivariate analysis. The main goal of this analysis is to find out if there are common regional-level factors that drive the development of regional entrepreneurial activity in all three countries.

In fact, we find that persistence levels of regional entrepreneurial activity in the three economies are quite comparable, although the geographic patterns of places with high and low levels of entrepreneurial activity show some differences. There are also differences in regional patterns of changing entrepreneurial activity. However, we identify a number of common factors that are related to long-term changes in regional new business formation in the three countries. Our multivariate analyses suggest that particularly human capital, regional 'openness' as indicated by the share of foreign-born population, and population density are positively related to rising levels of new business formation. Furthermore, we find that in all three countries the regions with relatively low levels of new business formation in the base year are more likely to experience an increase than regions that already experience relatively high start-up rates.

The paper is organized as follows. Section 2 provides a brief overview of recent research on the persistence and change of regional entrepreneurship rates over time. Section 3 deals with the methodology of our analysis. In particular, it introduces the 'league table' approach that we use to measure the persistence and change of regional entrepreneurial activities. Section 4 provides our findings comparing the persistence levels in England and Wales, Germany, and the United States. Section 5 then compares the geographic pattern of persistence and change between the three economies and presents the results of multivariate analyses of the factors behind long-term changes in regional performance. Section 6 identifies policy implications, proposes avenues for further research, and concludes.

Although there are some case studies that investigate significant changes in entrepreneurial activity in certain regions over long periods of time, particularly

the evolution of relatively high levels of entrepreneurial activity[2], there is very little systematic analysis of the reasons for long-term changes in the levels of regional entrepreneurship.[3] We provide a systematic international comparison of the degree of changes in regional entrepreneurial activity over time periods of up to a century. In particular, we present the first analysis of factors that determine changes in regional new business formation over a period of 40 years using a consistent method across three economies – England and Wales, Germany, and the United States (Section 5)[4]. In doing this, we extend the preliminary analysis presented for the same economies in Potter et al (2023) by introducing additional more recent and more geographically disaggregated data and introducing new econometric models. Overall, this paper is one of the few analyses that compares the relevance of different regional factors for new business formation across national contexts by means of multivariate analysis (see Reynolds, Storey, & Westhead, 1974, as an early example).

2. Persistence and change in regional entrepreneurship levels – reasons and consequences

Fritsch & Wyrwich (2023) discuss emerging evidence of high persistence of regional entrepreneurship rankings within countries over time. Although these findings currently cover only a small number of countries[5] and make use of different data sources, entrepreneurship metrics and methodologies, they nevertheless suggest that high persistence of regional entrepreneurial activity could be a more general feature of advanced economies.

Various theories have been proposed to explain regional levels of entrepreneurship and quite a number of empirical analyses have empirically

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[2] E.g., the studies of Saxenian (1994) and Kenney & von Burg (1999) about the Silicon Valley, Feldman (2001) and Feldman et al. (2005) about the Capitol Hill region in the US, Garnsey & Hefernan (2005) the Cambridge region in the UK, Wigren (2003) about the Gnosjö region in Sweden or Sternberg & Tamasy (1999) about Munich in Germany. A meta-analysis of such cases is missing.

[3] Key examples are Fotopoulos & Storey (2017) for England and Wales, and Fritsch & Kublina (2019) for West-Germany.

[4] The selection of these three countries was based on data availability, reasons of sample structure and resource constraints. For example, we did not include post-socialist economies with the exception of the eastern part of Germany because these countries represent special constellations.

[5] Countries are China, the Czech Republic, England and Wales, Germany, Italy, Poland, Russia, Sweden, and the United States.

investigated the potential forces that drive regional entrepreneurial activity (see Sternberg, 2009 and Parker, 2018, for an overview). Nearly all of these studies[6] focused on short-term developments with no or only a very short time lag between the dependent and the independent variables. Hence, it is unclear if this empirical evidence applies to changes over periods of several decades.

A basic approach to explaining entrepreneurship in general is occupational choice theory (Lucas, 1978; Parker, 2018) that provides a framework for explaining why more people choose business ownership than other forms of economic activity (e.g., being an employee, unemployment, or economic inactive). The approach can be traced back to Frank Knight (1921). It assumes that this is an informed choice in which, all else equal, individuals select the type of occupation that maximizes their utility, frequently captured by monetary earnings. On those grounds, the regions where wages are relatively high should have lower rates of business ownership because individuals will shift to becoming employees. In this model, persistence in regional entrepreneurship rates would be a result of persistence in rewards to self-employment compared to other occupational opportunities.

Another set of theories are ‘structural’. These approaches emphasize the sectoral and size structure of employment units, the age and gender structure of the working population, its educational attainment and skill level, the share of immigrants, innovation activities and the regional knowledge base. Further factors that may shape regional entrepreneurial activity are availability of resources such as capital for investments, networks and social capital in the region as well as advantages and disadvantages of a location such as population density (agglomeration effects) (Sternberg, 2009; Parker, 2018; Fritsch & Wyrwich, 2023). Since these factors tend to change only slowly, the level of entrepreneurial activity in a region compared to other regions is also likely to show little change, often over long periods of time (Fotopoulos, 2014). If, however, policy or other influences lead to changes of these factors, then they may induce change in the regional entrepreneurship rate.

[6] The only exemption we are aware of is Fotopoulos & Storey (2019) and Fritsch & Kublina (2019).

A favored explanation for persistence in regional entrepreneurship rates is culture (e.g, Anderson & Koster, 2011; Fritsch & Wyrwich, 2023). Culture can be regarded as an informal institution, i.e., the unwritten rules of society, such as codes of conduct, social norms and values (North, 1994; Williamson, 2000). A particularly entrepreneurial culture that may explain persistence of relatively high levels of regional entrepreneurship may affect the extent to which entrepreneurship is considered a valid and desirable activity. It differs between regions, is an outcome of past entrepreneurship activity rates, and changes only slowly over time. Persistently low levels of regional entrepreneurial activity may be based on different types of culture that still need to be further explored. Since culture usually takes a long time to evolve and change, it is not a promising explanation for marked changes in regional entrepreneurship performance.

3. Methodological issues

3.1 Entrepreneurship metrics

We use two measures of entrepreneurship for the analysis, namely the business start-up rate and the self-employment rate. The start-up rate is the number of new businesses set up in a period (in this case annually) over the regional population or workforce, while self-employment is the share of self-employed persons.[7] An important difference between these two metrics is that self-employment can encompass many old-established firms, whereas start-ups include only new businesses. As a consequence, indicators built on start-ups reflect the dynamic element that is inherent in entrepreneurship considerably more accurately than indicators based on self-employment.

Since regional information on new business formation in the three countries of our sample is only available from the late 1970s onward, we have to rely on self-employment rates as indicators of entrepreneurial activity in earlier periods. We use both metrics to identify and compare long-term persistence in periods of up to a century in Section 4. The multivariate analyses of what may be

[7] Rates help to make the numbers of start-ups and self-employed comparable across regions by relating these numbers to the economic potential of a region. The regional workforce or population can be regarded as particularly well-suited for such a standardization because it represents the number of potential start-up founders or self-employed people.

the determinants of change that we report in Section 5.2 are restricted to the period 1980 to 2019 for two reasons. First, the information available about potential determinants of change in the year 1980 is much more comprehensive than in more distant years. Second, for this period, we can use start-up rates, which is the more appropriate metric of entrepreneurial dynamics compared to self-employment rates.

3.2 Regional rankings

Long-run trends in regional entrepreneurship levels can be analyzed by comparing the values of the chosen entrepreneurship metric at different points in time. However, such comparisons may be driven by national trends such as macroeconomic developments, demographic, technological and regulatory changes, which drive increases or decreases in entrepreneurship in all regions in a country. What we are really interested in, however, is changes within a region that influence its performance. A factor that may impair comparison of regional entrepreneurship levels over long periods of time are changes in the statistical reporting system such as changes in the definition of start-ups or self-employment,[8] or concern the statutory reporting requirements of individuals and firms.

A way to abstract from such effects and to focus on the regional influences on entrepreneurship is to compare the position of a region in a national ranking, the national 'entrepreneurship league table', over time.[9] An important advantage of rankings is that due to their ordinal character, they are robust to the effect of extreme cases ('outliers') that could bias the results if continuous metrics are applied. For these reasons we use regional entrepreneurship rankings in order to

[8] There are frequently requirements of minimum efficient size to be identified as a firm and, hence, a start-up (e.g., having at least one employee subject to obligatory social insurance contributions). It may also be the case that self-employment in a second or a third occupation is not classified as entrepreneurship.

[9] Fotopoulos & Storey (2017, 2019), Potter et al. (2023), Potter & Fotopoulos (2024).

validly compare changes in the entrepreneurship performance of a region of a country with other regions in the same country over an extended period of time.[10]

3.3 Geographic framework

The size of the spatial units has been selected to enable comparability across the countries. Generally, we aimed at using functional geographic units as basis of the analysis. In the case of England and Wales, administrative counties (NUTS3) as well as larger NUTS2 geographical units are used.[11] Because the London area is divided into quite a number of NUTS3 regions that do not represent functional regions, we ran a robustness check where we aggregated all London NUTS3 regions into one region and found that the results remained largely unchanged See Tables A4a and A4b in the Appendix). The geographic framework for the German analysis is labor market regions, which are functional travel to work areas and are somewhat larger than the NUTS3 regions used for the analyses for England and Wales (BBR, 2012).[12]

The analysis for the United States is for Commuting Zones (CZs) and for Metropolitan Statistical Areas (MSAs). Commuting Zones are functional regions delineated by commuting ties and comparable to the German labor market areas (Potter et al., 2023). They have the advantage of strong spatial disaggregation and full coverage of the country. MSAs are larger areas defined by a county or a group of adjacent counties with commuting ties and represent labor markets with a population threshold of at least 50 000 population in their urban cores. They do not cover remote counties without close commuting ties to these urban cores.

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[10] A further advantage of rank positions is that they can be taken as a measure of the relative attractiveness of regions for entrepreneurial talent, investments, and relocation of firms compared to other regions and, therefore, tend to have particular appeal to policymakers concerned with regional competitiveness. However, it may be considered a disadvantage that the ranks do not capture the absolute scale of differences between regions.

[11] NUTS (Nomenclature des Unités Territoriales Statistiques) is the common classification of territorial units used for harmonized regional statistics in the EU. See https://www.europarl.europa.eu/factsheets/en/sheet/99/common-classification-of-territorial-units-for-statistics-nuts-.

[12] German NUTS3 regions are no functional units and may just represent a core city. NUTS2 regions in Germany are however rather large and do not compare well with the geographic entities used in the analysis for the US.

However, they included 96% of total employment, 95% of total establishments, and 96% of total new establishments in the USA in 2019 (Potter et al., 2023).

4. Persistence of regional entrepreneurship rates: International comparisons

In order to examine the persistence and change in regional rankings over time, we sought to use comparable data and methods across all three countries. The first set of comparisons uses regional self-employment data, which provide the longest time periods for assessing trends, as data on business start-ups are not available for the early years. Four time periods are distinguished. The first covers almost a century, starting around 1920. The second covers the half century up to the early 1970s. The third is the most recent half century, from 1970 to 2020. Finally, we look at the last three decades, from 1990 to 2020. Our measure of persistence is the simple Spearman rank correlation coefficient, where a value of one reflects perfect persistence, a correlation of minus one indicates a complete change in rank position, and a statistically insignificant correlation coefficient indicates no association over time.

Table 1: Correlation coefficients of regional self-employment rates in different time periods: England and Wales, Germany and the United States

Time period:	England and Wales	Germany			United States	
		All	West	East	Commuting zones	MSAs
Approximately 1920-2020	1921 - 2011 [n=59] *0.74***	1925 - 2019 [n=253] *0.085*	1925 - 2019 [n=200] *0.045*	1925 - 2019 [n=53] *0.013*	1920 - 2015/19 [n=722] *0.241***	1920 - 2015/19 [n=377] *0.386***
Approximately 1920-1970	1921 - 1971 [n=59] *0.802***	n.a.	1925 - 1970 [n=200] *0.104***	n.a.	1920 - 1970 [n=722] *0.132***	1920 - 1970 [n=377] *0.407***
Approximately 1970-2020	1971 - 2020 (NUTS3, n=145) *0.683*** 1971-2020 (NUTS2, n=35) *0.775***	n.a.	1970 - 2019 [n=200] *0.313***	n.a.	1970 - 2019 [n=722] *0.524***	1970 - 2019 [n=377] *0.537***
Approximately 1990-2020	1991-2020 (NUTS3, n=145) *0.756*** 1991 - 2020 (NUTS2, n=35) *0.869***	1993-2019 [n=253] *0.470***	1993 -2019 [n=200] *0.835***	1993 - 2019 [n=53] *0.477***	1990 - 2019 [n=722] *0.658***	1990 - 2019 [n=377] *0.721***

Notes: Spearman rank correlation coefficients; n = number of observations. ***: statistically significant at the 1% level. Data for England and Wales are from the Office for National Statistics and pertain to Census data for 1921, 1971, 2011 and the Annual Population Survey for the year 2020. Information for Germany in the year 1925 is from the occupation census taken in this year. Data for East Germany in the period of the socialist regime (1945-1990) and the first years after German re-unification (1991 and 1992) are not available. Data for West Germany in the year 1970 are from the population census taken in this year. The data for 1993 and 2019 are from the Establishment History Panel. Data for the United States are from the US Decennial Census and American Community Survey from the US Census Bureau.

Table 1 shows the correlations between the rankings of regional self-employment rates in each economy. Over the century, there is clear evidence of high statistical persistence in both England and Wales and the United States. For the US, similar results are found for both CZs and MSAs. The relatively weak correlations for Germany in several periods are probably due to the disruptions caused by the Second World War. The division of Germany between 1945 and 1990, when East Germany was under a communist regime that implemented massive anti-entrepreneurial policies, may explain the particularly low correlations for East Germany. German reunification in 1990 caused further disruptions that affected regional levels of entrepreneurial activity (Fritsch, Greve,

& Wyrwich, 2023). The rather low positive correlation coefficient for Germany over the whole century probably reflects the wartime experience and the subsequent division, thus calling into question its value as a comparator in this period. The highest correlation of self-employment rates over the whole period is found for England and Wales.

Comparing the persistence of regional rankings over time periods of different lengths, we expect that the longer the time period, the more likely it is that regions will change their league table position, and therefore that positive correlation coefficients will decrease over time. This is broadly supported for the case of England and Wales (Table 1). In Germany, the closest relationship between self-employment rates is found for West Germany over the period 1993-2019. However, for the United States, using MSAs, the correlation coefficient in the first half century (0.407) is not very different from that in the full century (0.386). In fact, for the US, the correlation coefficients for both MSAs and CZs increase for periods of comparable length over the observation period, suggesting that the persistence of regional entrepreneurship is more pronounced in more recent times.

Correlations for more recent periods show that, in contrast to the first half of the century, the US correlations reported for the CZ and MSA spatial units are very similar (0.524 and 0.537). The comparison with Germany shows striking differences between the West and the former East, which explains why Germany as a whole has a much lower correlation coefficient than either the United States or England and Wales. However, the correlation coefficients for West Germany are comparable to those for England and Wales. The correlation coefficients for US self-employment rates in the most recent period (roughly 1990-2020) are higher than those for the fifty years as a whole. This is consistent with the expectation that change is likely to be slow, implying that the shorter the period over which change is measured, the smaller the likely change.

Our second set of comparisons uses data on regional birth rates (Table 2). These are available for shorter periods, but are likely to reflect entrepreneurial dynamics much better than self-employment rates. We are also able to include an

analysis of regional start-up rates for Great Britain, thus extending the analysis from England and Wales alone.

Table 2: Correlation coefficients of start-up rates in different time periods: England and Wales, Great Britain, Germany and the United States

Time period	England and Wales	Great Britain	Germany			United States	
			All	West	East	Commuting zones	MSAs
Approximately 1980-2020	1981-2020 (NUTS2, n=35) *0.549**** 1981-2020 (NUTS3, n=145) *0.343****	1981-2020 (NUTS2, n=40) *0.616**** 1981-2020 (NUTS3, n=167) *0.388****	n.a.	1978-2019 [n=200] *0.446****	n.a.	1978-2019 [n=722] *0.729****	1978-2019 [n=377] *0.817****
Approximately 1990-2020	1989 to 2020 (NUTS2, n=35) *0.732**** 1989 to 2020 (NUTS3, n=145) *0.609****	1989 to 2020 (NUTS2, n=40) *0.743**** 1989 to 2020 (NUTS3, n=167) *0.623****	1993 to 2020 [n=258] *0.320****	1993 to 2020 [n=204] *0.600****	1993 to 2020 [n=53] *0.182*	1988/92 - 2015/19 [n=722] *0.806****	1988/92 - 2015/19 [n=377] *0.863****

Notes: Spearman rank correlation coefficients; n = number of observations; n.a. = not available. ***: statistically significant at the 1%-level. Data for England and Wales and Great Britain are from the Business Demography of the Office for National Statistics; VAT registration data are from the Department of Business, Enterprise and Regulatory Reform (BERR). Data for East and West Germany are from the Establishment History Panel. Data for the United States are from the Business Dynamics Statistics, US Decennial Census and American Community Survey from the US Census Bureau.

The measure of start-up activity in the United States is taken from the US Census Bureau's Business Dynamics Statistics (BDS) for establishment openings. It is very similar to the start-up measure used for the comparison with Germany. However, the start-up data for England and Wales (Fotopoulos & Storey, 2017; Potter & Fotopoulos, 2024) are at the enterprise level rather than at the establishment level. We choose two time periods for comparison. The period from 1980 to 2020 represents the longest period for which establishment data are available in all three countries. We also calculate the rank correlation from the early 1990s to 2020, which allows us to include East Germany in the comparisons.

The most striking finding is that for the United States, the start-up correlations for the period 1980-2020 are markedly higher for both CZs and MSAs (0.729 and 0.817 respectively) than for self-employment. This confirms that the spatial persistence of entrepreneurship is an important issue in the US. In addition, the US data on births show higher correlation coefficients than those for England and Wales, Great Britain and West Germany. As might be expected, the correlation coefficient for East Germany over the period 1993-2020 is relatively low, probably reflecting the turbulence of radical transformation in that part of the country (Fritsch, Greve, & Wyrwich, 2023). The values for West Germany and the other countries are comparable to those for the longer period 1980-2020.

Overall, the data provide clear evidence of regional persistence in entrepreneurship rates over time for different entrepreneurship metrics and geographical units in the three economies. All show positive and significant correlation coefficients, implying persistence over time. Furthermore, the metrics of births and self-employment paint a broadly similar picture. In particular, our comparison does not support the expectation that the greater flexibility and dynamism of the US economy is associated with greater changes in regional levels of entrepreneurship. Rather, it appears that regional entrepreneurial stability has been more pronounced in the United States in recent times than in the European economies examined.

5. What drives change in regional entrepreneurship performance?

Having shown that the long-term persistence of regional self-employment and new business formation rates in the two European economies (England and Wales and Germany) and the United States are at about the same level, we now turn to those factors that are related to change in the level of regional entrepreneurship. We first briefly describe the concrete geographic patterns and the types of regions experiencing change in the three countries (Section 5.1) and then perform multivariate analyses of the explanatory factors behind long-run changes in regional start-up rates (Section 5.2).

5.1 Geographic patterns of change

The three economies under inspection have rather different geographies. An important characteristic of the US economy is that human settlement and economic activities are considerably more geographically concentrated in large metropolitan areas than is the case in European countries, including Germany and England and Wales (Potter et al., 2023). In contrast, many European regions outside of the large agglomerations make important contributions to innovation and competitiveness. This holds particularly for Germany with its rather decentralized geographic structure where a larger city can be reached by car from nearly all locations within one or two hours (Fritsch & Wyrwich, 2021).[13]

The development of self-employment and new business formation in England and Wales is dominated by the growth of the London area and the strong increase of entrepreneurship there. The rise of entrepreneurial activity in London over the last decades was significantly shaped by the city's specialization in knowledge-intensive services, which have grown substantially with globalization and technological change. In contrast, many of the locations with decreasing levels of self-employment are traditional tourist towns on the coast that lost customers to locations abroad with the rise of cheap air travel (Fotopoulos & Storey, 2017). Another set of regions that have persistently weak entrepreneurship performance are the old-industrialized areas in Wales and in the North West, often traditional mining regions.

In Germany, the geographic pattern of the development of self-employment is strongly shaped by forty years of separation after World War II into a socialist East and a capitalist West. In West Germany, there were several accessible rural regions, with rising levels of new business formation that benefitted considerably from development spillovers that were generated by the growth of neighboring larger cities such as Hamburg, Munich, Cologne, and Duesseldorf. However, there are also more remote rural leapfrogging regions (for example, in the South of Baden-Wuerttemberg and in the North of Bavaria), where the increase of entrepreneurship cannot be explained by such growth

[13] Germany is also a particularly interesting case due to the many successful small and medium enterprises of the "Mittelstand" located in low-density areas that are fairly distant from the larger cities (Fritsch & Wyrwich, 2021).

spillovers. Some of the plunging regions like those in the Ruhr area[14] were and still are dominated by declining large-scale industries, but many of the locations with strongly falling levels of entrepreneurship are rural, low-density regions without significant manufacturing activity.

German reunification in 1990 triggered a boom in business start-ups in East Germany, which led to a sharp increase in self-employment in all regions. After a few years, the self-employment rate in the East exceeded the level in the West. It is quite remarkable that the recovery of the level of entrepreneurship in East Germany was particularly pronounced in those regions that had high levels of self-employment before the Second World War (for details see Fritsch, Greve, & Wyrwich, 2013). This geographical pattern clearly points to the historical roots of regional entrepreneurship, despite the disruptive changes of the context.

In the United States, self-employment and start-ups are highly concentrated in large cities. However, there are metropolitan areas and rural regions among those places that have moved considerably up in the entrepreneurship league tables. Plungers with regard to self-employment are disproportionately concentrated in states adjacent to the American heartland (Kansas, Missouri, Illinois, Kentucky, Arkansas, and Oklahoma). They are rarely large cities, tourist destinations, or innovation hubs. Generally, there seems to be a tendency for high-density regions on average to improve their position in the league table (Potter et al., 2023). In recent years, the largest MSAs were among the leapfrogging regions with regard to start-up rates, including New York, Chicago, and Los Angeles.

5.2 Drivers of long-run change – results of multivariate analyses

Multivariate analyses of changes in regional positions in the national league table are performed with regard to the start-up rate in England and Wales, West-Germany, and the United States, for the period 1980-2019 and 1981-2020

[14] The Ruhr area is a large agglomeration at the western border of Germany, north of the city of Cologne, which was dominated by mining and heavy industries from the late 19th century to the late 20th century. The region experienced considerable economic decline since the mid-1960s.

respectively.[15] The start-up rate is chosen here because, as explained above (Section 3.1), it can be regarded a considerably more appropriate indicator of entrepreneurial dynamics than the self-employment rate. To identify the drivers of change, we conducted multivariate analyses of changes in new business formation in all three economies based on models with similar sets of independent variables.[16] This similarity should allow us to judge the communalities and differences in the factors driving regional change.

The dependent variable that measures the dynamics in regional positions in the national league table with regard to the start-up rate is the Rank Mobility Index (RMI; see Fotopoulos and Storey, 2017). The Rank Mobility Index is defined as RMIr = (Rank t0,r – Rank t+1,r) / (n-1). The rank is the position of a region r in the national league table with respect to the start-up rate. The region with the highest start-up rate has the position '1'. The numerator counts the number of ranks changed between two periods of time t0 and t+1. The denominator is the highest possible rank change given by the number of ranks (n) minus 1. Therefore, all RMI values are in the interval [-1, +1]. All independent variables are for the base year 1980 or time-periods close by, so that they can be regarded as representing causal influences on the observed change.[17] The base year 1980 is chosen because this is about the first year where comparable start-up data are available for all three countries. Our method of analysis is standard OLS regression, which is appropriate given the form of the dependent variable, the RMI.

The choice of independent variables reflects the main factors suggested by theory and those that have been found statistically significant in analyses of change with no or only very short time lags between the dependent and the independent variables. As stated earlier (Section 2), it is unclear if the results

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[15] East Germany has to be omitted because it was until 1990 under socialist regime that followed massive anti-entrepreneurial policies. The analysis can not be performed for the whole of Great Britain but has to be limited to England and Wales because most of the independent variables are based on census data that is not available for Scotland.

[16] For the definition of the independent variables, descriptive statistics and correlations see the Appendix.

[17] Independent variables that represent changes over the analysis period are not included in order to circumvent causality problems in the interpretation of the results. For the definition of variables and descriptive statistics see the Appendix.

found in these analyses are also valid for explaining long-term change. Definition and measurement of the variables is highly comparable between the countries (see the Appendix for details). The human capital variable reflects the positive role of education and knowledge in new business formation (Sternberg, 2009; Parker, 2018) and population density accounts for the potential role of agglomeration economies (Bosma & Sternberg, 2014). Small firm presence stands for the relatively high propensity of small firm employees to become entrepreneurs that was found in many analyses (Parker, 2018).

Industry diversity measures the specialization of the local economy and the employment share in manufacturing represents the share of industries with a relatively high minimum efficient size that is unfavorable for starting a business. The regional wage level reflects the monetary benefits of paid employment and the share of foreign-born population can be seen as a measure of a tolerant and open atmosphere in a region. The share of population aged 55-64 is a measure for the age structure of the regional population and the regional rank position in the base year indicates the potential for an increase of new business formation by 'catching up' with more entrepreneurial regions. The expectation is that regions at the bottom of the ranking are able to realize a larger increase of new business formation as compared to regions at the top where the level of new business formation is already rather high.

Although the size of regions, the time periods, the measures of start-ups and the independent variables are not perfectly identical in the three countries, the basic results presented in Table 3 show a rather high level of correspondence in what are the main drivers of change.[18] We show results for the United States at the level of CZs and also for MSAs although these regions cover only a part of the country. Despite quite pronounced levels of correlation among a number of the independent variables (see the Appendix) the results of the models remain rather robust when single variables are excluded. An exception is the share of immigrant

[18] The spatial unit for the England and Wales analysis shown here is the NUTS3 level; see Appendix A for details. Analysis for Germany does not include the eastern part of the country, which was a separate socialist state (the German Democratic Republic) until 1990.

population in the models for England and Wales where we also present a model without this variable.

Table 3: Factors related to changing levels of regional new business formation 1980-2020 in three economies

	England and Wales 1981-2020		West Germany 1980-2019	USA 1978/82 – 2015/20	
				Commuting Zones	MSAs
Human capital	0.814 (0.821)	1.898** (0.831)	3.211*** (1.211)	1.640*** (0.249)	1.099*** (0.217)
Population density	0.03 (0.02)	0.09*** (0.01)	0.667*** (0.182)	0.000*** (0.000)	0.000** (0.000)
Small firm presence	-0.018 (0.053)	0.009 (0.059)	0.210** (0.106)	0.000 (0.004)	0.010 (0.006)
Industry diversity	2.413*** (0.690)	2.552*** (0.734)	-0.119 (0.068)	0.107 (0.199)	0.128 (0.207)
Share of manufacturing sector	0.369 (0.276)	0.523* (0.280)	-0.117 (0.070)	-0.211* (0.126)	0.249 (0.177)
Average wage level	0.085** (0.042)	0.100** (0.047)	-0.379 (0.368)	0.000 (0.000)	0.000 (0.000)
Share of immigrant population	1.841*** (0.685)	-	0.054** (0.022)	-0.712*** (0.249)	0.554*** (0.214)
Share of population aged 55-64	1.791 (1.392)	0.798 (1.360)	0. 039 (0.177)	3.237*** (0.561)	2.353*** (0.456)
Rank position in t-1	0.006*** (0.001)	0.005*** (0.001)	0.003*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Constant	-3.660*** (0.824)	-3.768*** (0.870)	0.455 (1.139)	-0.694*** (0.176)	-0.770*** (0.173)
$R^{2\ adj.}$	.607	.580	.406	.276	.281
Number of observations	145	145	202	722	377

Notes: Results of OLS regression with the Rank Mobility Index (RMI) of start-up rates as dependent variable. Robust standard errors in parentheses. ***: statistically significant at the 1%-level; **: statistically significant at the 5%-level; *: statistically significant at the 10%-level.

There are four variables that are significantly related to the long-run increase in regional levels of new business formation in the three countries. According to these results, there is a key positive role for regional human capital (measured by the share of employees with a tertiary degree) in driving the regional level of new business formation. In all three countries, there is also a significantly positive effect of population density that indicates a common tendency of increasing start-up activity in larger cities. A positive relationship

with increasing start-up levels is also found for the share of immigrant population in the base year, which may indicate a positive role of a tolerant and open atmosphere in a region. The strongly positive effect of the regional rank position in the base year indicates a development to the median. Accordingly, regions with a relatively low level of new business formation in the base year (= high rank number) are relatively likely to show an increase in start-up activity and a rise in the league table, while regions at the top of the league table (= low rank number) tend to decline.

Small firm presence in the regional economy[19] is only statistically significant for West Germany. In the other two economies, it is not statistically significant, suggesting that the positive effect of small firm employment on new business formation that is often found in the literature (Parker, 2018) is not relevant in these countries over a long period of about forty years. Industry diversity, measured by the Herfindahl-Hirschman index based on employment shares, is statistically significant for England and Wales but not for West Germany and the US. The regional employment share of the manufacturing sector is only weakly significant, with a negative sign for US CZs and a positive sign in one of the models for England and Wales. The average wage level in the base year is related to an improvement of the regional rank position only in England and Wales. The positive sign of the estimated coefficient for this variable suggests growing kevels of new business formation in regions with relatively high wages, which is the opposite of what one would expect based on the standard theory of occupational choice (Lucas, 1978; Parker, 2018). The result may, however, represent an effect of economic prosperity on new business formation. The age structure of the regional population as measured by the population share aged 55-64 is positively related to increasing levels of new business formation only in the USA but has no long-run effect in the two European countries.

In summary, we find a remarkably high level of correspondence in the variables that are related to an increase in start-up rates in all three economies.

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[19] For West Germany and the US the measure of small firm presence is average establishment size. For England and Wales the measure is the ratio of employers and managers in establishments with up to 24 employees over the corresponding figure for larger establishments. See the Appendix.

According to these results, rising levels of new business formation in the long run are driven by human capital, agglomeration advantages, and a regional atmosphere of tolerance and openness as indicated by the share of immigrant population. In all three countries we find a tendency of development towards the median: levels of new business formation tend to increase the most in regions that have relatively low start-up rates in the base year. The main differences of the factors that drive long-term changes in regional new business formation are for England and Wales, where industry diversity and average wage level in the base year play a role while these variables are insignificant in the other two countries. The employment share of the manufacturing sector is only weakly significant in models for England and Wales and the US with opposite signs, while the share of regional population aged 55-64 is only relevant in the US.

In summary, our analyses suggest that an important part of the forces behind the changing levels of new business formation in the three econ omies are quite comparable. Therefore, one may expect that the results may also be valid for other developed market economies. However, the close correlations between a large part of the independent variables (see the Appendix) clearly suggest that the may be a complex network of relationships among the different influences that deserves further investigation.

6. Summary and conclusions

6.1 Main results

The first main area of results presented in this paper concerns the comparison of the level of persistence and change of regional entrepreneurial activity over long periods of time in England and Wales, Germany, and the United States. We assessed the development of regional self-employment and start-up rates over time based on national rankings of regions, the entrepreneurial league tables. We found a pronounced tendency of regional persistence in all three countries and at comparable levels for both of our metrics of entrepreneurial activity. A key explanation for this persistence is regional entrepreneurial culture, particularly persistent values and attitudes of the regional population that can be assumed to be conducive to entrepreneurship (Fritsch & Wyrwich, 2023). The pronounced tendency of regional persistence means that changes are slow. Hence, regions

with high levels of entrepreneurship are likely to remain highly entrepreneurial and lagging regions in entrepreneurship may stay this way for many years. Given the relatively entrepreneurship-friendly culture in the United States and the relatively high level of flexibility of the US economy identified in the literature (Frydman, Khan, & Rapaczynski, 2011; GEM, 2024), the level of similarity in the persistence of regional entrepreneurial activities across the three economies is surprising.[20]

The second main area of results concerns the types of regions displaying positive or negative change in the regional rankings. Although the geography of persistence and change of regional entrepreneurship is quite different between the three countries (Section 5.1), our multivariate analyses identified a number of common variables that are related to an improved entrepreneurial performance in all three countries. These common factors are the qualification level of the regional workforce (measured by the share of people with a tertiary degree), population density, the share of immigrant population indicating a region's atmosphere of tolerance and openness, and the region's rank position in the base year. A region's position in the national entrepreneurial league table in the base year indicates a tendency of low entrepreneurial regions to improve more than those who are already at the top of the ranking ('regression to the median').

The age structure of the regional population as indicated by the share of population aged 55-64 is only statistically significant for the USA. Variables such as average establishment size, industry diversity, and the share of the manufacturing sector are insignificant or produce partly contradictory results. Quite interestingly, the regional wage level that is in the center of the theory of occupational choice is only statistically significant for England and Wales and with a negative sign that may represent an effect of economic prosperity on new business formation. We conclude from these analyses that workforce qualification and regional openness are key factors for policies that aim at increasing the long-term entrepreneurial performance of regions.

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[20] The more pronounced entrepreneurship-friendly culture in the United States is related to a relatively high level of entrepreneurial activity. According to the GEM 2023/24 Global Report, the Total Early-Stage Entrepreneurial Activity (TEA) amounted to 14.8% in the United States, 11.8% in the United Kingdom and 7.7% in Germany.

6.2 Limitations and future research directions

Our findings make a powerful case for conducting international comparisons of the factors that drive regional entrepreneurial activity in different countries. An important limitation of our analyses lies in the fact that the three countries that we observe are all well-established and relatively highly developed economies. However, we do not know whether our results can be generalized to other countries such as low developed and highly agrarian societies or emerging economies. This calls for conducting similar analyses for such types of countries.

Although we have added considerably to the knowledge about the factors that determine long-term changes in regional levels of entrepreneurship, we did not analyze the forces that are responsible for persistence. Several authors (see, e.g., Fritsch & Wyrwich, 2023) hypothesize that a main explanation of persistence at high and medium levels of entrepreneurship is the prevalence of a positive entrepreneurial culture that is characterized by widespread entrepreneurial values and attitudes among the local population such as individualism, autonomy, and self-realization. However, little is known about the values and attitudes of the population in countries and regions with a persistently low level of entrepreneurial activity. A common explanation for persistently low regional levels of entrepreneurship is that dominance of large-scale industries created long-lasting non-entrepreneurial attitudes among the local population with norms that are out of line with core entrepreneurial values. The employment legacy of large firms and the norms it created can also be long-lasting and often remains even when the large enterprises no longer exist (Glaeser, Kerr, & Kerr, 2015; Obschonka et al., 2018).[21] Clearly, more research is needed to better understand the nature and the effect of 'soft' factors like cultures, norms and values of the regional population. A key question that is largely unsolved and deserves further exploration is how such informal institutions persist and in what ways they are transferred across generations

Given that a main objective of policy is to initiate change, understanding the forces that are responsible for the change of regional levels of entrepreneurial

[21] The link between regional dominance of large-scale industries and entrepreneurship has begun to be investigated specifically for coal mining areas in England and in the United States (Stuetzer et al., 2016; Gherhes et al., 2020; Beresford, 2013).

activity is probably even more important than knowing the reasons for its persistence. Theory suggests several structural factors that may be in play. Here our analysis is pointing to the importance of human capital, agglomeration, migration, seniors in the population, and the previous entrepreneurship levels. More needs to be uncovered about the relevant structural factors in different contexts. Although a few case studies of regional success stories provide anecdotal evidence for such changes, a systematic analysis of factors driving leapfrogging and plunging regions is still missing. Generally, we know little about the drivers of leapfroggers and our knowledge about plungers is even more limited.

Although we found considerable similarity of basic patterns of regional persistence and change among the three economies in our comparison, we still know little about the effect of the national context such as formal institutions (rules), structures, and histories. There are quite significant differences between the three economies with respect to the geography of entrepreneurship, which are related to the spatial distribution of general economic activity and the settlement structure. While economic activity in the United States is heavily concentrated in urban areas, the geographic concentration of entrepreneurship is much less pronounced in European countries, where there are also many examples of low-density regions with highly effective and economically successful entrepreneurial activities (Fritsch & Wyrwich, 2021). This contrast merits further investigation, with a particularly interesting question being whether policy interventions to enhance the entrepreneurial performance of low-density rural areas in the United States could be an effective means of reducing regional inequality and increasing economic and social welfare there.

Another issue that research has to address is the nature of the entrepreneurship to be targeted by policy. The two entrepreneurship metrics used in this study, namely self-employment rate and start-up rate, did not distinguish between different types of entrepreneurship such as innovative and knowledge-intensive entrepreneurial activity, which could be assumed to be of particular importance for economic impact. A main reason for not distinguishing different types of entrepreneurship was non-availability of data for a long-term comparison of these entrepreneurship types. However, shorter term trend analysis can still be

valuable for these additional measures. For example, entrepreneurship measures could be built that account for the innovative content of a firm rather than general start-up or self-employment rates. An increasing strand of research suggests that there is a need to consider the quality of entrepreneurship, i.e., productive entrepreneurship with growth potential (Morris et al., 2015; Guzman & Stern, 2020; Andrews et al., 2022; Wurth, Stam, & Spigel, 2021).

Finally, a major question for policy aimed at levelling up regional entrepreneurship activity is how to identify appropriate policy levers. Comparing actors and institutions in a region with a position at the lower end of the league table with those in 'best practice' regions that are consistently at the very top may not be very helpful for several reasons. One reason is that there is a wide set of institutions and resources that are said to stimulate entrepreneurial success and there is little theoretical guidance or empirical evidence suggesting which ones to act on in priority in places where entrepreneurial activity is relatively weak.

A solution to this problem could be to analyze the development of those regions that considerably improved their position in the league table, i.e. the leapfroggers. A main task for such an analysis would be to better understand the combination of factors that brought about such an improvement, particularly the role of policy. An example of potential policy learning comes from our finding that upward moves in the regional entrepreneurship league table are related with with increased human capital. This applies to all three economies in our sample (see Section 5.2) and is consistent with other research linking the regional knowledge base in entrepreneurship with innovative start-ups (Acs et al., 2009; Qian, 2017). Therefore, policies that seek to strengthen the regional knowledge base may be one of the key elements of policy positions that aim to develop leapfroggers. However, lessons may also be learned from the plungers.

6.3 Policy implications

The findings we present on persistence and change of regional entrepreneurship levels in the three countries suggest several policy implications. A first obvious conclusion is that national and regional policy makers must be aware of the stark variations entrepreneurship rates across regions, which frequently persist over very long periods of time. This persistence implies that regional levels of

entrepreneurship may adjust only rather slowly to changes in framework conditions (e.g., a decline of a dominant large-scale industry). The fact that many regions lag in entrepreneurship performance over long periods implies the danger of foregone economic potential and reduced social welfare regionally and nationally. This is a strong argument for an important role of entrepreneurship policy measures for levelling up at the regional level.

A second implication is that entrepreneurship policy should account for the specificities of regions within countries, particularly their different development trajectories (marked improvement, marked decline, continuity at the top, bottom or middle of the regional rankings). Substantial diversity of regional entrepreneurship development trajectories demonstrates that a single 'one size fits all' policy framework to improving entrepreneurship activity is unlikely to be ideal. If the objective of the policy is to raise entrepreneurship nationally, then entrepreneurship policies must take into account various region-specific causes of leapfrogging and plunging – to reinforce improvements where they are occurring, to limit decline and to spread positive actions to other regions with similar opportunities. Hence, policy should identify the main constraining and enabling factors and relevant levers for policy action in different types of development trajectory. Because regional actors are usually more familiar with the conditions in their own region than those of the central state, regional actors should be assigned a significant role in decision making about the appropriate policy interventions.

A third important policy conclusion is that regional entrepreneurship policy should not neglect the 'soft' factors that are important for the emergence and success of new businesses, such as the values, norms, and behaviors of the local population, which can be summarized under the notion of culture. An important 'soft' factor could also be a region-specific collective memory of the past that may be dormant for a long period of time but could be activated by certain events (see Olick et al., 2011; Laikhuram, 2023). Because it is quite likely that regions at different positions in the league table (e.g., in the upper half or at the bottom) are characterized by different cultural values, norms, and attitudes of the regional population, the types of policy measures that could be employed to

improve performance or arrest decline may also be rather different across these types of regions.

Fourth, the strong persistence in regional entrepreneurship rankings over time found in various countries implies that policies aimed at increasing the level of regional entrepreneurship will often require considerable periods of time before significant and sustainable improvements are observed. This is consistent with the recognition that, in general, informal institutions change only slowly and over long periods of time (North, 1994; Williamson, 2000). This may include many of the factors that promote and hinder entrepreneurship in a region, such as entrepreneurship culture.

6.4 Final remark

This article compared the long-term persistence and change of regional entrepreneurship in the United States with two European economies, England and Wales, and Germany. A main objective was to compare the levels of persistence and change of regional entrepreneurial activity between countries and to identify and compare factors that are related to increasing regional entrepreneurship. Although the analyses revealed some considerable correspondence between the three countries, further research should dig deeper into similarities and differences and try to identify the main links between the relevant factors. Since the three countries in our sample were all developed market economies, we are unable to say to what extent our results also apply to other types of country, particularly to less developed ones.

Our knowledge of persistence and change of regional entrepreneurship is still in an infant stage and much more empirical analysis for more and different types of countries is desirable to fill this research gap. The key theme is to better understand both the persistence and the change in regional entrepreneurial activity. Although persistence draws attention to historical roots and the role of ‘soft’ factors such as informal regional institutions, the change in regional levels of entrepreneurial activity can provide important opportunities to learn about the appropriate levers of a regional entrepreneurial policy.

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Appendix A: Descriptive statistics and additional analyses for England and Wales 1981-2020

Table A1: Definition of variables

Variable	*Definition*
Human capital	Regional share of employees with a tertiary degree (a)
Population density	Resident population (thousands) per km^2 (a)
Small firm presence	The ratio of employers and managers in establishments with up to 24 employees over the corresponding figure for larger establishments (a)
Industry diversity	Theil index of industry diversity of manufacturing employment (see Potter et al., 2023, and Potter & Fotopoulos, 2024) (b)
Share of manufacturing sector	Share of manufacturing employment in total employment (a)
Average wage level	Average annual wage per full-time employee (British Pounds) (b)
Share of immigrant population 1981	The share of non-U.K. born over resident population (a)
Share of population aged 50-64 in 1981	Share of resident population aged 50-64 over total population (a)
Rank position of regional start-up rate 1981	Position in the ranking of start-up rates 1981. Highest rate has the position 1 (c)
Notes: All variables except population share of migrants, share of population aged 55-64 and start-up rates are for the year 1980. (a) Office for National Statistics (ONS) Census data; (b) Cambridge Econometrics Sub-Regional Data; (c) VAT registration and ONS business demography data..	

Table A2: Descriptive statistics

Variable	*Mean*	*Median*	*Minimum*	*Maximum*	*Standard deviation*
RMI 1981-2020	0.000	0.021	-0.910	0.757	0.334
Human capital	0.129	0.123	0.054	0.242	0.033
Population density	1.605	0.643	0.212	9.158	2.016
Small firm presence	1.837	1.748	1.007	3.486	0.459
Industry diversity	0.848	0.852	0.757	0.898	0.027
Share of manufacturing sector	0.270	0.265	0.088	0.488	0.084
Average wage level	4.922	4.825	3.854	6.971	0.486
Share of immigrant population	0.069	0.045	0.012	0.372	0.070
Share of population aged 50-64	0.237	0.237	0.054	0.242	0.033
Rank position in t0	0.129	73	1	145	20.157

Table A3: Correlations between variables

	Variable	1	2	3	4	5	6	7	8	9
1	RMI 1981-2020	1								
2	Human capital	-.070	1							
3	Population density	.378***	.074	1						
4	Small firm presence	-.474***	-.040	-.055	1					
5	Industry diversity	-.008	.160*	-.293***	-.148*	1				
6	Share of manufacturing sector	.215***	-.489***	-.179**	-.363***	-.013	1			
7	Average wage level	.161*	-.083	-.242***	-.381***	.089	.258***	1		
8	Share of immigrant population	.275***	.354***	.821***	.027	-.152*	-.245***	-.176**	1	
9	Share of population aged 50-64	-.133	-.024	.094	.272***	-.053	-.209**	-.280***	-.033	1
10	Rank position in t0	.573***	-.383***	-.082	-.497***	-.147*	.380***	.190**	-.321***	-.219***

Notes: ***: statistically significant at the 1%-level; **: statistically significant at the 5%-level; *: statistically significant at the 10%-level

Table A4a: Factors related to changing levels of regional new business formation 1981-2020 in England and Wales

	(1)	(2)	(3)
Human capital	0.814 (0.821)	1.898** (0.831)	0.229 (0.740)
Population density	0.00003 (0.02)	0.00009*** (0.01)	
Small firm presence	-0.018 (0.053)	0.009 (0.059)	-0.048 (0.053)
Industry diversity	2.413*** (0.690)	2.552*** (0.734)	2.113*** (0.643)
Share of manufacturing sector	0.369 (0.276)	0.523* (0.280)	0.246 (0.261)
Average wage level	0.085** (0.042)	0.100** (0.047)	0.068 (0.042)
Share of immigrant population	1.841*** (0.685)		2.726*** (0.351)
Share of population aged 50-64	1.791 (1.392)	0.798 (1.360)	2.278* (1.333)
Rank position in t0	0.006*** (0.001)	0.005*** (0.001)	0.006*** (0.001)
Constant	-3.660*** (0.824)	-3.768*** (0.870)	-3.289*** (0.787)
Number of observations	145	145	145

$R^{2\ adj.}$	0.607	0.580	0.601
Notes: Robust standard errors in parentheses. ***: statistically significant at the 1%-level; **: statistically significant at the 5%-level; *: statistically significant at the 1%-level.			

In England and Wales, there are 145 NUTS3 regions, officially termed International Territorial Level 3 regions, and 172 Travel to Work Areas (TTWAs). Unfortunately, early VAT registration and business demography data were not available for TTWAs. The size of TTWAs in England and Wales is generally much closer to that of NUTS3 regions, with the notable exception of London. London constitutes a single TTWA but contains 21 NUTS3 subregions. Therefore, an additional analysis was carried out on NUTS3 units, aggregating London's subregions. The results of this analysis are presented in Table 5 below.

Table A4b: Factors related to changing levels of regional new business formation 1981-2020 in England and Wales: aggregation of London subregions

	(1)	(2)	(3)
Human capital	1.352 (1.073)	2.579** (1.165)	0.584 (0.958)
Population density	0.04 (0.03)	0.10*** (0.02)	
Small firm presence	0.011 (0.063)	0.015 (0.064)	-0.011 (0.061)
Industry diversity	2.546*** (0.925)	2.676*** (1.002)	2.423*** (0.881)
Share of manufacturing sector	0.338 (0.325)	0.749** (0.322)	0.307 (0.325)
Average wage level	0.091* (0.051)	0.123** (0.058)	0.082 (0.051)
Share of immigrant population	3.423*** (0.998)		4.238*** (0.737)
Share of population aged 50-64	-0.787 (1.561)	-1.426 (1.616)	-0.011 (1.446)
Rank position in t0	0.006*** (0.001)	0.005*** (0.001)	0.006*** (0.001)
Constant	-3.318*** (1.073)	-3.540*** (1.140)	-3.213*** (1.038)
Number of observations	125	125	125
$R^{2\ adj.}$	0.575	0.527	0.571
Notes: Robust standard errors in parentheses. ***: statistically significant at the 1%-level; **: statistically significant at the 5%-level; *: statistically significant at the 1%-level.			

Appendix B: Descriptive statistics and additional analyses for West Germany

Table B1: Definition of variables

Variable	*Definition*
Human capital	Regional share of employees with a tertiary degree (a)
Population density	Resident population (thousands) per km squared (b)
Small firm presence	Number of employees per establishment (a)
Industry diversity	Theil index of industry diversity of manufacturing employment (see Potter et al., 2023) (a)
Share of manufacturing sector	Share of manufacturing employment in total employment (a)
Average wage level	Mean daily wage per full-time employee (German Mark) (a)
Share of immigrant population 1970	The share of non-born over resident population (a)
Share of population aged 50-64 in 1970	Share of resident population aged 50-64 over total population (a)
Rank position of regional start-up rate 1980	Position in the ranking of start-up rates 1980. Highest rate has the position 1 (c)
Notes: Geographic units are the 203 Labour Market Areas of West Germany. The data for population share of migrants and share of population aged 55-64 are for the year 1970; all other variables are for the year 1980. *Data source*: (a) Employment Statistics; (b) Federal Statistical Office.	

Table B2: Descriptive statistics

Variable	*Mean*	*Median*	*Minimum*	*Maximum*	*Standard deviation*
RMI 1980-2019	0,000	0.010	-0.836	0.692	0.266
Human capital	0.027	0.024	0.009	0.093	0.014
Population density	294.3	170.4	55.70	2 492.1	364.9
Small firm presence	0.076	0.074	0.029	0.154	0.019
Industry diversity	0.198	0.188	0.099	0.452	0.053
Share of manufacturing sector	0.404	0.403	0.101	0.680	0.111
Average wage level	41.291	41.985	34.234	53.888	3.003
Share of immigrant population 1970	0.030	0.023	0.0002	0.110	0.022
Share of population aged 50-64 1970	0.059	0.059	0.044	0.072	0.005
Rank position in t0	102	102	1	203	58.745

Table B3: Correlations between variables

	Variable	1	2	3	4	5	6	7	8	9
1	RMI 1980-2019	1								
2	Human capital	.275***	1							
3	Population density	.284***	.607***	1						
4	Small firm presence	-.196***	-.426***	-.335***	1					
5	Industry diversity	-.026	-.117	-.197***	-.2620***	1				
6	Share of manufacturing sector	-0.046	.091	-.180*	-.1802	.459***	1			
7	Average wage level	.231***	.680***	.505***	-.5909***	.213**	.170	1		
8	Share of immigrant population	.154*	.510***	.378***	-0.3698***	.083	.374***	.579***	1	
9	Share of population aged 50-64	.167*	.065	.144*	-.0042	-.060	-.204**	.051	-.016	1
10	Rank position in t0	.455***	.140	.218**	.2880***	-.237**	-.215**	.026	.268***	-.008

Notes: ***: statistically significant at the 1%-level; **: statistically significant at the 5%-level; *: statistically significant at the 10%-level

Appendix C: Analysis of drivers of change in regional new business formation 1980-2019 in USA

Table C1: Definition of variables

Variable	*Definition*
Human capital	Share of BA degree among population 25+ (a)
Population density	Resident population by mile squared (a)
Small firm presence	Number of employees per establishment (b)
Industry diversity	Theil index of industry diversity of manufacturing employment (see Potter et al., 2023) (a)
Share of manufacturing sector	Share of manufacturing employment in total employment (a)
Average wage level	Average annual wage per employee (part- and full-time) (a)
Share of immigrant population	Share of foreign-born population (a)
Share of population aged 55-64	Share of resident population aged 50-64 over total population (a)
Rank position in t-1	Rank position of regional start-up rate 1978-82 average. Highest rate has the position 1. (c)
Notes: All data except rank position of start-up rates are for the year 1980. *Data sources:* (a) Decennial Census; (b) County Business Patterns; (c) Business Dynamics Statistics	

Table C2a: Descriptive statistics (Commuting Zones)

Variable	*Mean*	*Median*	*Minimum*	*Maximum*	*Standard deviation*
Rank Mobility Index 1980-2019	0.000	0.006	-0.755	0.800	0.213
Human capital	0.126	0.118	0.049	0.392	0.044
Population density	85.024	36.776	0.354	4 915.422	233.619
Average establishment size	12.427	12.322	4.324	28.782	3.976
Industry diversity	0.586	0.593	0.360	0.740	0.051
Share of manufacturing sector	0.185	0.175	0.004	0.541	0.110
Average wage level	11 391.160	11 253.420	6 321.888	18 723.590	20 52.963
Share of immigrant population	0.024	0.016	0.002	0.371	0.031
Share of population aged 55-64	0.098	0.097	0.047	0.160	0.015
Rank position in t0	361.5	361.5	1	722	208.568

Table C2b: Descriptive statistics (MSAs)

Variable	*Mean*	*Median*	*Minimum*	*Maximum*	*Standard deviation*
Rank Mobility Index 1980-2019	0.000	-0.011	-0.540	0.652	0.175
Human capital	0.156	0.141	0.070	0.366	0.053
Population density	203.488	132.676	4.029	2033.857	251.900
Average establishment size	15.502	15.579	6.228	24.966	3.506
Industry diversity	0.546	0.553	0.326	0.666	0.053
Share of manufacturing sector	0.213	0.200	0.043	0.542	0.097
Average wage level	12559.570	12477.640	8535.248	18600.510	1870.533
Share of immigrant population	0.038	0.026	0.004	0.258	0.038
Share of population aged 55-64	0.092	0.091	0.043	0.195	0.018
Rank position in t0	189	189	1	377	108.975

Table C3a: Correlations between variables (Commuting Zones)

	Variable	1	2	3	4	5	6	7	8	9
1	RMI 1980-2019	1								
2	Human capital	.167***	1							
3	Population density	.276***	0.213***	1						
4	Average establishment size	.223***	0.125***	0.357***	1					
5	Industry diversity	-.140***	-0.653***	-0.287***	-0.190***	1				
6	Share of manufacturing sector	.170***	-0.255***	0.173***	0.727***	0.233***	1			
7	Average wage level	.089**	0.258***	0.337***	0.588***	-0.223***	0.223***	1		
8	Share of immigrant population	-0,048	0.281***	0.362***	0.060	-0.338***	-0.147***	0.170***	1	
9	Share of population aged 55-64	.065*	-0.408***	0.019	-0.262***	0.167***	0.038	-0.254***	-0.122***	1
10	Rank position in t-1	.368***	-0.195***	0.197***	0.591***	0.114***	0.653***	0.143***	-0.169***	-0.098***

Notes: ***: statistically significant at the 1%-level; **: statistically significant at the 5%-level; *: statistically significant at the 1%-level.

Table C3b: Correlations between variables (MSAs)

	Variable	1	2	3	4	5	6	7	8	9
1	RMI 1980-2019	1								
2	Human capital	.198***	1							
3	Population density	.388***	0.120**	1						
4	Average establishment size	.350***	-0.024	0.400***	1					
5	Industry diversity	-.088*	-0.566***	-0.101*	0.072	1				
6	Share of manufacturing sector	.234***	-0.342***	0.280***	0.728***	0.455***	1			
7	Average wage level	.305***	0.035	0.425***	0.603***	0.053	0.368***	1		
8	Share of immigrant population	.141***	0.172***	0.352***	-0.190***	-0.187***	-0.275***	-0.001	1	
9	Share of population aged 55-64	.146***	-0.413***	0.189***	-0.012	0.071	0.111**	0.048	0.0137	1
10	Rank position in t-1	.303***	-0.138***	0.387***	0.895***	0.142***	0.761***	0.531***	-0.272***	0.068

Notes: ***: statistically significant at the 1%-level; **: statistically significant at the 5%-level; *: statistically significant at the 10%-level.