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Entrepreneurial activity across European cities

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Abstract

This paper investigates variation in entrepreneurial activity across European cities. More specifically, by utilizing city indicators for 31 European countries, based on European Urban Audit Surveys data, we undertake a panel data study of how various demographic, socio-economic and geographical characteristics of European cities and institutional country-level settings affect entrepreneurship, as proxied by the rate of self-employment, in 377 European cities during the period of 1989-2006. While controlling for various spatial effects across cities we find that the rate of self-employment is largely explained by city size, socio-economic characteristics, such as the level of education and city inhabitants' wellbeing, and size of the local government. We also find that institutional quality, including a property right system and democratic institutions, significantly affect entrepreneurship. Our findings fail to support a hypothesis of the importance of capital city incubators for entrepreneurial activity. Finally, we find that city location, namely latitude and longitude, emerge as significant predictors of entrepreneurship. Surprisingly, our city location results suggest that cities in the south of Europe are more entrepreneurial than in the north. Overall, along with the positive effect of lower education and the insignificant effect of city typology associated with knowledge hub, these results may suggest that self-employment seems to capture rather low-value added entrepreneurship in the context of European cities. However, these effects vary significantly across European countries holding true more for East European cities as opposed to West European ones.

Keywords: Entrepreneurship, urbanisation, Institutions, European Urban Audit Surveys.

JEL Codes: L26 R10 R30 O31

1. Introduction

The importance of entrepreneurship as a driving force in economic development has been widely recognised. Entrepreneurs substantially contribute to job creation, generate and disseminate innovative ideas, increase competition and enhance economic efficiency and productivity (Acs and Armington 2004; Cohen and Klepper 1992; Audretsch and Thurik 2004). The issues of innovation, efficiency and productivity became central in the discussion of the Lisbon Agenda of the European Union which defined a growth pattern for Europe to be based on knowledge, technology and innovation. This was linked to the concern that European countries were lagging behind the US in technological terms and to catch-up they would need higher productivity, more innovation, and more flexible and skilled labour markets. The 2003 Green Paper outlines the need and the strategy of building up an entrepreneurial society (European Commission 2003).

In the identification of entrepreneurial activity as an important driver of economic growth, a growing number of empirical studies have focused on explaining variation in entrepreneurial activity at various spatial levels with the majority of them taking either a cross-country perspective or looking at the inter-regional differences. More recent studies on

entrepreneurship have shifted their focus to examining cross-city variation in entrepreneurship (Rosenthal and Strange, 2003, 2008; Glaeser and Saiz, 2003; Glaeser 2007; Glaeser et. al 2010). Overall, however, given limited city-level data availability, scarce work has been undertaken so far on cross-city entrepreneurship within the spatially oriented entrepreneurship research, and more specifically in the context of Europe. Some scholars, notably, Bosma and Schutjens (2007, 2009) have attempted to bridge this spatial level gap, focusing on studying entrepreneurial activity in European regions. More specifically, Bosma and Schutjens (2009) explore the determinants of entrepreneurial activity at the regional level in Europe, using the Global Entrepreneurship Monitor (GEM) data[1]. Based on the same dataset, they also draw important distinctions between low and high ambition entrepreneurship, finding little regional variation in the latter as compared to the former (Bosma and Schutjens 2007). Given the fact that not all entrepreneurial activities equally contribute to economic growth, distinguishing between low and high ambition entrepreneurs has important policy implications, in particular in the light of the Lisbon Agenda aimed at targeting economic growth and productivity improvements via raising regional entrepreneurship levels.

Despite the growing number of spatial-oriented studies of entrepreneurial activity in Europe, to our best knowledge no empirical studies have yet been undertaken on entrepreneurship in European cities and our paper aims to fill this gap.

This paper investigates variation in entrepreneurial activity, proxied by the rate of self-employment, across European cities. More specifically, by harmonizing city indicators for 31 European countries, based on Urban Audit Survey data, we undertake a panel data study of how various demographic, socio-economic, ethnic and geographical characteristics of European cities and institutional country-level settings affect entrepreneurship in 377 European cities during the period of 1989-2006[2].

Earlier studies show that significant heterogeneity in entrepreneurship across cities can largely be explained by industrial differences, age and education (Glaeser 2007). Existing theories also suggest the importance of cultural differences for explaining spatial heterogeneity in entrepreneurship, though there is less empirical support for it at the city level (ibid). The heterogeneity of entrepreneurship across space can largely be explained by the urban incubator hypothesis, implying that a large market potential in terms of customers and suppliers, high knowledge intensity, government expenditure and better institutions are expected to benefit potential entrepreneurs (Tödtling and Wanzenböck 2003, Glaeser 2007).

Less empirical research exists on the effects of various institutional arrangements on entrepreneurship across city space. A well-functioning business environment is likely to provide incentives to entrepreneurs in pursuing market opportunities (North 1994; Baumol 1990, 1993). Merging our city level data with country level data allows us to look at the effects of cross-country institutional arrangements on exploring heterogeneity in entrepreneurial rates across cities. More specifically we hypothesize that a strong property rights system and democratic political institutions will emerge as strong predictors of entrepreneurship.

Amongst others the comparative advantage of our research lies in adding city geographical controls, including location proxied by latitude and longitude, presence of sea, mountains, border and the differences between a capital and regional cities.

Our study also explores regional variation in entrepreneurial activity in Western European cities as compared to Eastern European cities, drawing some important conclusions for the possible patterns of entrepreneurship emerging across Europe with further implications to be drawn for the potential role of entrepreneurship in regional growth patterns.

[1] They largely use the NUTS1 spatial level data.

[2] Within this time span the reference years for data collection were 1991, 1996, 2001 and 2004.

The paper proceeds as follows. The next section discusses theoretical issues pertaining to the determinants of entrepreneurial entry. Section 3 describes the data and the methodology. Empirical results follow in Section 4. Section 5 concludes.

2. Determinants of Entrepreneurial Entry: Theoretical Considerations

In developed Western economies self-employment is generally viewed as a desired outcome eventually resulting in business growth and success (Mandelman and Montes-Rojas 2009). To the extent that the self-employed are regarded as highly skilled talented individuals who abandon their employment to realize their innovative ideas to introduce new products or make substantial improvements to production processes the justification for the use of self-employment as a right proxy for productive entrepreneurship can be seen (for further discussion of using self-employment as a working definition of entrepreneurship see section 3.3). As Mandelman and Montes-Rojas (2009) put it further,

> The self-employed sector is presumed to be dynamic and populated by 'superstars' who obtain outstanding profits and social influences'...and 'are thought to bring vitality to the economy and decisively contribute to economic expansion' (Mandelman and Montes-Rojas 2009:1914)[3].

At the same time according to the dualistic view advocated by Harris and Todaro (1970) the self-employment sector may be seen as stagnant and unproductive. They distinguish between urban employment in the highly productive modern sector, and a stagnant and unproductive informal sector which is largely comprised of the urban unemployed and rural migrants. Here, self-employment may be associated with 'disguised unemployment' (Mandelman and Montes-Rojas 2009:1914). Based on these theoretical considerations, Madelman and Montes-Rojas (2009) test both approaches in studying transition patterns from employment and unemployment in the context of developing countries, focusing on the case study of Argentina. They find clear sector segmentation with own-account workers accounting for the majority of self-employed in their sample resembling characteristics associated with dualist approach, while self-employed with employees emerge to be associated with more productive entrepreneurship conforming to the industrialised countries view.

Departing from this in the present work we aim to shed some light on the type of entrepreneurial activity as proxied by the self-employment rate by looking at its typical determinants. More specifically, we test the importance of higher and lower education for entrepreneurial entry, expecting the former to be associated with more productive entrepreneurship and the latter - with less-ambition entrepreneurship. Additionally, the role of city type 'knowledge hub' and various geographical characteristics of cities help us to further clarify possible entrepreneurial patterns emerging in Europe.

Empirical studies on entrepreneurship and city show that heterogeneity in entrepreneurship across cities can largely be explained by the following determinants: (1) various returns to entrepreneurship across space (Baumol 1990, 1993); (2) differential supply of inputs, including finance availability to entrepreneurs. This also includes entrepreneurial human capital to reflect the quality of labour force and labour market characteristics (Doms et al. 2010, Glaeser et al. 2010); (3) circulation of technological innovations and ideas (Chinitz 1961) and city as incubator of entrepreneurship, making circulate more entrepreneurial ideas, connecting pro-active people and altogether contributing to the strength of the city and economic growth (Porter 1990); (4) cultural

[3] Their view originates from Rosen's (1981) 'superstar' theory. For the survey of the literature also see Blanchflower (2004).

differences, business environment, criminality rates, state expenditure and so forth (Tödtling and Wanzenböck 2003, Glaeser 2007, Glaeser et al. 2010, Rosenthal and Ross 2010); (5) agglomeration effects (Duranton and Puga 2004; Rosenthal and Strange 2003).

Based on this empirical evidence, we expect the size of the market, labour market characteristics, level of human capital development, the size of local government, finance availability, the rate of crime, city inhabitants' wellbeing, agglomeration effects, institutional settings and geographic characteristics of cities all to play important role in determining entrepreneurial activity across European cities.

3. Data and Methodology

3.1 Sample Description

In our study we utilize the data collected through the European Urban Audit Surveys (UAS)[4] in the period of 1989-2006. The sample covers 377 European cities from 31 European countries[5]. These cities, though varying in size[6], are generally considered to be the most appropriate spatial units for modelling and analysis purposes (Fingleton 2001, Fisher 2009). The sample data cover cities located in Western Europe as well as in Eastern Europe. Western Europe is represented by 257 cities covering Austria (5 cities), Belgium (7 cities), Cyprus (1 city) Denmark (5 cities), Finland (6 cities), France (36 cities), Germany (40 cities), Greece (10 cities), Ireland (5 cities), Italy (32 cities), Luxembourg (1 city), Malta (2 cities), the Netherlands (23 cities), Norway (6 cities), Portugal (10 cities), Spain (25 cities), Sweden (8 regions), Switzerland (8 cities) and the United Kingdom (31 cities). *Eastern Europe* is covered by 94 cities including the Baltic states such as Lithuania (3 cities), Latvia (2 cities), Estonia (2 cities), Bulgaria (7 cities), the Czech Republic (14 cities), Hungary (9 cities), Poland (28 cities), Slovakia (8 cities), Romania (14 cities), Slovenia (2 cities), Croatia (5 cities). The sample data also include Turkey (26 cities).

The European Urban Audit dataset contains urban audit indicators across various domains specific to our study. These include economic and social aspects, education, demographic characteristics of cities and other indicators used to test our main hypotheses pertaining to entrepreneurial entry at city level. We merge these statistics with institutional country-level data and geographical characteristics of cities to shed some light on the effect of institutional settings on entrepreneurial activity and some spatial effects of cities. The institutional indicators are derived from the Polity IV data[7]. These indicators as well as geographical controls are discussed further below.

3.2 Addressing the Problem of Missing Values: Multiple Imputation Technique

One of the limitations of our dataset is that there are a number of missing values. We address this problem by using the multiple imputation technique which originated in early 1970, but has been increasingly used in recent empirical regional research (Blien et al. 2009; Penn 2009). The core of multiple imputation is that missing values are replaced with multiple sets of simulated values to complete the data. Here, in order to impute data we use a chained equation to be able to use a predictive mean-matching method which cannot be applied if missing values are not monotone missing that is the case here.

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[4] The UAS data were obtained from the Eurostat New Cronos dataset available from http://www.esds.ac.uk.

[5] In this study we use NUTS3 city level data for Europe.

[6] The population size of cities included in the sample varies from a minimum of 21,277 in Gozo (Malta) to 6,828,168 people in Istanbul (Turkey).

[7] See M. Marshall and K. Jaggers, 2009. Polity IV Project: Political Regime Characteristics and Transitions, 1800-2008, Dataset Users' Manual, available from http://www.systemicpeace.org/polity/polity4.htm.

To impute missing data we first undertake factor analysis to identify variables which form a single factor with self employment, our dependent variable. Next, we impute the data using our predictive mean-matching method and set a number of imputations equal to 100[8]. Further, we undertake data analysis through the multiplication of imputed data and the pooling of individual analyses using Rubin's combination rules (Rubin 1987). For this we use the *mi* system for multiple imputation and the estimation of models with multiplied imputed data which appears as a major new feature of Stata 11 software.

3.3 Variable Definitions

1. We use the rate of self-employment as our dependent variable to measure entrepreneurship. It has widely been used in a number of empirical studies in this area (Blanchflower and Oswald 1998, Glaeser 2007)[9]. There is a great variation in the rates of self-employment in our sample, with the rate varying from as low as 1 % in about 23 cities, including Vilnius (Lithuania), Zurich (Switzerland), Poznan (Poland), Bucharest (Romania) and Umea (Sweden) to as high as 44% in Vidin (Bulgaria). For definition and description of all city-level explanatory variables see Table 1.

Among institutional variables we use Polity IV indicators, in particular polity score and regime durability as indicators of democracy and autocracy, and constraints on executive authority, a component of the polity indicator, which has been widely used in empirical studies as a proxy for property rights protection. We use domestic credit to private sector and GDP to measure the availability of formal finance in European countries. These data are obtained from the World Bank 'World Development' Indicators.

The spatial characteristics of the city include latitude and longitude, neighbourhood-effects in Euro regions, presence of mountains and sea (gateway cities or cities on the coast).

Additionally, we use capital-city, Eastern European vs. Western European city dummies, and EU and EU NMS dummies with the latter two to respectively denote EU cities and cities of EU new member states.

Finally, we introduce city type dummies obtained from the State of European Cities Report. These are originated on the basis of various city characteristics such as size, economic structure, economic performance and drivers of competitiveness (EC 2007). Among these city types we distinguish between Europe's International hubs, represented by knowledge hubs, established capitals and reinvented capitals, and specialised poles, including national service hubs, transformation poles, gateways, modern industrial centres, research centres and visitor centres[10]. Table 1 provides variable definitions and descriptive statistics, while Table 2 shows the correlation matrix between urban audit indicators and institutional variables pertaining to this study.

3.4 Methodology

[8] While addressing a problem of missing values, we undertake a robustness check varying the number of imputations from 50 through 500 to 1000. The analysis of imputed datasets reveals that a dataset based on 100 imputations has the most parsimonious fitted MI model with the average relative variance increase due to nonresponse being closer to zero and the reported relative efficiencies being high for all coefficient estimates. These imputation results can be obtained from the authors upon request (for further discussion of Stata Corp. 2009). Respectively, we proceed our further analysis based on the imputed dataset pooled on the basis of 100 imputations.

[9] See also Parker (2004) for overview of the literature using self-employment as a working definition of entrepreneurship.

[10] For detailed description of each city type and city classification see EC 2007.

We use the following model to examine the determinants of entrepreneurial entry in a panel of 377 cities for 4 years.

$$S_{it=} \beta_1 S_{it-1} + \beta_2 X_{it} + \beta_3 Z_{it} + u_{it} \qquad i=1,..., N;\ t=1,...,T \tag{1}$$

$$u_{it} = v_i + e_{it} \tag{2}$$

where S_{it} is our self-employment rate and S_{it-1} is its lagged value (predetermined variable). X_{it} is a vector of our two potentially endogenous variables, namely GDP per head and the rate of unemployment. Z_{it} is a vector of strictly exogenous control variables listed in Table 1. The error term u_{it} consists of the unobserved country-specific effects, v_i and the observation-specific errors, e_{it}.

To estimate equation (1) we use the System Generalised Method of Moments (SYS GMM) estimator (Arellano and Bover 1995, Blundell and Bond 1998)[11]. The choice of this estimator is determined by the need to address some econometric problems which may arise from estimating equation (1). These include (1) the problem of potential endogeneity of some of our regressors, notably GDP per head and the rate of unemployment; (2) the presence of predetermined variables - the lagged dependent variable S_{it-1} that gives rise to measurement error as it is correlated with past errors; (3) the presence of fixed effects which may be correlated with the repressors; (4) our finite sample. SYS GMM allows the predetermined and endogenous variables in levels to be instrumented with suitable lags of their own differences (Roodman 2006). Tables 3-4 reports the SYS GMM results and discuss a set of instruments used for levels and differences equations.

4. Empirical Results and Discussion

This section discusses our empirical findings. Table 3 reports estimation results based on the whole sample, while Table 4 reports the results for split samples to test regional differences between Eastern and Western European cities. In Table 3 specification (1) tests the significance of major city-level determinants outlined in section 2. Specification (2) extends to include formal finance availability and polity indicator as a proxy for democratic institutions. Specification (3) is similar to (2) with the only exception of polity variable being replaced with constraints on executives, used as proxy for protection of property rights[12]. Specifications (4) and (5) are similar to specification (3) with each of them is respectively extended to include 'knowledge hub' and 'gateways' city type variables[13]. Finally, specifications (6) and (7) include respectively two extra variables: one is an alternative measure of the size of the local government, notably expenditure, and the other one is nationals as a proportion of the total population. Table 4 specifications report the differences between Eastern and Western cities while drawing on specifications reported in Table 3.

In the System GMM estimates reported in Tables 3-4, both unemployment and GDP per head are treated as potentially endogenous variables and a lagged value of self-employment variable as predetermined. Neither the basic Hansen test of over-identifying restrictions nor the Difference Hansen test, which focuses on the additional instruments used by the system GMM estimator, detects any problem with instrument validity.

[11] For the detailed discussion of System GMM estimator see Roodman 2006.

[12] Both institutional variables cannot be included in the regression simultaneously given that they are highly correlated. We also test the effect of regime durability, but the results are insignificant. For this reason we do not report this specification, but it is available from the authors upon request.

[13] We also test for the effect of dummies depicting other city types outlined in section 3.3

The results obtained imply that labour market characteristics as proxied by the unemployment rate, and market size as proxied by GDP per head, fail to predict entrepreneurial entry. This also holds true for both Western and Eastern parts of Europe. The effect of the unemployment rate, perhaps, is mitigated through the higher levels of municipal authorities' expenditure: the higher the level of welfare protection, the lower is the incentive to become self-employed.

Surprisingly, we find that low-skilled labour has a positive effect on self-employment. The percentage of residents with low quality of education (1-2 ISCED) and self-employed workers are strongly and positively related both before and after controlling for spatial and institutional characteristics of the city that contradicts the conventional empirical findings viewing higher education as a strong predictor of entrepreneurial entry in cities (see, for example, Glaeser 2007; Doms et al. 2010). Furthermore, although overall these findings generally apply to both Eastern and Western Europe, we find some marginal differences across these two parts of Europe, once we control for the annual expenditures of municipal authorities. Both lower education and higher education emerge as significant predictors of self-employment in Western European cities (see Table 4(4)). Highly-educated individuals in Eastern European cities may prefer employment to self-employment that can partly be explained by the level of economic development. As per capita GDP increases, the rate of entrepreneurial activity falls as a result of the emergence of economies of scale, and many individuals prefer employment to self-employment at this stage, given that income stability can be provided by large domestic firms.

While controlling for various spatial effects across the European cities we find that the rate of self-employment is largely explained by city size, proxied by population density and a number of registered cars. Our findings provide the evidence for the early agglomeration hypothesis of Chinitz (1961) who argues that entrepreneurship grows as the result of agglomeration effects. At the same time agglomeration effect on entrepreneurship seems to be more pronounced in Western European cities as opposed to their counterparts in Eastern Europe (Table 4).

Analysing the causal impact of criminality on entrepreneurship as in Rosenthal and Ross (2010) we observe first that the coefficient on car thefts is negative and highly significant. This indicates that in equilibrium, there is a negative association between the criminality in the city and the rate of self-employment. The effect increases once controlling for the city wealth like GDP per head and city type. Table 4 shows that the effect is higher for Eastern European cities than Western ones.

Using both annual expenditure of the municipal authority per resident and income derived by local authorities from local taxation as two proxies for the size of local governments we address the question of whether the size of the local government matters for self-employment. Entrepreneurial entry can be affected by welfare provision and higher tax burden via increasing opportunity cost and drop in expected returns to entrepreneurial activity (Parker 2009). Altogether we observe that the values of both coefficients are negative and statistically significant across Table 3 specifications, implying that high marginal tax rates and high levels of welfare protection may adversely affect self-employment. Interestingly, the effects of local government expenditure are more pronounced for Eastern Europe than for Western Europe. On the one hand side, this may reflect a soviet legacy of a relatively generous welfare protection system inherited from the past. Alternatively, higher levels of expenditure of local authorities may also depict higher levels of corruption in the context of Eastern European cities. Corruption associated with higher uncertainty in the business environment may discourage individuals from going into self-employment.

The other explanatory variables include average living area (m^2 per person) and proportion of households living in owned dwellings. These can be used to understand the city inhabitants' wellbeing effects. Not surprisingly, households living in owned dwellings are more likely to start their own business, thus showing positive correlation with the rate of self-employment. Average living area m^2 per person does not seem to effect self-employment.

Furthermore, we have examined a variety of outcomes, including the impact of the city's ethnicity such as the proportion of nationals in a total population and the importance of the capital city as an incubator for entrepreneurship. Both coefficients are statistically insignificant. First, our findings fail to support a hypothesis of the importance of capital city incubators which traditionally have been viewed to play important role for promoting entrepreneurial activity. Second, the fact that city nationals have any advantages in doing business in European cities hypothesis is not supported. Indeed the rate of self-employment does not change depending on the national and ethnic structure of the city residents.

We also investigate the effect of EU entry and accession of new member states (NMS) to EU on the rate of self-employment. Drawing on the whole sample, the effect of EU entry emerges as not robust across specifications as reported in Table 3. However, a regional variation in the effect of EU entry is significant across Eastern and Western European cities with the impact being more positive and significant in the latter case. Interestingly, EU enlargement fails to play any promising role in Eastern European cities.

We also find that institutional quality, including a property rights system and democratic institutions emerge as strong determinants of self-employment. The effect of property rights is much weaker in Eastern European cities as compared to its counterparts in the Western part of Europe that, perhaps, reflects the prevalence of low-potential entrepreneurship in Eastern Europe, given that a property rights system plays a more pronounced role for high-aspiration entrepreneurship than for less-ambition one (Estrin, Korosteleva and Mickiewicz 2009). We also investigate the effect of formal finance availability on self-employment in the context of Europe. Bygrave (2003) argues that while informal financing is accessible to all entrepreneurs, formal finance plays a more significant role for 'star' firms, such as high-growth entrepreneurs, high-technology firms and export-oriented small firms, leaving no other choice for less-ambition entrepreneurs as to rely on self-financing or informal finance (Estrin, Korosteleva and Mickiewicz 2009). Our findings suggest that, overall, the effect of formal finance availability is insignificant for self-employment in most of our specifications with exception of specification (4) where we control for a property rights system. However, at the East-West level of analysis, the results reported in Table 4 suggest that the size of formal financial system fails to play any significant role in Eastern Europe cities with exception when we control for expenditure of local authorities, while it is statistically significant and adversely related to self-employment in Western Europe, implying that self-employed are more likely to be financially constrained, given their specific features, such as the lack of credit history and credible reputation, and high costs of their monitoring by financial institutions.

The overview of city typologies points to great variability in Europe's cities. These typologies, based on key characteristics of the core rather than the wider urban areas, are designed as a framework to aid cross-city comparisons. However, it is important not to treat them too rigidly and there is certainly room for discussion. Although knowledge hubs, modern industrial centres and research centres are considered to be drivers of entrepreneurship (EC 2007) we fail to find any significant results based on the whole sample. Our findings suggest show only scarce self-employment in gateways cities. These are cities located near important waterways, whether rivers or seas. They are the platforms for freight transport, distribution and related industries and services. However, our study shows some important differences between East and West European cities, with knowledge intensity as captured by the dummy of city type associated with knowledge hub emerging as significant and positively related to self-employment in West European cities.

Finally, we turn to geographical characteristics of cities, namely latitude and longitude, which, as reported in Tables 3-4, appear to be significant predictors of entrepreneurship. Surprisingly, our city location results suggest that Southern Europe is more entrepreneurial than Northern Europe.

5. Conclusion

In this study based on European Urban Audit data, we find that the heterogeneity in entrepreneurial activity across European cities is largely explained by city size, socio-economic characteristics, and the size of the local government. We also find that institutional quality, including a property right system and democratic institutions, significantly affect entrepreneurship. Our findings fail to support a hypothesis of the importance of capital city incubators for entrepreneurial activity

The key message resulting from our findings is that some specific city features emerging either as significant determinants of self-employment, notably lower level of human capital and prevalence of self-employment in South Europe, as well as insignificance of knowledge intensity, as proxied by a city type dummy 'knowledge hub' allows for some speculations that self-employment captures more a low-ambition, low-value added entrepreneurship in Europe. However, these effects vary significantly across European cities holding true more for East European cities as opposed to their counterparts in the Western Europe.

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Table 1: Descriptive statistics and definitions of the variables

Variable	Definition	Mean	St. dev.	Min	Max	Obs
Self employment	Self employment rate, %	12.26	6.94	1.00	44.00	1271
Unemployment	Unemployment rate, %	11.93	8.53	1.30	91.10	1271
GDP per head	GDP per head	17226.12	14412.84	648	73932	1271
Men elected	Percentage of elected city representative who are men	74.33	12.27	47.00	100.00	1271
High education	Prop. of working age population qualified at level 5 or 6 ISCED, %	20.23	6.79	0.02	43.14	1271
Low education	Prop. of working age population qualified at level 1 or 2 ISCED, %	26.82	12.02	0.00	76.00	1271
Cars	Number of cars per 1000 inhabitants	358.13	153.10	0.00	1117.10	1271
Tourist	Tourist overnight stays in the city per year	1419398	3040241	2445	30600000	1271
Population density	Population density in the city per sq. km	2194.06	2554.5	24.60	21571.20	1271
Tax income	Proportion of Municipal Authority income derived from local taxation	28.52	16.54	0.40	99.90	1271
Living area	Average living area - m² per person	2045.76	10904.31	12.30	86620	1271
Own home	Proportion of households living in owned dwellings, %	47.47	22.89	2.70	94.40	1271
Car theft	Car thefts - number per 1000 inhabitants	3.49	3.44	0.00	20.20	1271
Household child	Proportion of households with children aged 0-17 , %	29.56	11.10	4.80	80.70	1271
Expenditure	Annual expenditure of the Municipal Authority per resident, USD	1542.55	1608.50	0.3	12861.9	1271
National	Nationals as a proportion of total population	94.12	6.53	46.30	100.00	1271
Private credit	Domestic credit to private sector as % of country GDP' obtained from WDI World Bank	76.61	41.49	7.17	213.74	1456
Polity index	Polity project 'Polity score' "+10=strongly democratic to negative 10=strongly autocratic"; higher value denotes stronger property rights	9.35	1.45	-5	10	1456
Executive constraints	Polity project. 'Executive constraints' "1=unlimited authority to 7=executive parity"; higher value denotes lower administrative barrier	6.81	0.49	3	7	1456
EU	1=city is in the European Union, 0 otherwise	0.70	0.45	0	1	1508
EU_NMS	1=city is in the New Member State , 0 otherwise	0.04	0.21	0	1	1508
Capital-city	1= capital-city, 0 otherwise	0.006	0.77	0	1	1508
Knowledge hub	1= city type is knowledge hub, 0 otherwise	0.35	0.47	0	1	1508
Gateways	1= city type is gateway city, 0 otherwise	0.04	0.20	0	1	1508

Source: European Urban Audit Survey 1989-2006 unless specified otherwise

Table 2: Correlation matrix for institutional, spatial and urban audit variables

	Self-employment	Unemployment	GDP per head	Men elected	High education	Low education	Cars	Tourist	Population density	Tax income	Living area	Own home	Car theft	Household child	Expenditure	National	EU national	Non EU national	Private credit	Polity index
Unemployment	0.09[a]	1																		
GDP per head	-0.19[a]	-0.31[a]	1																	
Men elected	0.53[a]	0.19[a]	-0.49[a]	1																
High education	-0.10[a]	-0.06[b]	0.38[a]	-0.26[a]	1															
Low education	0.51[a]	0.11[a]	0.02	0.24[a]	-0.07[b]	1														
Cars	0.48[a]	-0.24[a]	0.25[a]	0.11[a]	0.06[c]	0.23[a]	1													
Tourist	0.10[a]	-0.02	0.19[a]	-0.01	0.17[a]	0.05[c]	0.08[a]	1												
Population density	0.12[a]	-0.01	0.08[b]	0.01	0.09[a]	0.07[b]	0.07[a]	0.19[a]	1											
Tax income	-0.32[a]	-0.15[a]	0.32[a]	-0.28[a]	0.28[a]	-0.07[b]	0.10[a]	0.01	0.01	1										
Living area	-0.05[d]	-0.04[d]	0.03	-0.17[a]	0.00	-0.04	0.01	0.03	-0.04[d]	0.02	1									
Own home	0.30[a]	-0.07[b]	-0.07[b]	0.32[a]	-0.13[a]	0.20[a]	0.07[a]	0.00	-0.02	-0.08[b]	-0.02	1								
Car theft	-0.09[a]	-0.11[a]	-0.11[b]	-0.01	0.04[d]	-0.03	0.17[a]	0.13[a]	0.05[c]	0.12[a]	-0.01	0.04	1							
Household child	-0.14[a]	0.11[a]	-0.51[a]	0.13[a]	-0.21[a]	0.00	-0.36[a]	-0.18[a]	-0.09[a]	-0.12[a]	-0.02	0.15[a]	-0.09[a]	1						
Expenditure	-0.27[a]	-0.27[a]	0.69[a]	-0.44[a]	0.39[a]	-0.09	0.16[a]	0.09[a]	0.00	0.37[a]	0.05[d]	-0.23[a]	0.15[a]	-0.33	1					
National	0.12[a]	0.24[a]	-0.52[a]	0.33[a]	-0.22[a]	0.00	-0.18[a]	-0.10[a]	-0.21[a]	-0.30[a]	0.00	0.30[a]	0.03	0.33	-0.32[a]	1				
Private credit	-0.14[a]	-0.27[a]	0.51[a]	-0.32[a]	0.16[a]	0.06[c]	0.22[a]	0.08[a]	0.04	0.28[a]	0.04	-0.08[b]	0.16[a]	-0.29[a]	0.36[a]	-0.34[a]	0.34[a]	0.35[a]	1	
Polity index	0.18[a]	-0.20[a]	0.35[a]	-0.09[b]	0.11[b]	0.10[a]	0.45[a]	0.05[d]	0.06[c]	0.15[a]	0.01	-0.03	0.15[a]	-0.36[a]	0.08[a]	-0.21[a]	0.18[a]	0.23[a]	0.42[a]	1
Executive constraints	0.23[a]	0.00	0.12[a]	0.09[b]	0.07[b]	0.11[a]	0.13[a]	-0.02	0.06[c]	-0.04	-0.10[a]	0.00	-0.05[c]	-0.26[a]	0.27[a]	-0.09[a]	0.09[a]	0.10[a]	0.10[a]	0.73[a]

Note: a - significant at 0.001; b - significant at 0.01; c - significant at 0.05; d- significant at 0.1. Source: European Urban Audit Survey 1989-2006

Table 3: Estimation results: System GMM

Estimation of the model Dependent variable S_{it} (Self-employment)							
Dependent variable *Si*	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Si,t−1	-0.1056 [c] (0.0488)	-0.1066 [a] (0.0510)	-0.0985 [d] (0.0507)	-0.0996 [d] (0.0546)	-0.0941 [d] (0.0510)	-0.0823 [d] (0.0463)	-0.0822 [d] (0.0466)
Unemploym-t	0.2231 (0.2136)	0.2736 (0.2370)	0.1404 (0.2140)	0.1417 (0.2200)	0.1254 (0.2131)	0.2140 (0.2125)	0.2317 (0.2150)
Expenditure						-0.0004 [c] (0.0001)	-0.0003 [d] (0.0001)
National							-0.0300 (0.0500)
GDP per head	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0002 (.0001)	0.0001 (0.0001)		
Men elected	0.1715 [a] (0.0568)	0.1726 [a] (0.0512)	0.1846 [a] (0.0484)	0.2032 [a] (0.0462)	0.1871 [a] (0.0489)	0.1217 [a] (0.022)	0.1231 [a] (0.0199)
High education	0.0131 (0.0497)	0.0045 (0.0427)	-0.0053 (0.0442)	-0.0221 (0.0451)	-0.0063 (0.0449)	0.0528 [c] (0.023)	0.0525 [c] (0.0238)
Low education	0.1305 [a] (0.0288)	0.1167 [a] (0.0308)	0.1177 [a] (0.0248)	0.1049 [a] (0.0320)	0.1189 [a] (0.0288)	0.1411 [a] (0.0177)	0.1402 [a] (0.0180)
Cars	0.0180* (0.0042)	0.0178 [a] (0.0041)	0.0168* (0.0038)	0.0164 [a] (0.0038)	0.0167 [a] (0.0038)	0.0187 [a] (0.0038)	0.0188 [a] (0.0035)
Tourist	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 [c] (0.0000)	0.0000 [c] (0.0000)
Population density	0.0001 [b] (0.0000)	0.0001 [d] (0.0000)	0.0001 [d] (0.0001)	0.0001 (0.0000)	0.0001 [c] (0.0000)	0.0001 [d] (0.0000)	0.0001 (0.0000)
Tax income	-0.0899 [a] (0.0210)	-0.0981 [a] (.0227)	-0.0993 [a] (0.0215)	-0.1074 [a] (0.0231)	-0.0999 [a] (0.0215)	-0.0762 [a] (0.0109)	-0.0784 [a] (0.0120)
Living area	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
Own home	0.0582 [a] (0.0204)	0.0680 [a] (0.0238)	0.0566 [a] (0.0211)	0.0619 [b] (0.0241)	0.0561 [a] (0.0211)	0.0500 [b] (0.0193)	0.0531 [a] (0.0213)
Car theft	-0.2345 [a] (0.0574)	-0.2455 [a] (0.0602)	-0.2378* (0.0609)	-0.2586 [a] (0.0658)	-0.2345 [a] (0.0601)	-0.1857 [a] (0.0447)	-0.1810 [a] (0.0426)
Household child	-0.0719 (0.0629)	-0.0476 (0.0611)	-0.0337 (0.0629)	-0.0047 (0.0639)	-0.0356 (0.0639)	-0.1058 [a] (0.0252)	-0.1032 [a] (0.0236)
Private credit		-0.0143 (0.0158)	-0.0218 (0.0160)	-0.0281 [a] (0.0153)	-0.0222 (0.0163)	-0.0012 (0.0074)	-0.0019 (0.0067)
Polity index		1.1120 [c] (0.4392)					
Executive constraints			1.8614 [a] (0.5130)	1.954 [a] (0.6045)	1.7464 [a] (0.5261)	1.7769 [a] (0.4423)	1.7771 [a] (0.4431)
EU	1.1837 (0.8125)	0.5487 (0.9862)	1.4703 [d] (0.8215)	1.2613 (0.9048)	1.4915 [d] (0.8285)	1.8272 [a] (0.8781)	1.8453 [b] (0.8302)
Latitude	-0.1936 [c] (0.0843)	-0.2235 [a] (0.0702)	-0.2421 [a] (.0736)	-0.2616 [b] (0.0759)	-0.2445 [a] (0.0744)	-0.1921 [a] (0.0561)	-0.1893 [b] (0.0559)
Longitude	0.0652 [d] (0.0389)	0.0576 [d] (0.0346)	0.0318 (0.0374)	0.0269 (0.0407)	0.0341 (0.0371)	0.0665 [c] (0.0319)	0.0645 [c] (0.0323)
Capital-city	0.0145 (0.6862)	0.2138 (0.7820)	0.0851 (0.7513)	-0.0659 (0.8616)	-0.0451 (0.7502)	0.0460 (0.6489)	0.0341 (0.6521)
Knowledge hub				-0.0818 (0.5969)			
Gateways					-1.5354 [c] (0.7134)		
Year	yes	yes	yes	yes	yes	yes	yes

Controls							
Hansen test	0.476	0.582	0.313	0.320	0.270	0.334	0.351
Dif. Hansen test	0.715	0.732	0.562	0.310	0.514	0.329	0.348
Number of obs.	888	875	875	875	875	875	875

Notes: a - significant at 0.001; b - significant at 0.01; c - significant at 0.05; d- significant at 0.1 Standard errors are in parentheses robust to heteroskedasticity. The figures reported for the Hansen test and Difference Hansen test are the p-values for the null hypothesis, valid specification. Instruments for first differences equation GMM-type [L(2/.).(Self-employment unemployment GDPph)] collapsed. Instruments for levels equation: GMM-type [DL.(Self-employment unemployment GDPph) collapsed and all other regressors, including time controls, used as standard instruments here. Note: the autocorrelation test show that the residuals are an MA(1) process which is what is expected. The test statistic for second-order serial correlation based on residuals from the first-difference equation is not calculated as the time period is less than 5.

Source: Authors' calculations based on European Urban Audit dataset 1989-2006, corrected for missing values via multiple imputation technique

Table 4: **Estimation results: System GMM – East-West differences**

Estimation of the model Dependent variable S_{it} (self-employment rate)								
Dependent variable S_{it}	(1)		(2)		(3)		(4)	
	East	West	East	West	East	West	East	West
$S_{i,t-1}$	0.0010 (0.0868)	-0.0377 (0.0528)	0.0059 (0.0781)	-0.0377 (0.0528)	0.0319 (0.0832)	-0.0486 (0.0534)	0.0248 (0.1370)	-0.0494 (0.0487)
Unemploym-t	-0.0399 (0.1741)	0.0275 (0.1111)	-0.0044 (0.1780)	0.0275 (0.1111)	0.0383 (0.1879)	0.0459 (0.1123)	-0.2388 (0.2270)	0.0609 (0.1067)
Expenditure							-0.0017[a] (0.0006)	-0.0005[a] (0.0001)
GDP per head	0.0002 (0.0002)	-0.0001 (0.0001)	0.0002 (0.0002)	0.0000 (0.0000)	0.0001 (0.0002)	-0.0000 (0.0000)		
Men elected	0.2011[a] (0.0462)	0.1278[a] (0.0362)	0.1888[a] (0.0420)	0.1278[a] (0.0362)	0.1755[a] (0.0429)	0.1411[a] (0.0359)	0.1536[a] (0.0368)	0.1385[a] (0.0200)
High education	0.0292 (0.0487)	0.0376 (0.0364)	0.0386 (0.0495)	0.0376 (0.0364)	0.0464 (0.0535)	0.0300 (0.0362)	0.0603 (0.0464)	0.0531[c] (0.0252)
Low education	0.1962[a] (0.038)	0.1414[a] (0.0239)	0.1875[a] (0.0311)	0.1413[a] (0.0238)	0.1898[a] (0.0292)	0.1317[a] (0.0234)	0.2177[a] (0.0454)	0.1340[a] (0.0138)
Cars	0.0159[a] (0.0040)	0.0111[a] (0.0019)	0.0160[a] (0.0040)	0.0111[a] (0.0019)	0.0169[a] (0.0038)	0.0114[a] (0.0019)	0.0100[a] (0.0057)	0.0115[a] (0.0018)
Tourist	0.0000 (0.0000)	0.0000[a] (0.0000)	0.0000 (0.0000)	0.0000[b] (0.0000)	0.0000 (0.0000)	0.0000[b] (0.0000)	0.0000 (0.0000)	0.0000[c] (0.0000)
Population density	-0.0003 (0.0003)	0.0001[a] (0.0000)	-0.0003 (0.0003)	0.0001[b] (0.0000)	-0.0002 (0.0003)	0.0001[c] (0.0000)	-0.0001 (0.0003)	0.0001[d] (0.0000)
Tax income	-0.091[a] (0.0273)	-0.072[a] (0.0187)	-0.08[a] (0.0279)	-0.072[a] (0.0187)	-0.0741[a] (0.0264)	-0.0815[a] (0.0180)	0.0550[a] 0.0145	-0.0656[a] (0.0135)
Living area	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000[d] (0.0000)	0.0000 (0.0000)
Own home	0.0210 (0.0195)	0.0391[a] (0.0129)	0.0209 (0.0175)	0.0391[a] (0.0129)	0.0216 (0.0165)	0.0448[a] (0.0137)	-0.0140 (0.0224)	0.0446[a] (0.0120)
Car theft	-0.5853[a] (0.1895)	-0.1618[a] (0.0492)	-0.4936[c] (0.1921)	-0.162[a] (0.0492)	-0.4332[a] (0.2103)	-0.1658[a] (0.0502)	-0.380[b] (0.152)	-0.151[a] (0.046)
Household child	-0.0688 (0.0435)	-0.1099[a] (0.0559)	-0.0795[c] (0.0444)	-0.1099[a] (0.0559)	-0.0811[a] (0.0419)	-0.0963[a] (0.0556)	-0.0649 (0.0410)	-0.1073[a] (0.0251)
Private credit	-0.0473	-0.0209[c]	-0.0454	-0.0209[c]	-0.0424	-0.024[a]	-0.0427[b]	-0.0234[b]

	(0.0329)	(0.0104)	(0.0285)	(0.0164)	(0.0256)	(0.0104)	(0.0255)	(0.0084)
Polity index	-0.0710 (0.3948)	1.6762[a] (0.5064)						
Executive constraints			1.9036 (1.3686)	1.6762[a] (0.5064)	2.4441[c] (1.3092)	1.6131[a] (0.5561)	2.7358[c] (1.092)	1.7449[a] (0.5311)
EU		2.2647[a] (0.7364)		2.2647[a] (0.8215)		2.7091[a] (0.8060)		2.2078[b] (0.7362)
EU_NMS	1.5363 (1.6483)		1.8580 (1.5107)		1.7269 (1.3623)		2.9663[a] (1.7076)	
Latitude	-0.0081 (0.0947)	-0.2424[a] (0.0654)	-0.0985 (0.1121)	-0.242[a] (0.0654)	-0.1168 (0.1049)	-0.264[a] (0.067)	-0.3150[a] (0.1179)	-0.2230[a] (0.0465)
Longitude	0.0710 (0.1135)	0.1074[a] (0.0275)	0.1167 (0.0988)	0.1074[a] (0.0275)	0.1349 (0.0959)	0.1016[a] (0.0290)	0.1513 (0.097)	0.1183[a] (0.0280)
Capital-city	-1.5813 (1.3388)	-0.4673 (0.7556)	-1.2058 (1.3247)	-0.4673 (0.7556)	-0.8842 (1.2940)	-0.4674 (0.7702)	-0.1685 (0.8855)	0.0128 (0.7746)
Knowledge hub					1.2980 (0.8182)	1.1788[c] (0.5032)		
Year controls	yes	yes	yes	yes	yes	yes	yes	yes
Hansen test	0.392	0.974	0.401	0.974	0.286	0.948	0.139	0.992
Dif. Hansen test	0.828	0.927	0.708	0.927	0.266	0.837	0.475	0.881
Number of obs.	220	629	220	629	220	629	220	629

Notes: a - significant at 0.001; b - significant at 0.01; c - significant at 0.05; d- significant at 0.1 Standard errors are in parentheses robust to heteroskedasticity. The figures reported for the Hansen test and Difference Hansen test are the p-values for the null hypothesis, valid specification. Instruments for first differences equation GMM-type [L(2/.).(Self-employment unemployment GDPph)] collapsed. Instruments for levels equation: GMM-type [DL.(Self-employment unemployment GDPph) collapsed and all other regressors, including time controls, used as standard instruments here. Note: the autocorrelation test show that the residuals are an MA(1) process which is what is expected. The test statistic for second-order serial correlation based on residuals from the first-difference equation is not calculated as the time period is less than 5.

Source: Authors' calculations based on European Urban Audit dataset 1989-2006, corrected for missing values via multiple imputation technique.