Title: Self-employment and Job Generation in Metropolitan Areas, 1969-2009

Summary:

Many regional development policy initiatives assume that entrepreneurial activities promote economic growth. Empirical research has presented rationale for this argument showing that small firms create proportionally more new jobs than large ones. However, little research has been performed on the issue of net job generation at the urban level, particularly when self-employment is considered as an indicator of entrepreneurial activities. This paper investigates to what extent U.S. metropolitan areas in the 1969-2009 period characterized by relatively high rates of self-employment also have shown relatively high rates of subsequent total employment growth. The analysis corrects for the influence of sectoral composition, wage level, educational attainment, innovation and size of the metropolitan area to measure the extent to which the number and quality of self-employed in a region contribute to total employment growth. It finds the relationship between self-employment rates and subsequent total employment growth to be positive on average but to weaken over time.

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1. INTRODUCTION

Schumpeter (1934) argued that innovation was the key to growth, and that the entrepreneur was central to the process of innovation. Many other economists and, especially in recent years, politicians have stressed the importance of entrepreneurship in achieving economic progress. Entrepreneurship has for example been argued to be at the heart of national advantage (Porter, 1990, p.125), to be crucial in determining profit opportunities (Kirzner, 1973 and Yu, 1998) and to have a central role in the development of transition economies (McMillan and Woodruff, 2002). This suggested important role of entrepreneurship would imply that regions showing high entrepreneurial activity should also show high subsequent economic growth. However, there is at least one crucial condition as brought forward by Baumol (1990) for this relationship to hold: that entrepreneurship is led into productive channels. He shows that throughout history there have been times when entrepreneurs did not contribute to economic growth or were even harmful to it. Nowadays, individuals may start firms to escape unemployment (Pfeiffer and Reize, 2000) or to evade taxes (Torrini, 2005) and employment protection legislation (Román et al, 2011), thereby failing to contribute to economic growth. In addition, scale economies in production and R&D may outweigh entrepreneurship in terms of importance for economic growth. Therefore, the role of individual entrepreneurship in regional development is far from obvious. The analysis in this paper is aimed at increasing our understanding of this role.

Entrepreneurship is an ill-defined concept and even when a definition is agreed upon several measurement issues have to be solved. This complicates research into the effect of entrepreneurial activities on growth. One approach to consider the impact of entrepreneurial activities on growth has been to use self-employment rates. Blanchflower (2000), Carree et al (2002, 2007), Van Stel and Carree (2004), and Van Praag and Van Stel (2012) have investigated the impact of self-employment rates on economic growth. These studies use data for OECD countries at the country level. A disadvantage of the sample chosen by these authors is the high level of spatial aggregation. In addition, although sophisticated harmonization methods are applied nowadays (Van Stel, 2005; Marcotte, 2012), comparing measures of self-employment across countries remains a challenge. Moreover, there are various institutional and cultural differences between countries complicating the investigation of the relation between self-employment and growth.

Evidently, self-employment and entrepreneurship are not synonymous. Entrepreneurship is a multifaceted concept and any single measure of entrepreneurship is therefore unlikely to do justice to all of these different facets (Iversen et al, 2008). However, there are reasons to assume that a self-employed individual will, on average, show a higher degree of entrepreneurial activities when compared to an employee of a firm. Self-employed (partly) derive their income from their business and can be expected to be alert to profit opportunities. They are more likely than employees to consider new markets, organizational schemes, products and production methods. However, not all self-employed can be considered entrepreneurial. Some run the same business for a very long time without pursuing any type of innovation. In addition, some choose self-employment as a part-time occupation next to their main job for tax saving reasons. In any case, the self-employment definition of entrepreneurship 'has the merit of inclusiveness and convenience' (Parker et al, 2012, p.7) and it is close to the risk-bearing entrepreneur defined in the writings of Knight (Iversen et al, 2008; O'Kean and Menudo, 2008).

Carree et al (2002) argue that not only relatively low self-employment rates, but also relatively high self-employment rates can be harmful to growth. They provide the example of Italy as a country in which the self-employment rates are relatively high while the performance in terms of innovations and economic growth is relatively poor. However, they also show evidence for Germany and Scandinavian countries to have suffered in terms of economic growth from having relatively low self-employment rates.[1]

In this paper we investigate whether for U.S. metropolitan areas there is a positive relation between self-employment rates and subsequent growth of total employment.[2] The measure of self-employment is taken to be the number of sole proprietors.[3] The sole proprietorship is a business that is owned and operated by one person. It is the simplest and least expensive business structure to form. Many start-up companies choose this form until it becomes profitable to enter into a partnership or corporation. The sole proprietorship form is often useful for a new business because it has a simple structure and is easy to set up. It is the

[1] Similar arguments can be found in Shane (2009) or in Congregado et al (2010) among others.

[2] We are aware of the recent stream of literature investigating the impact of regional start-up rates on employment growth, as summarized by Acs and Storey (2004), Fritsch (2008) and Dejardin and Fritsch (2011). However, since the self-employment rate considered in the current paper is a static indicator of entrepreneurship (instead of a dynamic indicator such as the start-up rate), it is far from obvious that the relationship with macro-economic performance is similar for these two indicators of entrepreneurial activities (Van Praag and Van Stel, 2012). In particular, for incumbent self-employed it seems less likely that innovations are pursued, compared to new-firm start-ups.

[3] A recent and exhaustive analysis of business ownership developments in the United States is carried out by Hipple (2010).

least regulated form of business organization. The business owner in a sole proprietorship is responsible for all financing, management decisions and liabilities of the business.

A positive relationship between self-employment rates and subsequent economic growth can be due to the entrepreneurial activities and relatively fast growth of small firms. However, there are other factors that can cause this relationship to emerge and which the current analysis takes into account. *First*, the existence of a high-quality self-employment sector in a region, that is, a sector dominated by business owners who recognize and exploit the better opportunities of profit, tend to generate more value, more growth, and more employment than regions where the self-employment sector is dominated by business owners with relatively limited capabilities. In the spirit of Baumol (1990) and Murphy, Shleifer and Vishny (1991), the allocation of talent in favor of entrepreneurial activities in a region should lead to economic growth and job creation. *Second*, regions with relatively high shares of employment in the manufacturing sector usually also have low self-employment rates. Since the manufacturing sector has been performing less well, on average, compared to the service sectors in terms of generating employment, a positive relation between self-employment and total employment growth may emerge due to sectoral composition.[4] *Third*, regions with relatively low wages may show both strong total employment growth and high self-employment rates. Low wages imply low (expansion) costs for companies and they imply that self-employment may be a financially attractive choice of occupation compared to becoming employee. *Fourth*, large metropolitan areas may have relatively low self-employment rates compared to small metropolitan areas, ceteris paribus. Large companies often locate in densely populated metropolitan areas as they are more dependent on agglomeration effects than their smaller counterparts. Hence, in case congestion effects have a negative effect on regional growth, this could be reflected in a positive correlation between self-employment and growth.[5]

Besides the previous ones, there are also others factors that can contribute to employment growth. For instance, a skilled population, measured by educational attainment, not only leads to higher productivity and income (Mincer, 1958; Becker, 1964) but also favors the location of economic activities and the business performance, propelling positive

[4] One could expect that a metropolitan area that had a high concentration in manufacturing in the past to be associated to lower employment growth than these areas which had well-positioned in growing sectors (in particular in those sectors which benefited from growth and employment over the last decades). This hypothesis is consistent with the empirical evidence provided by Glaeser et al (1995) or more recently by Blumental et al (2010).

[5] See Carlino and Chatterjee (2002) for a study explaining the decline in the share of urban employment accounted for by the relatively dense metropolitan areas from congestion costs.

economic outcomes (Glaeser and Saiz, 2003; Van der Sluis et al, 2008; Unger et al, 2011). Consistent with the prior studies, we expect education to be significantly and positively related to employment growth. In the same way, one could argue that the presence of universities and research institutions will contribute to economic growth and employment, not only by providing educated workers but also by transferring tacit knowledge through their labs and researchers (Hill and Lendel, 2007; Lendel, 2010). For these reasons the analysis should correct for the influence of sectoral composition, wage level, educational attainment, innovation and size of the metropolitan area to measure the extent to which the number and quality of self-employed in a region contribute to total employment growth.

The rest of this paper is as follows. In section 2 we introduce our model and hypotheses. In section 3 we discuss the data and in section 4 we present the empirical results. Section 5 concludes.

2. THE MODEL AND HYPOTHESES

The model determining total employment growth from period *t-1* to period *t* is given in equation (1). The dependent variable is the logarithmic change of total employment *TE* in urban area *i* from period *t-1* to period *t*. Total employment includes both employment and self-employment. The predetermined variables in equation (1) include the self-employment rate *SE*, the self-employment quality *Q*, the manufacturing share of total employment *MAN*, the government services share of total employment *GOV*, the size of the metropolitan statistical area (MSA) measured by *log(TE)*, the relative wage level per job *WAGE*, human capital as measured by means of the educational attainment *EDUC*, and the number of universities with high and very high levels of research activities in a metropolitan area, *UNIV*. Apart from the observable variables measured in period *t-1* the model includes a variable representing unobservable effects, $\theta_{i,t-1}$. The unobservable effects are assumed to follow an AR(1)-process as given in equation (2).[6] The error terms in equation (1) and (2), ε_{it} and ν_{it}, are assumed to be independently distributed.

(1) $$\Delta \log(TE_{it}) = \alpha_t + \beta_t SE_{i,t-1} + \mu_t Q_{i,t-1} + \gamma_t MAN_{i,t-1} + \delta_t GOV_{i,t-1} + \varsigma_t \log(TE_{i,t-1}) + \eta_t WAGE_{i,t-1}$$
$$+ j_t EDUC_{i,t-1} + t_t UNIV_{i,t-1} + q_{i,t-1} + e_{it}$$

(2) $$\theta_{it} = \pi_t \theta_{i,t-1} + \nu_{it}$$

[6] Equation (2) showing how the unobservable effects are assumed to change over time is similar to the state (or transition) equation in state space models (estimated by the Kalman filter).

When we substitute equation (1) into equation (2) we arrive at the following equation:

$$\Delta \log(TE_{it}) = \alpha_t + \beta_t SE_{i,t-1} + \mu_t Q_{i,t-1} + \gamma_t MAN_{i,t-1} + \delta_t GOV_{i,t-1} + \varsigma_t \log(TE_{i,t-1}) + \eta_t WAGE_{i,t-1}$$

$$(3) \quad + \varphi_t EDUC_{i,t-1} + \tau_t UNIV_{i,t-1} + \rho_{t-1}(\Delta \log(TE_{i,t-1}) - \alpha_{t-1} - \beta_{t-1} SE_{i,t-2} - \mu_{t-1} Q_{i,t-2} - \gamma_{t-1} MAN_{i,t-2} - \delta_{t-1} GOV_{i,t-2}$$

$$- \varsigma_{t-1} \log(TE_{i,t-2}) - \eta_{t-1} WAGE_{i,t-2} - \varphi_{t-1} EDUC_{i,t-2} - \tau_{t-1} UNIV_{i,t-2} - \varepsilon_{i,t-1}) + \nu_{i,t-1} + \varepsilon_{it}$$

Equation (3) can be estimated for each time period separately. This leads to a system of equations in which there are parameter restrictions between two consecutive equations. For example, the parameter α_t is included in the equations in which $\Delta log(TE_{it})$ and in which $\Delta log(TE_{i,t+1})$ are the dependent variables, respectively. These parameter restrictions can be easily imposed in a system of equations. The error terms, $\varepsilon_{it} + \nu_{i,t-1} - \pi_{t-1}\varepsilon_{i,t-1}$, are obviously correlated over time and, hence, across the equations. We correct for this in the system by applying the Seemingly Unrelated Equations (SUR) estimation technique.

We assume that data for the variables *TE, SE, Q, MAN, GOV, WAGE, EDUC* and *UNIV* are available for period 1 until period *T*. It implies that the first two periods are not available for estimation because there are two lags present in equation (3). This leaves a system of *T-2* equations in which all parameters are identified except for the lagged parameters in the first equation (where *t* is 3). One way to solve this identification problem is to assume the parameters α_2 through τ_2 equal to α_3 through τ_3. Another way to get around this problem is to add the following equation to the system:

$$(4) \quad \Delta \log(TE_{i2}) = \alpha_2 + \beta_2 SE_{i1} + \mu_2 Q_{i1} + \gamma_2 MAN_{i1} + \delta_2 GOV_{i1} + \varsigma_2 \log(TE_{i1}) + \eta_2 WAGE_{i1} + \varphi_2 EDUC_{i1} + \tau_2 UNIV_{i1} + \varepsilon_{i2}$$

This equation would result in case either $\pi_1 = 0$ or that $\theta_{i0} = 0$. Neither of these two restrictions is particularly realistic nor empirically testable. However, equation (4) can be seen as providing starting values to the time-varying parameters α_t through τ_t. In the empirical analysis we will compare the results using the two solutions to the identification problem.

We have the following hypotheses concerning the effects of the variables on total employment growth:

H1: *Metropolitan areas with relatively high self-employment rates also show relatively high subsequent total employment growth rates, or* $\beta_t > 0$.

There are several reasons why we expect high self-employment rates to be connected to subsequent employment increases.[7] *First*, small firms have been shown in previous research to have higher net gains in employment when compared to their larger counterparts even when correcting for the selection effect of small firms having higher hazard rates (e.g. Evans, 1987 and Sutton, 1997). Proprietorships are almost always small to very small firms and, hence, may on average show strong job growth. *Second*, high self-employment rates may indicate a favourable 'entrepreneurial' climate in which the setting-up of new ventures is relatively easy. These new ventures may function as the seedbed for the future large enterprises. *Third*, high self-employment rates imply a relatively high number of firms relative to the number of workers. This is a measure of localized competition as proposed by Glaeser et al. (1992) and also used by Feldman and Audretsch (1999). The latter find evidence of localized competition to promote innovative output. Similarly, Nickell (1996) found that competition, as measured by increased number of competitors, has a positive effect on the rate of total factor productivity growth. Both increased innovative output and increased productivity are likely to attract new firms and employment. The last two reasons will be especially relevant on the somewhat longer term.

H2: *Metropolitan areas with a relatively high quality of self-employment also show relatively high subsequent total employment growth rates, or* $\mu_t > 0$.

If relatively many individuals with high levels of capabilities (e.g. high levels of human and social capital) prefer to be self-employed rather than wage-employed, it may indicate that self-employment is rewarding, and that there are opportunities abound in the region under consideration. In addition, high-skilled entrepreneurs are more likely to create new jobs than lower-skilled entrepreneurs (Unger et al., 2011; Van der Sluis et al., 2008).

H3: *Metropolitan areas with relatively high shares of employment in manufacturing industries show relatively low subsequent total employment growth rates, or* $\gamma_t < 0$.

[7] Følster (2000) claims a significant positive effect of self-employment on overall employment for Swedish counties in the 1976-1995 period.

The total employment share of the services sector has increased strongly at the expense of the manufacturing sector in the last thirty year of the 20th century and in the first decade of the 21th century. In our sample of 366 MSAs the average employment share of the manufacturing sector almost halves, from 20.6% in 1969 to 8.1% in 2009. Manufacturing firms have been introducing many labour-saving technologies and have outsourced many of their service activities in order to concentrate on core activities. Hence, it may be expected that metropolitan areas specialized in manufacturing have been confronted with relatively limited employment gains.[8]

H4: *Metropolitan areas with relatively high shares of employment in government services will show relatively high total employment growth during periods of economic downturn and relatively low total employment growth during periods of economic boom, or* δ_t *moves counter-cyclically.*

The employment share of government services has slipped somewhat in our sample of 366 MSAs. It was 20.4% on average in 1969 while it was 16.3% in 2009. This would suggest that, on average, metropolitan areas with high shares of government services have shown less employment growth. However, it may be expected that metropolitan areas with high employment share of government shares (e.g. due to military bases or due to being the state capital) are less influenced by economic downturns but also benefit less from strong economic growth. The parameter δ_t should be positive when business is characterized by mass layoffs while it should be negative when business flourishes.

H5: *Metropolitan areas in which the wages are relatively high will show relatively slow employment growth, or* $\eta_t < 0$.

Firms will seek to introduce labour-saving technologies when labour costs are relatively high. This will imply high wage areas to show low employment growth. However, there is a counter-argument in that high wages imply high personal incomes allowing for a broad range

[8] Papers that provide empirical evidence for industry composition affecting regional employment growth include Glaeser, Scheinkman and Schleifer (1995), Partridge and Rickman (1996), Clark (1998) and Rosenbloom and Sundstrom (1999). Recently and by using both the manufacturing and the finance, insurance and real estate sector location quotient and a variant of the Hirshman-Herfindahl Index in order to capture the economic diversity, Blumenthal et al (2008) provides evidence of this effect for MSAs in the United States.

of products and services to be offered on the local market.[9] We expect the cost effect to be usually larger than the demand effect, though.

H6: *Metropolitan areas with relatively high stocks of human capital will show relatively higher employment growth, or* $\phi_t > 0$.

The positive impact of high educational attainment of a MSA's inhabitants for economic performance is a well established hypothesis, positively checked in a number of studies. Human capital investment, measured by education attainment, is often found to be highly correlated with strong metropolitan employment growth (see for instance, Glaeser and Saiz (2004), Simon and Nardinelli (2002), Simon (1998), Glaeser et al (1995), Crihfield and Panggabean (1995), or Rauch (1993)). This positive effect may be associated with higher productivity levels for both workers and business owners. We hypothesise that the higher is the level of human capital the higher will be the employment growth, since higher entrepreneurial human capital should be associated to the better and bigger business opportunities normally associated to higher scales.

H7: *The presence of research universities in a metropolitan area will be positively related to employment growth, or* $\tau_t > 0$.

We hypothesise that the presence of research institutions and universities will propel economic growth, not only providing educated workers and technical talent but also improving productivity by the transfer of knowledge through their labs. In fact, universities, and research institutions can have effects on MSA's labour markets not only providing technical talent but also attracting money and private research and development.

There are two parameters left which are not dealt with in separate hypotheses. The first is the parameter ς_t connected to the MSA-size variable $log(TE_{i,t-1})$. The value of the parameter may be positive or negative dependent upon whether agglomeration or congestion effects dominate.[10] In case agglomeration effects are important, firms may choose to start up

[9] Jackson (1984) presents evidence for the number of different product *categories* bought to be a positive function of income.

[10] See Eaton and Eckstein (1997) and Black and Henderson (1999) for models of the interrelationship between urbanization, accumulation of human capital and economic growth. Carlino and Chatterjee (2002) and Chatterjee and Carlino (2001) stress congestion costs to explain the trend of employment deconcentration. This

or expand in large MSAs. This would imply $\varsigma_t > 0$. In case congestion effects like traffic jams and high rents are strong, firms will avoid the large MSAs and try to locate in smaller cities. This would imply $\varsigma_t < 0$. It is not clear which of the two effects are larger. The second is the parameter π_t introduced in equation (2). This is a partial adjustment parameter that is expected to be between zero and one. A value of zero would imply that the effect of unobservable effects in one period is unrelated to that in the preceding or following period. This is unlikely because regional factors like the quality of infrastructure and the legislative environment are only slowly changing over time. A value in excess of one is also unlikely because it would imply that the relative attractiveness of regions will show an ever increasing disparity over time.[11]

3. DATA

The main source of data is the Regional Information System (REIS) of the Bureau of Economic Analysis. It provides annual information for the period 1969-2009 on total employment (TE) and its components. It distinguishes between employment and proprietorship employment and has a sectoral composition of total employment. The REIS data source also has information on the average wage level per job. The respective variables in our model are constructed as follows. The self-employment rate SE is equal to the number of nonfarm proprietors as a ratio of total employment. As an indicator of self-employment quality Q, we use the ratio of average nonfarm proprietors' income over average wage and salary disbursements. If, on average, self-employed individuals are able to make a profit which is higher than the average presumed opportunity costs for an entrepreneur (average wage), this indicates that apparently relatively many high-skilled individuals have selected into entrepreneurship, which in turn suggests that entrepreneurial opportunities abound and are being exploited.

The manufacturing share of employment *MAN* equals total employment in the manufacturing sector divided by total employment. The government services share of employment *GOV* equals total employment in the government services sector divided by total employment. The relative wage level *WAGE* is equal to the ratio of the wage level per job in a

deconcentration process involves the decline in the share of urban employment accounted for by the relatively dense metropolitan areas.

[11] Note that we do not incorporate fixed effects into the model. This would lead to a large number of additional parameters and to problems concerning estimation of a fixed effects dynamic panel data model with (two) lagged dependent variables (see e.g. Hsiao et al., 2002). More importantly, it is unlikely to have unobserved effects to remain constant over a 40-year time period.

MSA divided by the average wage level per job across all MSAs for the specific year[12]. Educational attainment *EDUC* is defined as the percentage of the population with a bachelor degree in a MSA. Finally, research *UNIV* is measured by means of the number of universities with high and very high levels of research activities in a metropolitan area, by using the Carnegie Research Universities Classification. Summary statistics for the variables are presented in Table 1. The total number of observations for the variables is 15006 (366 MSAs for 40 years).[13]

The summary statistics show that the average self-employment rate has increased from about 11% in 1969 to about 19% in 2009. At the same time the standard deviation has not increased. The self-employment quality, measured as the self-employment incomes/ wage incomes ratio has decreased by half in the period. Both the manufacturing and government services employment share have decreased, on average, in the 1969-09 period. The standard deviation of both variables has also gone down considerably. The standard deviation of the relative wage has increased somewhat over the 40-year period. The average size of the MSAs in terms of employment has almost doubled from 205 thousand to 406 thousand number of jobs. The percentage of the population with bachelor degree or more for persons 25 years old and over increased from 7.5 in 1969 to 26.9 in 2009, whereas the number of MSA with research universities has increased notably in the period.

In Table 2 the ten MSAs with highest and the ten MSAs with the lowest total employment growth over the 1969-09 period have been displayed. Saint George, UT has shown the highest total employment growth while Steubenville-Weirton, OH-WV has shown the lowest growth. In fact, this is one of the six MSAs in which there has been a *decrease* in total employment. Out of ten MSAs with highest total employment growth four are in Florida. The table also shows the self-employment rates of the MSAs in the first and last year of the sample period. Out of ten MSAs that had the highest total employment growth no less than nine had an above average self-employment rate in 1969. The only one exception is Las Vegas-Paradise, NV. In 2009 nine out of ten MSAs with highest total employment growth

[12] See Table A1 in the Appendix for variable definitions and data sources.

[13] For the manufacturing share variable there have been a small number of missing observations in the data source that have been filled up. For Albuquerque, NM, (1998, 1999, 2000), Albany-Schenectady-Troy, NY (2005), Amarillo, TX (from 1998 till 2009 except 2008), Charlottesville, VA (from 1999 till 2003), Columbus, GA-AL (2000), Decatur, AL (1998,1999,2000), Donthan, AL (2005 and 2006), Dover (2002, 2007, 2009), Jefferson City, MO (2006,2007), Monroe, LA (from 2002 to 2007), Portland, South Portland-Biddeford, ME (from 1998 to 2005), Providence-New Bedford-Fall River, RI-MA (2005), Rapid City, SD (2003), Sioux City, IA-NE (1998, 1999, 2000) and Washington, DC-MD-VA-WV (1998 to 2007) the *MAN*-variable is interpolated. The interpolation is the simple average of manufacturing employment in the period before and after the missing(s) observation.

had the self-employment rate above the 20%-average. For the ten MSAs with slow total employment growth the statistics are even more striking: only two out of ten MSAs shows a self-employment rate above the 10%, in 1969 –Danville, IL and Elmira, NY. Likewise, nine out of ten shows a below average rate in 2009. The only exception is Flint, MI. These statistics suggest some tentative support for our first hypothesis.

4. EMPIRICAL RESULTS

The estimation results are presented in Tables 3-5. An important decision concerning the empirical analysis is the length of the time period. We concentrate on the effect of self-employment on total employment growth in the subsequent five years because the effects of differences in self-employment rates may materialize only after a couple of years. That is, the forty-year period is subdivided into the periods 1969-74, 1974-79, 1979-84, 1984-89, 1989-94, 1994-99, 1999-04 and 2004-09.[14]

We will also investigate the robustness for the omission of the state of Florida. Table 2 already showed that Florida has a large amount of very fast growing MSAs. It is important to consider whether this one state has a strong influence on the estimation results.

We start with the discussion of the empirical results for the full sample. Table 3 shows the estimation results for equation (3) with the parameters in the second sub-period 1974-79 assumed to be equal to those in the first sub-period 1969-74. The impact of the self-employment rate *SE* is significantly positive at the 1%-significance level for the periods 1974-79, 1979-84, 1989-94 and 1999-04.[15] For the rest of sub-periods, the effect of *SE* is not statistically significant. Hence, the results show a support for the *first* hypothesis above all in the first part of the sample period. In this sense, the effect of self-employment rates on subsequent total employment growth seems to have become less and less over the forty-year period under investigation.

The evidence on the quality of the self-employment sector appears to be mixed, hence we find no clear evidence for the *second* hypothesis. The mixed results over the various periods of investigation may point at some degree of business cycle dependency.

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[14] The first two sub-periods 1969-74 and 1974-79 were periods of strong total employment growth, on average. The third sub-period 1979-84 was one of economic downturn and relatively small total employment growth. The fourth sub-period 1984-89 was one of recovery and relatively high total employment growth. The last two sub-periods, 1989-94 and 1994-99 are comparable to the third and fourth sub-periods, respectively, but the downturn and recovery were both less strong. Finally, the last two sub-periods show a small total employment growth, especially the last one, the financial crisis.

[15] This is in line with the findings by Birch (1981), Kirchhoff and Phillips (1988) and Neumark et al that there is empirical evidence of small firms to be at the core of new job creation in the United States, at least for the first part of our sample.

The results for the effect of the manufacturing share variable *MAN* provide support for the *third* hypothesis in four out of seven periods. In the first and in the last two sub-periods the effect of *MAN* is negative and significant. It is also significant in the sub-period 1989-94. Only in the three sub-periods 1979-84, 1984-89 and 1994-99 the effect is not significant. However, the overall result is that MSAs with relatively strong specialization in manufacturing industries have shown less employment growth than MSAs less specialized in manufacturing. This phenomenon has been especially intense in the last decade.

The impact of the government services employment share *GOV* on total employment growth is significant in two out of seven sub-periods. The effect is positive in the 1979-84 and 1999-04 periods. The evidence on the *fourth* hypothesis is mixed. The results do show that the effect of *GOV* is positive in the 1979-84 and 1999-04 economic downturn periods consistent with a counter-cyclical effect.

The effect of the MSA-size variable *log(TE)* on total employment growth is positive in three out of seven periods and negative in two of them. These results don't allow us to state if agglomeration effects have been stronger/weaker than congestion effects. The *fifth* hypothesis is not strongly supported. In four out of seven sub-periods the relative wage level per job *WAGE* has a negative effect on the subsequent increase in the number of jobs. Only in the 1974-79 period this effect is positive. The percentage of the population with at least a bachelor degree and the presence of very active research universities in the economy are predictive of growth in employment only in two out of seven periods, (1979-84 and 1994-99 for the sixth hypothesis and 1974-79 and 1984-89 for the seventh). Results suggest either that human capital like innovation are not associated with MSA's employment growth or, more likely in view of previous results, that the proxies don't capture so well the two dimensions.[16]

The partial adjustment coefficient of the unobserved effects π_t is found to be quite constant over time. It ranges from 0.215 to 0.511. Finally, a Wald-test was executed on the presence of a quadratic effect of the *SE*-variable. It may be argued that both very low and very high self-employment rates are detrimental to growth.[17] No statistical evidence is found for this (the p-value equals 0.33).

In Table 4 we present the empirical results when we use a different solution for the identification problem. Equation (4) is added and parameters for the first sub-period are

[16] Interactions between educational attainment/innovation and self-employment/quality of self-employment have also been included as regressors. However these specifications don't provide statistically significant estimates.

[17] This would be in line with the model introduced by Carree et al. (2002). They present empirical evidence that countries with very low self-employment rates (like the Scandinavian countries) and countries with very high self-employment rates (like Italy) have suffered in terms of forgone growth of GDP.

estimated as well. In general the effects of the variables are not much affected. Three effects that were significant in Table 3 are not significant anymore. These are the effects of *SIZE* and of *UNIV* in the 1974-79 period and the effect of *Q* in the 1979-84 period. Four effects that were insignificant in Table 3 become significant in Table 4. These are the effects of the MSA-quality variable in the 1984-89 sub-period, the government variable in the 1974-79 sub-period, the size variable in the1989-94 sub-period and the educational attainment variable in the 194-89 sub-period. Again the hypothesis that there are no quadratic effects of *SE* cannot be rejected (the p-value is 0.49). Because the two different ways of solving the identification problem result in largely the same estimation results, we will focus our attention to the results when only equation (3) is used and the parameters of the first and second sub-periods are assumed equal.

In Table 5 we consider the robustness of the empirical results presented in Table 3 to changes in the sample. In Table 5 the twenty MSAs in the state of Florida are left out, reducing the number of observations from 366 to 346. It can be seen that the empirical results are similar despite of the reduction in the sample. The only two changes are that the effect of manufacturing share *MAN* becomes statistically significant in the eighties and that the effect of *Q* is now also statistically significant in the 1984-89 sub-period.

5. CONCLUSION

Self-employment can be a vehicle for entrepreneurial activities. Local and national governments have been promoting the creation of new small businesses, many in the form of proprietorships. The analysis of the current paper suggests that MSAs with high self-employment rates have been growing in terms of total employment considerably stronger than MSAs with low self-employment rates *up till* the mid 1980s but much less so thereafter. So, what has happened with the positive effect of self-employment rates in the U.S. cities?

A *first* explanation is that many entrepreneurs who started up in the recovery period after the economic crisis of 1980-82 were not as effective in creating new jobs as those who started their companies in the economically more difficult times beforehand. After the 1980-82 period entrepreneurship became somewhat of a fashion and was promoted by local and national government policies. The increase in the self-employment rate from 11% to 19% may have been accompanied by a decline in the average managerial or entrepreneurial talents of self-employed. A *second* explanation is the Tax Reform Act of 1986 reducing the benefits of incorporation. The Tax Reform Act of 1986 changed rates so that corporate rates are always higher than individual tax rates. This has left almost no reason for single-owner

businesses to incorporate for tax-saving reasons. Firms that would otherwise have incorporated for tax-saving reasons, and not for reasons of company growth necessitating limiting of liabilities, now remain proprietorships. A *third* explanation is that there has been an increase in the number of people having both a job as proprietor and as employee. These 'part-time' businesses are less likely to grow than 'full-time' businesses. A *fourth* explanation is that the job-creation prowess of small firms has decreased because large firms have been able to adjust to the changing economic circumstances. The mass layoffs of the late 1970s and early 1980s have resulted in large companies that survived being characterized by more concentration on core activities and more attention for 'intrapreneurial' initiatives. Also the new industries of the late 1970s and early 1980s like biotechnology and electronics matured in the 1990s. Many small firms did not survive this process.[18] A *fifth* explanation is that small firms show less job loss during recessions than large firms and that the high growth of small firms occurs during the early stages of recovery, while large firms experience strong growth later in the expansion periods (see also Kirchhoff and Phillips, 1988).

The reason behind self-employment apparently having become less of a vehicle for job creation or even entrepreneurship itself is of importance to policy makers. Of course it remains important for long-term economic growth to have free entrepreneurial entry and exit into markets. New and small firms are, for example, an important source of innovative activity (e.g. Acs and Audretsch, 1987 and Prusa and Schmitz, 1991). In addition, this study does not dispute that small firms or proprietorships have less job loss during recessions making the small business sector an important stabilizing economic factor. However, policies aimed at promoting self-employment may (i) affect the average managerial and entrepreneurial talent distribution of new entrepreneurs and (ii) have different effects in different time periods.[19] Further research should concentrate on the reasons behind the decrease in the effect of self-employment rates on total employment growth in U.S. MSAs and on whether this decrease has also occurred in other countries.

[18] See Klepper (1996) and Carree and Thurik (2000) for economic models explaining the shakeout of small producers in later stages of the industry life cycle. See Audretsch (2001) for an overview of the role of small firms in the U.S. biotechnology industry.

[19] Audretsch and Fritsch (2002) also indicate that there are different growth regimes across time. Regional economic development policy targeted towards either fostering new start-ups or nurturing large, incumbent enterprises may be appropriate in some time periods while counterproductive in others.

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Table 1: Summary statistics

		Mean			Standard deviation		
Year		1969	1989	2009	1969	1989	2009
TE	Total employment	205,430	314,779	406,895	406,785	767,709	921,535
Log(TE)	Log. of total employment	11.334	11.813	12.089	1.140	1.096	1.091
ΔTE	Logarithmic difference between total employment in t+5 and t	0.141	0.138	0.029	0.097	0.070	0.054
SE	Self-employment rate	0.110	0.140	0.190	0.030	0.035	0.038
Q	Self-employed income/ wage income ratio	1.104	0.740	0.556	0.215	0.173	0.159
MAN	Manuf. Employment rate	0.206	0.151	0.081	0.122	0.080	0.047
GOV	Govern. Employment rate	0.204	0.175	0.163	0.123	0.087	0.070
WAGE	Relative wage level per job	1.000	1.000	1.000	0.148	0.134	0.159
EDUC	Bachelor´s degree or more (percent)	7.50	19.48	26.883	1.502	3.471	4.342
UNIV	Very high and high activity research institutions	0.268	0.322	0.519	0.721	0.725	1.220

Table 2: MSAs with slow and fast employment growth, 1969-09

MSA	ΔTE69-09	SE69	SE09
St. George, UT	2.764	0.200	0.298
Palm Coast, FL	2.641	0.139	0.125
Naples-Marco Island, FL	2.260	0.214	0.295
Punta Gorda, FL	2.164	0.210	0.324
Las Vegas-Paradise, NV	2.149	0.085	0.203
Cape Coral-Fort Myers, FL	1.977	0.199	0.264
Bend, OR	1.971	0.183	0.298
Lake Havasu City-Kingman, AZ	1.960	0.193	0.237
Prescott, AZ	1.952	0.197	0.273
Austin-Round Rock-San Marcos, TX	1.783	0.117	0.241
Average	0.754	0.110	0.190
Mansfield, OH	0.043	0.096	0.137
Elizabethtown, KY	0.037	0.045	0.157
Elmira, NY	0.036	0.107	0.164
Battle Creek, MI	0.026	0.082	0.118
Flint, MI	-0.003	0.071	0.245
Youngstown-Warren-Boardman, OH-PA	-0.008	0.089	0.182
Kokomo, IN	-0.017	0.083	0.172
Danville, IL	-0.156	0.102	0.179
Anderson, IN	-0.168	0.090	0.163
Steubenville-Weirton, OH-WV	-0.209	0.084	0.151

Note: Total employment growth (ΔTE69-09) is measured as the logarithmic difference between total employment (including self-employment) in 2009 and that in 1969. Self-employment rates in 1969 and 2009 are presented in the last two columns SE69 and SE09 respectively.

Table 3: Empirical results of equations (3)

Period		1974-79	1979-84	1984-89	1989-94	1994-99	1999-04	2004-09
	α	-0.049	-0.323***	0.224**	0.317***	-0.212***	0.136**	-0.011
		(0.070)	(0.079)	(0.092)	(0.059)	(0.056)	(0.055)	(0.050)
Self-employment	β	0.738***	0.915***	-0.002	0.578***	-0.094	0.237**	-0.069
		(0.152)	(0.172)	(0.175)	(0.104)	(0.093)	(0.095)	(0.093)
Quality	μ	0.066***	-0.035*	0.042	-0.051***	0.048***	0.001	0.013
		(0.018)	(0.021)	(0.030)	(0.015)	(0.013)	(0.011)	(0.011)
Manufacturing	γ	-0.169***	0.076	0.060	-0.160***	0.001	-0.223***	-0.236***
		(0.049)	(0.060)	(0.064)	(0.051)	(0.051)	(0.054)	(0.064)
Government	δ	0.058	0.242***	-0.070	-0.047	-0.032	0.114**	0.055
		(0.045)	(0.056)	(0.066)	(0.046)	(0.046)	(0.050)	(0.047)
Size	ς	-0.010***	0.031***	-0.006	-0.005	0.012***	-0.010**	0.006*
		(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Wage	η	0.133***	-0.219***	-0.083**	-0.137***	0.039	-0.089***	-0.012
		(0.027)	(0.032)	(0.039)	(0.030)	(0.029)	(0.024)	(0.024)
Educational attainment	φ	-0.000	0.002*	0.001	-0.005***	0.003***	0.000	-0.001
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Universities	τ	0.014*	0.010	0.020*	-0.000	0.005	0.003	0.007
		(0.008)	(0.010)	(0.011)	(0.010)	(0.007)	(0.007)	(0.006)
	π	0.262***	0.295***	0.215***	0.226***	0.445***	0.511***	0.277***
		(0.044)	(0.036)	(0.040)	(0.032)	(0.029)	(0.041)	(0.041)
R^2		0.514	0.529	0.192	0.430	0.415	0.488	0.346
Mean dep. Var.		0.151	0.059	0.130	0.089	0.109	0.051	0.026
Stdev dep. Var.		0.103	0.097	0.082	0.073	0.058	0.063	0.059
Observations		366	366	366	366	366	366	366

Note: The dependent variable is the five-year logarithmic change in total employment (including self-employment). Parameters in the 1969-74 period are assumed to be equal to those in the 1974-79 period for purposes of identification. Standard errors in brackets. Superscripts *, ** and *** indicate significance at the 10%-, 5%- and 1%-significance level, respectively. The value of the Wald χ^2-statistic testing the presence of quadratic effects of SE on total employment growth equals 8.01 (seven degrees of freedom). The corresponding p-value is 0.33.

Table 4: Empirical results of equations (3)-(4)

Period		1969-74	1974-79	1979-84	1984-89	1989-94	1994-99	1999-04	2004-09
	α	0.387***	-0.179*	-0.259***	0.213**	0.319***	-0.199***	0.144***	-0.015
		(0.081)	(0.095)	(0.081)	(0.090)	(0.058)	(0.055)	(0.054)	(0.051)
Self-employment	β	1.052***	0.738***	0.925***	-0.041	0.544***	-0.081	0.212**	-0.059
		(0.186)	(0.193)	(0.173)	(0.173)	(0.103)	(0.091)	(0.095)	(0.093)
Quality	μ	-0.014	0.086***	-0.033	0.058**	-0.036**	0.049***	0.002	0.014
		(0.019)	(0.022)	(0.021)	(0.0269)	(0.015)	(0.012)	(0.011)	(0.011)
Manufacturing	γ	-0.307***	-0.114*	0.031	0.056	-0.166***	-0.005	-0.228***	-0.234***
		(0.051)	(0.067)	(0.060)	(0.063)	(0.051)	(0.050)	(0.053)	(0.064)
Government	δ	-0.261***	0.161**	0.193***	-0.076	-0.049	-0.044	0.108**	0.059
		(0.051)	(0.065)	(0.057)	(0.064)	(0.046)	(0.046)	(0.049)	(0.047)
Size	ς	-0.020***	-0.007	0.027***	-0.007	-0.007*	0.011***	-0.010**	0.006*
		(0.005)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Wage	η	-0.054*	0.171***	-0.221***	-0.083**	-0.126***	0.036	-0.087****	-0.010
		(0.003)	(0.035)	(0.033)	(0.039)	(0.030)	(0.028)	(0.024)	(0.024)
Educational attainment	φ	0.005*	-0.001	0.003**	0.002*	-0.005***	0.003***	0.000	-0.001
		(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Universities	τ	0.035***	0.007	0.006	0.018*	-0.000	0.004	0.004	0.007
		(0.010)	(0.011)	(0.010)	(0.011)	(0.007)	(0.007)	(0.007)	(0.006)
	π	n.a.	0.254***	0.256***	0.200***	0.228***	0.433***	0.507***	0.278***
			(0.041)	(0.036)	(0.039)	(0.031)	(0.029)	(0.041)	(0.041)
R^2		0.476	0.509	0.529	0.181	0.426	0.410	0.485	0.347
Mean dep. Var.		0.139	0.151	0.059	0.130	0.089	0.109	0.051	0.026
Stdev dep. Var.		0.103	0.103	0.097	0.082	0.073	0.058	0.063	0.059
Observations		366	366	366	366	366	366	366	366

Note: The dependent variable is the five-year logarithmic change in total employment (including self-employment). The equation for the 1969-74 period is estimated without taking unobservable effects into account (see equation (4)). Standard errors in brackets. Superscripts *, ** and *** indicate significance at the 10%-, 5%- and 1%-significance level, respectively. The value of the Wald χ^2-statistic testing the presence of quadratic effects of SE on total employment growth equals 7.43 (eight degrees of freedom). The corresponding p-value is 0.49.

Table 5: Empirical results of equations (3) (except Florida)

Period		1974-79	1979-84	1984-89	1989-94	1994-99	1999-04	2004-09
	α	-0.075	-0.434***	0.020	0.425***	-0.320***	0.083	0.028
		(0.070)	(0.076)	(0.094)	(0.062)	(0.055)	(0.051)	(0.053)
Self-employment	β	0.755***	0.990***	0.246	0.491***	0.051	0.288***	-0.193*
		(0.158)	(0.170)	(0.174)	(0.110)	(0.092)	(0.090)	(0.101)
Quality	μ	0.067***	0.002	0.064**	-0.071***	0.070***	-0.002	-0.001
		(0.019)	(0.021)	(0.030)	(0.016)	(0.013)	(0.010)	(0.011)
Manufacturing	γ	-0.152***	0.156***	0.148**	-0.271***	0.122**	-0.199***	-0.250***
		(0.049)	(0.057)	(0.062)	(0.055)	(0.051)	(0.050)	(0.066)
Government	δ	0.078*	0.293***	0.054	-0.135***	0.060	0.129***	-0.019
		(0.046)	(0.053)	(0.066)	(0.049)	(0.045)	(0.046)	(0.051)
Size	ς	-0.008*	0.029***	0.004	-0.009**	0.014***	-0.006	0.007*
		(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Wage	η	0.120***	-0.176***	-0.101***	-0.129***	0.046*	-0.089***	0.001
		(0.027)	(0.031)	(0.037)	(0.031)	(0.028)	(0.021)	(0.025)
Educational attainment	φ	-0.001	0.004***	0.002	-0.006***	0.003***	0.001	-0.001**
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Universities	τ	0.013	0.005	0.019*	-0.004	0.007	0.003	0.004
		(0.009)	(0.010)	(0.010)	(0.008)	(0.007)	(0.006)	(0.006)
	π	0.295***	0.262***	0.115***	0.286***	0.420***	0.417***	0.401***
		(0.050)	(0.035)	(0.043)	(0.035)	(0.029)	(0.039)	(0.046)
R^2		0.492	0.516	0.158	0.468	0.450	0.488	0.393
Mean dep. Var.		0.146	0.049	0.124	0.089	0.106	0.045	0.026
Stdev dep. Var.		0.102	0.088	0.076	0.074	0.057	0.057	0.060
Observations		346	346	346	346	346	346	346

Note: The dependent variable is the five-year logarithmic change in total employment (including self-employment). The twenty MSAs in the state of Florida have been left out. Parameters in the 1969-74 period are assumed to be equal to those in the 1974-79 period for purposes of identification. Standard errors in brackets. Superscripts *, ** and *** indicate significance at the 10%-, 5%- and 1%-significance level, respectively. The value of the Wald χ^2-statistic testing the presence of quadratic effects of SE on total employment growth equals 9.06 (seven degrees of freedom). The corresponding p-value is 0.25.

Appendix

Table A1: Variables, definitions and sources

Variable	Definition	Source
Change in employment	5-year change in total employment (employment + proprietorship employment)	Bureau of Economic Analysis Regional Economic Accounts
Self-employment rate	Proprietorship employment as a ratio of total employment	Bureau of Economic Analysis Regional Economic Accounts
Quality	Average business owners income as a ratio of the average wage of employees	Bureau of Economic Analysis Regional Economic Accounts
Manufacturing share	Total employment in the manufacturing sector divided by total employment	Bureau of Economic Analysis Regional Economic Accounts
Government services	Total employment in the government services sector divided by total employment	Bureau of Economic Analysis Regional Economic Accounts
Relative wage	Ratio of the wage level per job in a MSA divide by the average wage level per job across all MSAs for the specific year	Bureau of Economic Analysis Regional Economic Accounts
Total employment	Employment and proprietorship employment	Bureau of Economic Analysis Regional Economic Accounts
Educational Attainment	Percent of the population with bachelor degree or more for persons 25 years old and over by state	Census of Population and the Current Population Survey
Universities and Research Institutions	The number of institutions in the MSA as either very high research activity or high research activity	Carnegie Classification of Institutions of Higher Learning