Do Entrepreneurs Create Jobs?

Stefan Fölster

ABSTRACT. Many countries support the creation of new firms. Such policy is based on the presumption that the total number of jobs increases when a person moves from unemployment or regular employment to self-employment. In this paper the link between self-employment and overall employment is analyzed. The empirical analysis, based on panel data of Swedish counties from 1976–1995, pays particular attention to simultaneity issues. The results suggest that self-employment may have a significant positive effect on overall employment.

1. Introduction

Does total employment increase when more people decide to become entrepreneurs and be their own employers? Or does this merely replace existing jobs with self-employment? These are important policy questions since many countries attempt to promote self-employment as a way of combatting unemployment. Many countries have introduced subsidies and loans to newly started firms. Many countries also allow unemployed people to receive unemployment insurance compensation during the initial phase of a business start-up. Further there are moves to lighten regulation and reduce taxes for self-employed.

In spite of this policy interest the question has received relatively little attention in economic research. Much of the literature on entrepreneurship has concerned effects on technological innovation and productivity growth, e.g. Schumpeter (1911) or Baumol (1990, 1993). In general equilibrium models, however, it remains ambiguous whether technological innovation and productivity growth increases or decreases employment.

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The Swedish Research Institute of Trade
103 29 Stockholm
Sweden
E-mail: stefan.folster@hui.se

One strand of literature has debated the extent of job creation in small firms (summarized e.g. in Storey, 1994).[1] Typically this literature has analyzed to what extent new jobs are created in small or large firms. But new jobs in small firms may merely substitute jobs in larger firms. In that sense this literature has not directly adressed the question whether restructuring from large to small firms increases or decreases total employment.[2]

There is also a sizable empirical literature on the determinants of self-employment (e.g. Blau, 1987; Rees and Shah, 1986; Blanchflower and Meyer, 1994). These studies usually formulate models that draw on Knight's (1921) notion that the individual responds to the risk-adjusted relative earnings opportunities associated with employment and self-employment.[3] These models are then tested using aggregate time series data on the frequency of self-employment in different branches or data from household surveys.

Some papers in this literature also indirectly estimate a relationship between self-employment and employment. For example, Parker (1996) finds a positive relation between unemployment and self-employment using cointegration techniques on aggregate U.K. time series.[4] This approach has been criticized by Meager (1994) who argues that these studies are biased by business cycle effects. In a slump some self-employed will go out of business, while unemployment grows simultaneously.

This critique raises two issues. One is that there may be correlations of unemployment and self-employment over the business cycle. The other issue is that there may be a simultaneous relation between self-employment and employment. On the one hand low employment may induce people who have a hard time finding work to become self-employed. On the other hand, increased self-employment may affect employment. The point of

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this paper is to disentangle these simultaneous relationships and to identify the long-run structural effect that self-employment may have on employment.

To this end we explore two simultaneous structural equations that link self-employment with the overall employment rate. The first captures individuals' choice of self-employment. This may be affected by the fact that a fall in employment makes self-employment relatively more attractive or provides an alternative to those unable to secure a job, thus increasing the rate of self-employment.[5] This is sometimes called the "push effect". In addition self-employment may vary due to demand fluctuations over the business cycle or structural shifts in business conditions. This is sometimes called the "pull effect" into self-employment.

The second structural equation models the demand for labor as a function of the wage rate, business conditions, but also the share of self-employed. A number of possible mechanisms have been mentioned in the literature. For example, a number of models link entrepreneurship to productivity growth.[6] If the self-employed create productive firms some of which in turn hire additional workers, then the aggregate marginal product of labor may increase for a given total employment. At the current wage rate the demand for labor will then increase. While a higher demand for labor will also drive wages this may be moderated by the fact that higher wages can attract more people into the labor force.[7]

In addition there are a variety of micro-economic and political mechanisms through which self-employment may affect overall employment. For example, there is no principal-agent problem between the firm owner and the employee for the self-employed. This means that there is no need for an efficiency wage and the equilibrium unemployment that is normally associated with efficiency wages. Further, there are no employment protection laws for self-employed. This means that firms may be more prone to engage people if there is a good supply of self-employed that can be contracted, instead of having to employ people who then may be costly to lay off. An additional indirect mechanism could be that a greater share of self-employed exerts a political influence which makes policy more favourable to business in general.[8]

In appendix I it is shown how these two structural equations can be derived from micro-foundations, starting with a labor market modelled in the tradition of Layard-Nickell-Jackman (1991), and extended by allowing employees to become self-employed. The main aim of the paper, however, is to empirically disentangle the simultaneous nature of the equations linking self-employment and employment.

One could try to analyze our model using country data for e.g. OECD countries. Unfortunately, there are considerable problems in comparing self-employment data between countries. The definitions of self-employment and employment vary considerably between countries. The same is true for the various variables that one might use as instruments and controls.

Instead, the model is applied to Swedish panel data of regional employment and self-employment. Using this data base it is possible to estimate cross-section, time-series regressions without encountering the considerable variation in the definition of the self-employed that plague cross-country comparisons. Also there is a fair supply of variables in this data base that can be used as instruments to disentangle the simultaneous relationships.

The analysis indicates that self-employment may indeed have a significant positive impact on overall employment. Section 2 presents empirical approach, Section 3 describes how the simultaneity problem is adressed, and Section 4 presents the results.

2. The empirical approach

The starting point is a modified version of the Layard-Nickell-Jackman (1991) model of a labour-market distinguishing between a wage-setting and a labour-demand relationship.[9] In Appendix I we show in greater detail how the macroeconomic expressions could be derived from a microeconomic model.

In the Layard-Nickel-Jackman model wages for employees (w) are thought of as being derived either from a bargaining (monopoly-union) model or from an efficiency-wage framework. The (real) wage is a positive function (1) of employment, n, and other variables. Employment is defined as the

share of the labor force that is either in regular employment or is self-employed.

$$w_{i,t} = \omega_i + \omega_t + \omega n_{i,t} + u_{i,t} \quad (1)$$

We express these relationships directly in the linear form that we assume in empirical estimation. We do not use the logarithmic form since the main variables $n_{i,t}$ and $s_{i,t}$ are already ratios of the labour force. Thus the coefficients (ω, λ) are easily interpreted as the effects of changes in employment and self-employment in terms of percent of the labour force rather than percent changes of absolute levels of these variables. Since we use panel data there is an observation for each region i and each time period t. It is natural to assume that there is a fixed component for each region, denoted by ω_i, a fixed component for each time period, denoted by ω_t, and stochastic and a normally distributed error $u_{i,t}$. The regional and period dummies go some way to correcting for differences in the business structure and economy-wide business cycles.[10]

The main modification in our model is that we assume that employment consists of regular employment and self-employment. We do not make any particular assumptions about the characteristics of firms operated by self-employed. They may be one-man operations, or they may in turn hire regular employees. The self-employed may work in the same branches as regular employees, or they may be concentrated in particular branches.

It is assumed, however, that entrepreneurial competence, and access to promising business ideas, varies among people. Suppose people can be ranked by their competence and the quality of their business idea in terms of the profit they earn if they become self-employed. Then the profit of the marginal self-employed, π', is a (decreasing) function of the share of self-employed of the labour force, s.[11] Here $v_{i,t}$ is a normally distributed stochastic error.

$$\pi'_{i,t} = p_i + p_t + ps_{i,t} + v_{i,t} \quad (2)$$

The share of self-employed, s, is determined by a relation between w and π'. The exact equilibrium relationship will depend on what the likelihood is that unemployed have business opportunities and how high unemployment benefits are in relation to wages. We assume simply that $\pi'_{i,t} = aw_{i,t}$. This allows combining and substituting (1) and (2) into equation (3), giving s as a negative function of n. Equation 3 expresses that a decrease in n lowers wages w (and income to unemployed) and thus makes it relatively more profitable to become self-employed. Equation (3) incorporates both the push effect – which makes self-employment more attractive when employment falls, and the pull effect captured by level shifts which may make self-employment (and sometimes employment) more attractive as business policy becomes more favorable or business conditions change. These shifts are captured by the region and period dummies ω_i and ω_t as well as the error term. Here the error term $\mu_{i,t}$ is a function of $u_{i,t}$ and $v_{i,t}$.

$$s_{i,t} = \frac{a(\omega_i + \omega_t)}{p} - \frac{p_i + p_t}{p} + \frac{\omega a}{pn_{i,t}} + \mu_{i,t} \quad (3)$$

Finally, the labor demand relationship is assumed to follow from profit-maximizing behaviour of firms. The share of employment as a proportion of the labor force, $n_{i,t}$, is a decreasing function of the wage level and a vector of other variables.[12] In addition employment may be a function of the share of self-employment. Most directly the self-employed add to employment themselves, but some of them also employ others. To some extent this may replace employment in other firms. But at least in a Keynesian setting s also influences n directly to the extent that those that become self-employed do not crowd out other employed or self-employed persons. In addition self-employed may behave differently from regular employees in ways that affect employment, for example by not demanding negotiated wages and employment protection, or by having greater incentives to improve productivity.

Equation (4) shows the empirical implementation of this relationship between overall employment and self-employment. Here we also introduce lagged employment as a variable in order to capture lingering effects of self-employment that arises when start-ups grow and hire labour.

$$n_{i,t} = \eta_i + \eta_t + \mu_{t-1}\eta_{i,t-1} + \eta w_{i,t} + \lambda s_{i,t} + z_{i,t} \quad (4)$$

Figure 1 illustrates the model. The downward sloping line captures the determination of self-employment in equation (3) which increases the number of self-employed as employment and

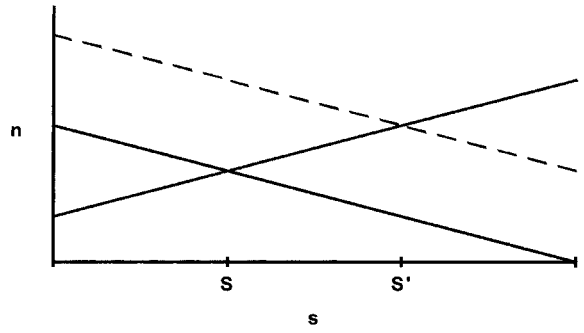

Figure 1. The relationship between self-employment *s* and employment *n*.

wages fall. The upward sloping line captures the employment function expressed in equation (4).

If policy is made more conducive to self-employment for other reasons then π' will rise for a given *s*. This would shift the downward-sloping line outward to the dotted line in Figure 1. The number of self-employed then increases from *S* to *S'* and employment increases also.

In this paper we do not analyze what causes different regions to end up in different employment/self-employment locations. Rather, we estimate the relationship given by equation (4), trying to isolate this from the simultaneous relationship given by (3) and business cycle and other effects that might affect the error terms in (3) and (4) simultaneously. Thus we seek an answer to the following question: What is the overall employment effect of a policy change, or of improved entrepreneurial opportunities, that increase self-employment by a certain amount?

3. The simultaneity issue and other econometric problems

We exploit a pooled time-series cross-section data set containing information on the 24 Swedish counties (län) in order to study the covariation between employment and self-employment. The estimates concern the period 1976 to 1995 for which data are available. The self-employment data exclude agriculture. The data are described in more detail in Appendix II.

Clearly, estimation of the system described by equations (3) and (4) as it is does not allow identification of the coefficients. Since we use county data the bias need not be all that large. The wage may be determined more by the national wage rate, and thus not be influenced very much by fluctuations in local employment. Further, for the decision to become self-employed the comparison with the national wage may be more important than with the county wage. If $w_{i,t}$ were exogenous rather than being endogenous then the system would be recursive, and (4) could be estimated as it is. However, that would still leave a risk of business cycle and other effects that could simultaneously vary the error term in both equations.

If there is a simultaneity bias in estimating equation (4) we do know something about the direction of the bias. The coefficients ω in equation (1) and p in equation (2) are negative by assumption. We can rewrite (3) and (4) as

$$n_{i,t} = -\frac{\omega_i + \omega_t}{\omega} + \frac{1}{\omega w_{i,t}} + u_{i,t} \qquad (5)$$

$$n_{i,t} = -\frac{\omega_i + \omega_t}{\omega} + \frac{p_i + p_t}{\omega a} + \frac{p}{\omega} a s_{i,t} + u_{i,t} \qquad (6)$$

Here we know that the coefficient $1/\omega$ on $w_{i,t}$ will be negative and $p/\omega a$ on $s_{i,t}$ is positive. Following the discussion in e.g. Maddala (1977, p. 242) this implies that the bias in estimating η leads to overestimation, while for λ in (4) the bias leads to underestimation. This means that the true coefficient λ is as least as large as the estimated ones.[13] This will be interesting if we find a rather large positive estimate for λ.

Of course the picture is complicated if there are other biases as well. For example, if county employment rates are measured with an error these may be correlated with errors in the measure of self-employment since both are employment and self-employment are measured in the same survey. But these surveys are quite extensive and not likely to contain significant errors. In any case such a measurement error would also lead to underestimation of λ.

More worrisome is our specification of the lag structure as a Koyck lingering effects model. It is well known that the lingering effects specification may give plausible, but misleading, coefficient estimates if the true lag structure is a current effect model with an autoregressive error scheme. This possibility, however, we test for and reject the current effect model. A remaining problem, however, is that the error term in the lingering

effect model is a moving average process and is therefore correlated with the lagged value of the dependent variable, $n_{i,\,t-1}$. Estimation by OLS leads to biased estimates.[14]

We adress the biases that may arise due to including the lagged dependent variable and simultaneity by using three types of instrument variable estimation methods, that are applied both to levels and first differences.

First, we use a 2SLS estimation, replacing the lagged dependent variable $n_{i,\,t-1}$ by its estimated value, using the second lag of employment as an instrument. This mainly adresses the issue of biased estimates due to the Koyck lingering effects specification.

Our second approach adresses both the lingering effects specification and the simultaneity problem. η and λ in equation (12) can be identified if instruments can be found that are exogenous determinants of $w_{i,\,t}$ and $s_{i,\,t}$. Therefore we use a 2SLS procedure using instruments for all three independent variables in (12). For $w_{i,\,t}$ we use regional dummies, the national wage rate and the ratio between county unemployment and non-employment as a share of the population age 16–64. Unemployment is a measure of how many people without employment are immediately available in the labour market. Non-employment includes people in labour market programmes and people in early retirement (often due to previous unemployment). The ratio of unemployment to non-employment is thus a measure of the labour market policy stance, which we take as exogenously given.[15]

As instruments for $s_{i,t}$ we use regional dummies, the second lag of $s_{i,t}$, and the share of public work that is contracted out, and a dummy for the introduction of a subsidy to unemployed for firm start-ups. Different counties have pursued quite different policies in terms of allowing entrepreneurs to compete for contracts. In some counties most work is done by public employees, while in other counties a sizable share is contracted out. Contracting out generally increases the number of self-employed. We take the choice of contracting out to be an exogenous policy variable.

Third, the availability of instruments allows us to use GMM as an estimation method. Apart from adressing the presence of the lagged dependent variable and the simultaneity problem, this procedure is also considered to be robust against autocorrelation and heteroscedasticity. GMM exploits the idea that the disturbances in the equations are uncorrelated with the instruments. The GMM estimator is the one that sets the calculated correlations of the instruments and disturbances as close to zero as possible, according to a criterion provided by a heteroscedasticity and autocorrelation corrected weighting matrix.

Two other econometric concerns should be discussed before we report results. First, one could argue that a number of regional variables that ought to be important are omitted from our regressions. These include population density, government production subsidies, public sector employment, labour market programmes, tax rates, and other factors. Many such differences between regions are, however, captured by our dummy variables. Also, this argument carries less weight the longer the periods of observation. The reason is that the actual rate of unemployment is then likely to be closer to the equilibrium rate, the main determinants of which are usually taken to be only a number of structural labour-market parameters.[16] For this reason we perform som regressions on averages over several years instead of on yearly observations. Also, to be on the safe side a number of potential explanatory variables, such as population density, are tested.

Second, a concern one might have is that regions with much self-employment increase their employment share merely by acting as a magnet for attractive employees. This possibility should be borne in mind when interpreting our results. Essentially the question is whether there is a supply restriction at the national level for certain types of labor, which is not binding at the regional level. One could argue, however, that if all regions increased self-employment and become “magnets” for attractive labor then it would become more profitable for the individual and for the nation to invest in the scarce human capital, so that supply would also increase. One should also note that the problem would be bigger if the regions we use as units of observations were smaller. The regions we use as units of observations are generally too large for employment figures to be affected merely by commuters.

4. Results

The first column in Table I shows OLS estimates of equation (4). The coefficient for self-employment is significant at the one percent level. The coefficient estimate for self-employment implies a short-run effect of around 0.5. This means that when self-employment increases by an additional one percent of the work force, then total employment increases by one half percent of the workforce. The long-run effect is calculated by taking into account the dynamics that arise because an increase in total employment also affects next year's total employment and so forth. The long run effect based on a self-employment coefficient of 0.5 would be 1.3. This would mean that when self-employment increases by one percent more of the work force, then total employment eventually increases by 1.3 percent of the workforce. A typical region with high self-employment, say 10 percent of the labor force, would then have total employment of 6.5 percentage points higher than a typical region with low self-employment with say, 5 percent of the labor force in self-employment.

As noted above this estimate is probably biased, but the presumption is that the bias is downward, and that the effect of self-employment may be underestimated.

In column (2) the second lag of employment is used as an instrument for lagged employment. In columns (3) to (5) all the instruments discussed above are used for the three explanatory variables. Column (5) uses the GMM estimation procedure.[17] As it turns out the coefficient estimates are not that different. The estimates for the self-employment coefficient are slightly higher when self-employment is instrumented. This is what one might expect, given that the simultaneity problem implies that OLS underestimates the coefficient. The difference, however, is quite small. A Hausman specification test, for example, does not detect any significant correlation between the explanatory variables and the error term.[18] This is again not a great surprise in light of the arguments given above, implying that the simultaneity bias

TABLE I
Estimated equation for the regional employment rate, 1976–1995, levels

Independent variables	OLS (1)	2SLS (2)	2SLS (3)	2SLS (4)	GMM (5)
Regional Employment rate, lagged	0.62*	0.60*	0.69*	0.63*	0.67*
	(17.91)	(17.94)	(29.81)	(20.76)	(16.14)
Self-employment	0.50*	0.50*	0.53*	0.54*	0.57*
	(8.09)	(8.03)	(7.21)	(7.42)	(6.89)
Relative wages	0.019	0.014	–0.035	–0.038	–0.041
	(0.36)	(0.37)	(–1.31)	(–1.34)	(–1.01)
Regional dummies	Yes	Yes	Yes	Random	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes
R^2-adj	0.98	0.98	0.98	0.98	0.98
Ljung-box Q-stat	1.99	2.16	1.67	1.22	0.16

Notes:
(i) *, indicates significance at the 1%-level.
(ii) *T*-ratios within parentheses.
(iii) The regressions have 480 observations.
(iv) Equations (1) and (2) are estimated with fixed, regional, effects.
(v) Equation (4) is estimated with "random effects" for each region.
(vi) Relative wages is the ratio between regional to national wages.
(vii) In column (2) the second lag of employment is used as an instrument for lagged employment.
(viii) In column (3), (4) and (5) instruments are the second lags of employment, self-employment and wage, regional dummies, the national wage rate and the ratio between county unemployment and non-employment as a share of the population age 16–64, the share of public work that is contracted out, and a dummy for the introduction of a subsidy to unemployed for firm start-ups.

may not be all that great. The instrumental variable technique also corrects for simultaneous variation in the error term, due to business cycles or other effects.

We also test whether the lingering effects model is correct by running the regression including lagged self-employment as an explanatory variable. The estimated coefficient for lagged self-employment is, however, never significantly different from zero. This supports the use of the lingering effects specification.

Population density has also been tried as a separate explanatory variable, but the estimated coefficient is always near zero and insignificant and is therefore not shown. This is what should be expected given that fixed effects are controlled for and population density is quite stable.

Since a Durbin-Watson test statistic is biased in regressions with lagged dependent variables, we use a Ljung-Box Q statistic to test for autocorrelation, with 3 lags. The Q-statistic is distributed as a Chi-square with three degrees of freedom. The statistic does not indicate presence of serial correlation in any specification.

To throw some light on the robustness of the estimates above, Table II shows the same regressions in first differences. First differences is the most radical way of eliminating fixed effects between regions. The first-difference form, using the second-lag of the dependent variable as an instrument for the lagged dependent variable is also suggested by Anderson and Hsiao (1981) as a solution to the bias in estimating regressions with lagged dependent variables and fixed effects.

Table III displays the estimates using non-overlapping four year periods as the unit of observation. In these regressions the coefficient on self-employment becomes much larger, since the lagged effects are included. On the other hand the coefficient on the lagged regional employment variable becomes much smaller. If one calculates the long run effect of self-employment on total employment based on Table III, the effect is on the same order of magnitude as the calculation based on Table I; that is, an increased share of self-employment by one percent of the population increases total employment by about 1.3 percent of the population.

There is a remaining concern that the estimates may be an artifact of business cycle swings or of

TABLE II
Estimated equation for the regional employment rate, 1976–1995, first differences

Independent variables	OLS (1)	2SLS (2)	2SLS (3)	2SLS (4)	GMM (5)
Regional Employment rate, lagged	–0.025 (–0.511)	–0.025 (–0.515)	–0.011 (–0.228)	–0.0009 (–0.019)	–0.0009 (–0.019)
Self-employment	0.49* (6.19)	0.49* (6.16)	0.51* (5.44)	0.51* (5.33)	0.53* (5.11)
Relative wages	–0.01 (–0.67)	–0.04 (–0.50)	–0.05 (–0.61)	–0.044 (–0.547)	–0.044 (–0.47)
Regional dummies	Yes	Yes	Yes	Random	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes
R2-adj	0.93	0.93	0.93	0.93	0.93
Ljung-Box Q stat.	0.99	0.84	0.69	1.44	1.31

Notes:
(i) *, indicates significance at the 1%-level.
(ii) *T*-ratios within parentheses.
(iii) The regressions have 457 observations.
(iv) Equation (4) is estimated with random, regional, effects.
(v) Relative wages is the ratio between regional to national wages.
(vii) In column (2) the second lag of employment is used as an instrument for lagged employment.
(viii) In column (3), (4) and (5) instruments are the second lags of employment, self-employment and wage, regional dummies, the national wage rate and the ratio between county unemployment and non-employment as a share of the population age 16–64, the share of public work that is contracted out, and a dummy for the introduction of a subsidy to unemployed for firm start-ups.

TABLE III
Estimated equation for the regional employment rate, 1976–1995 (4-year intervals), levels

Independent variables	OLS (1)	2SLS (2)	2SLS (3)	2SLS (4)	GMM (5)
Regional Employment rate, lagged	0.20**	0.21**	0.20**	0.20**	0.21**
	(2.98)	(2.09)	(2.15)	(2.12)	(2.99)
Self-employment	1.14*	1.16*	1.19*	1.17*	1.21*
	(5.85)	(5.87)	(5.00)	(5.13)	(5.22)
Relative wages	–0.07	–0.11	–0.17	–0.93	–0.13
	(–1.41)	(–1.35)	(–1.09)	(–1.05)	(–0.86)
Regional dummies	Yes	Yes	Yes	Random	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes
R2-adj	0.95	0.95	0.97	0.97	0.95
Ljung-Box Q stat.	2.41	1.89	1.49	1.77	1.89

Notes:
(i) * and **, indicates significance at the 1% and 5%-level respectively.
(ii) *T*-ratios within parentheses.
(iii) The regressions have 120 observations.
(iv) Equations (3) and (4) are estimated with fixed, regional, effects.
(v) Equation (5) is estimated with "random effects" for each region.
(vi) Relative wages is the ratio between regional to national wages.
(vii) In column (2) the second lag of employment is used as an instrument for lagged employment.
(viii) In column (3), (4) and (5) instruments are the second lags of employment, self-employment and wage, regional dummies, the national wage rate and the ratio between county unemployment and non-employment as a share of the population age 16-64, the share of public work that is contracted out, and a dummy for the introduction of a subsidy to unemployed for firm start-ups.

reverse causality rather than long-term effects. One way of looking at this issue more closely is to perform a Granger causality test. While this is not a foolproof method, a negative result would significantly weaken our case. This is shown in Table IV. This test indicates that self-employment Granger-causes employment, but employment does not Granger-cause self-employment. We have also used a Box-Jenkins pre-whitening procedure to calculate Granger-causality. This led to quite similar conclusions, and is therefore not reported.

Table IV supports the notion that self-employment Granger-causes employment, and this effect is more significant with a few years lag. This is precisely what one would expect. Some self-employed begin to employ with a lag. A few of the self-employed even employ many other after some time. The hypothesis that self-employment does not Granger-cause employment is significantly rejected. On the other hand the test provides no indication that employment Granger-causes self-employment.

TABLE IV
Granger causality tests for the relation between self-employment and employment for different lags of self-employment, F-statistic

Null hypothesis	1 lag	2 lags	3 lags	4 lags	5 lags
1. Self-employment does not Granger-cause employment	2.96	6.89	9.33	10.41	11.13
	(0.08)	(0.04)	(0.02)	(0.006)	(0.003)
2. Employment does not Granger-cause self-employment	1.77	1.09	0.97	0.94	1.01
	(0.29)	(0.33)	(0.37)	(0.39)	(0.37)

Comment: Probabilities in parentheses.

5. Conclusion

There are a number of mechanisms that link self-employment to total employment. We have attempted to capture these in a simple framework in the Layard-Nickell tradition. Some micro-foundations for the link between self-employment and employment are provided in Appendix II. But clearly more theoretical development of the mechanisms involved would be desirable.

As an empirical matter, however, we find significant support for the notion that increased self-employment has a positive effect on employment. A key issue in this empirical study is to identify parameters in the presence of simultaneity. We adress this problem with the use of instruments. As a word of caution, the choice of instruments may be important.

Another cautionary note concerns the characteristics of self-employment. Our results concern the effects of the pattern of self-employment that actually occurred. If one implemented public programs to increase self-employment it is not at all certain that this artificially created self-employment has the same characteristics, and the same employment effects, as we find here.

This raises a wider issue, namely which types of self-employment are most entrepreneurial and how business conditions for those could be improved. That may be an avenue for future research.

Appendix I: Some microfoundations.

The starting point is a modified version of the Layard-Nickell-Jackman (1991) model of a labour-market, distinguishing between a wage-setting and a labour-demand relationship.[19] In this type of model wages for employees (w) are thought of as being derived either from a bargaining (monopoly-union) model or from an efficiency-wage framework. The (real) wage is a positive function of employment, n^d, and a negative function of labour supply n^s. In the following equations we ignore other structural and business cycle variables. Employment, n^d, is defined as the share of the labor force that is either in regular employment or is self-employed. The difference between n^d and n^s constitutes unemployment.

$$w = f(n^d, n^s) \qquad \frac{\partial f}{\partial n^d} > 0, \qquad \frac{\partial f}{\partial n^s} < 0, \qquad \text{(A1)}$$

Individuals choose whether to enter the labor force, and they choose whether to seek employment or to become self-employed. It is assumed, however, that entrepreneurial competence, and access to promising business ideas, varies among people. Suppose people can be ranked by their competence and the quality of their business idea in terms of the profit they earn if they become self-employed. Then the profit of the marginal self-employed , π', is a (decreasing) function of the share of self-employed, s.

$$\pi' = h(s) \qquad \frac{\partial h}{\partial s} < 0, \qquad \text{(A2)}$$

Each individual maximizes utility in choosing between employment and self-employment. In equilibrium the number of self-employed is then determined by a market clearing condition $\pi' = k(w)$. If the individual is risk averse the expected profit for the marginal self-employed will be higher than the wage. But this could be reversed if self-employment is thought to be attractive in other ways. Individuals for whom $\pi' \geq k(w)$ are assumed to always be in the labor force and self-employed.[20] Other individuals merely choose whether to be in the labour force or not. For these utility maximization implies that more enter the labor force when the wage increases, $n^s = q(w)$.

Combining equations (A1) and (A2) and the equilibrium conditions yields equation (A3) which expresses that a decrease in n^d lowers wages w (and income to unemployed) and thus makes it relatively more profitable to become self-employed.

$$s = g(n^d, n^s) \qquad \frac{\partial g}{\partial n^d} < 0, \qquad \text{(A3)}$$

Finally, the labour demand relationship is assumed to follow from profit-maximizing behaviour of firms.

In order to model the demand for labor, assume that there is a size distribution of firms which is determined by economies of scale in the firm, or by the scarce supply of managerial talent as modelled in Lucas (1978). It is assumed that firms merge if they can better exploit economies of scale. Thus the size distribution of firms at any point in time is optimal. Each firm i, however,

operates in the range of diminishing marginal returns, and employs up to the point where the marginal product of labour equals the market wage, $m_i' = w$. For simplicity assume that each firm is operated by a self-employed person.

If an employee starts a new firm and becomes self-employed one of two things can happen. Either the new size distribution of firms may not be optimal, which implies that there will be a merger and the number of self-employed will remain unchanged. Or the new size distribution is optimal. This means that the marginal product of labor increases which increases the demand for labour. This labor demand function is expressed in (A4).

$$n^d = y(w, s). \qquad \text{(A4)}$$

It is now obvious that an increase in the number of self-employed leads to a higher marginal product of labor for a given wage rate, and thus increases labour demand n^d. The increase in the wage rate is, however, moderated by the fact that more people enter the labour force, according to $n^s = q(w)$.

Equations (A3) and (A4) correspond to the empirical equations (1) and (2) in the main text. There, however, n^d and s are expressed as a share of the labor force n^s, which therefore does not enter the equations explicitly. In the empirical work unobservable structural and business cycle variables that also determine $g(\ )$ and $y(\ )$ are captured by region and period dummies.

Appendix II: Data description

We have taken data for the number of self-employed, total employment, and people employed in agriculture in different counties from the labor force survey (AKU). The share of self-employment is calculated by dividing the number of self-employed minus self-employment in agriculture by the labor force. County variables are obtained from the Statistical Central Bureau Yearbook.

Relative wages are calculated as, regional wages for ISIC (SNI) 2 and 3, divided by national wages for ISIC (SNI) 2 and 3.

All observations are yearly from 1976–95.

Notes

[1] Birch (1979) first found that small and newly founded firms create most jobs. The results by Birch and others were criticized by Davis, Haltiwanger and Schuh (1996a, 1996b). But their criticism is partly refuted by Davidsson, Lindmark and Olofsson (1998). This issue is also surveyed e.g. in Acs (1996) and Acs, Carlsson and Karlson (1998).

[2] An exception is a paper by Thurik (1999) who studies the timing of changes in the share of entrepreneurs and unemployment in 23 OECD countries. He finds that a change in the number of entrepreneurs Granger causes a change in the rate of unemployment.

[3] More recent theoretical models in this tradition consider explicitly how stochastic shocks in demand or cost functions affect the decision to become self-employed (Appelbaum and Katz, 1986; Kihlstrom and Laffont, 1979).

[4] See also Crouchley et al., 1994.

[5] This mechanism is common in models of the choice of self-employment versus regular employment, e.g. Blau (1987). A number of authors describe this effect in terms of self-employment as a safety valve for unemployed people or people that are discriminated in the labour market, e.g. Moore (1983).

[6] E.g. Baumol, 1993.

7 An additional mechanism is that if unemployment is caused by rigid wages, it may be important that the self-employed generally have flexible incomes, e.g. they do not have a negotiated wage. This means that they will meet temporary slumps with reduced income rather than unemployment.

[8] Such political equilibria have been analyzed in Fölster and Trofimov, 1997.

[9] The model has been modified in other ways, e.g. to include participation in labour market programs by Calmfors (1994) and Calmfors and Skedinger (1995).

[10] Other variables that play a role are unemployment compensation, total factor productivity, the capital stock, and taxes, the quality of business opportunities, taxes, employment regulation and other policies that affect business. These are not explicitly included because many may be endogenous functions of self-employment. Instead an instrumental variables technique is used to isolate the exogenous effect of self-employment on total employment.

[11] B includes the quality of business opportunities, taxes, employment regulation and other policies that affect business.

[12] Such other variables might include productivity and the capital stock.

[13] This reasoning assumes that the covariances between the error terms u, v, and z are zero.

[14] Nickell (1981) also shows more generally that dynamic models with fixed effects yield biased estimates of order $1/T$.

[15] Calmfors and Skedinger (1995) provide a closer analysis of the link between labour market policy and the jobless rate.

[16] It is argued that since there seem to be no secular trends in unemployment, changes in the variables discussed must in equilibrium be fully shifted on to the real consumption wage (e.g. Layard et al., 1991; Bean, 1994; Calmfors and Skedinger, 1995).

[17] The GMM module in E-views was used. For the estimations reported here the Bartlett kernel was chosen in

combination with Andrew's automatic bandwidth procedure. We have also run GMM on a pre-whitened residual. This hardly affected the results.

[18] The Hausman specification test implies that a reduced form equation is estimated by OLS with self-employment as dependent variable and the instruments used in columns (3) to (5) of Table I as explanatory variables. The fitted values from this regression are then included in the employment equation (column 1). The Hausman test then consists of testing whether the coefficient on the fitted value is significantly different from one.

[19] The model has been modified in other ways, e.g. to include participation in labour market programs by Calmfors (1994) and Calmfors and Skedinger (1995). Labour supply is often assumed constant in these models. Here we let labour supply vary.

[20] In a more sofisticated model one might take into account that some unemployed individuals may choose self-employment even if $\pi' < k(w)$. This is the so-called "push-effect".

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