Do Lower Taxes Stimulate Self-Employment?

Stefan Fölster

ABSTRACT. This paper investigates the relation between taxation and the share of self-employed in two data sets. First, in a panel of OECD countries a strong negative correlation is found between the tax burden and the share of self-employed in total employment. Unfortunately the OECD data contains a number of measurement problems, and too few observations to allow a reliable detection of reverse causation. Therefore the analysis is complemented with regressions on the relation between the income tax and the share of self-employed using a panel of Swedish counties over the previous two decades. Here again there is a strong negative correlation between the tax burden and the share of self-employment. This survives simultaneous equations estimates and tests of Granger causality. Both samples indicate that reducing the tax burden by 10 percentage points (of GDP) increases the share of self-employed by about 3 percent of total employment.

1. Introduction

Should self-employment be encouraged with lower taxes? Yes, is the answer often given in the public policy debate. One line of argument is that some people who become self-employed are entrepreneurs who are creators of jobs and new products. Another line of argument is that self-employment is a safety valve for unemployed people or people that are discriminated in the labour market (e.g. Moore, 1983). In fact, a number of studies find that overall employment tends to be higher if a greater share of employed are self-employed (Thurik, 1999; Fölster, 1998).

But do lower taxes stimulate self-employment? Some policy proposals focus on asymmetric tax cuts, making the tax system more favorable for self-employed relative to employed people. For example, in many countries capital gains tax or wealth tax is reduced for investment in small businesses. But the argument is also made that general tax cuts for both self-employed and employed strengthens incentives to invest and work, thus making it more likely that potential entrepreneurs start firms and that unemployed people move into self-employment.

This paper investigates the link between the general tax level and the frequency of self-employment. Regressions based on a sample of OECD countries indicate a rather strong relationship between the general tax burden and the share of self-employed. This sample does not, however, permit a fuller investigation of a number of econometric issues, in particular of simultaneity issues. Therefore we present a more sofisticated analysis using a 20-year panel of Swedish counties. This second sample appears to confirm the relation between the tax burden and the share of self-employed.

Why taxes might affect self-employment

Theoretical models of the determinants of self-employment usually draw on Knight's (1921) notion that the individual responds to the risk-adjusted relative earnings opportunities associated with employment and self-employment. 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). In this type of model it is obvious that an asymmetric tax reduction, favoring the self-employed relative to others, increases self-employment. It is less obvious, however, why a general tax reduction might increase self-employment. In the models that build on Knight's tradition this only occurs if a general tax reduction increases willingness to accept a more uncertain

Final version accepted on January 5, 2001

Confederation of Swedish Enterprise
114 82 Stockholm
Sweden
E-mail: stefan.folster@svensktnaringsliv.se

Small Business Economics **19**: 135–145, 2002.

income stream. Whether this is the case depends on the shape of the utility function. Sinn (1996), for example, argues that redistributive taxation provides an insurance mechanism that may actually stimulate risk-taking, and thus self-employment. Ilmakunnas et al. (1998) show on the other hand that tax-financed welfare state arrangements generally insure employees' income, but not entrepreneurial investment in capital and effort made by self-employed. This would imply that tax-financed social insurance tends to make regular employment more attractive relative to self-employment.

Looking beyond these models, however, there are a number of additional reasons why a general tax reduction may affect self-employment. First, a tax-financed welfare system tends to reduce household savings.[1] Growing evidence suggests that potential entrepreneurs are constrained by limited access to capital.[2] This means that welfare state expenditure that replaces individual saving by pay-as-you-go systems may limit entrepreneurial investment.

A second reason why lower taxes may affect self-employment is that lower taxes often imply lower expenditure on unemployment benefits, early retirement benefits, and other subsidies to non-work. To the extent that unemployment benefits are reduced unemployed people who are constrained on the labor market have greater incentives to become self-employed.

A third mechanism has to do with tax evasion. Self-employment may make it easier to deduct private consumption as business expenses. On the other hand self-employment usually involves a more complicated taxation, greater costs for accounting and greater risks of being hassled by the tax authorities. Depending on how tax administration is organized and which of these effects dominate this mechanism may give rise to increasing or decreasing self-employment as the tax rate changes.

A fourth reason might be that higher taxes imply that more services are provided by the public sector that otherwise would be provided by self-employed.

A fifth mechanism that links taxes and self-employment is that tax policy depends on political decisions and is influenced by how many voters are, or intend to become, self-employed. As a result countries that have few self-employed may end up taxing the self-employed more heavily. In 1942 Schumpeter (1970) advanced the theory that economies of scale in large firms would lead to a reduction in self-employed that eventually would erode political support for capitalism. A similar theory can be advanced concerning the size of the public sector. Higher taxes often imply that there are more public employees, and fewer self-employed. This in turn tilts public opinion in favor of high taxes. This would imply a simultaneous relationship between taxes and the share of self-employed.

Previous empirical studies

A sizable empirical literature uses microeconomic data on individuals to analyze the determinants of self-employment. A common approach relevant to our question is how estimated income differences between employment and self-employment affect the decision to be self-employed. Evans and Leighton (1989) for example, use a panel data set of American individuals, and find that people with low wage and individuals with greater wealth had a higher probability of becoming self-employed. Several studies attempt to estimate what income would have been if the individual had not chosen employment or self-employment respectively. Other examples of this literature are Taylor (1996) and Fuji and Hawley (1991) who find that self-employed earn more as self-employed than they would have as employees, while Rees and Shah (1986) seem to find the opposite.

Several studies confirm that wealth has a positive effect on the probability of self-employment. Examples of this literature are Holtz-Eakin et al. (1994a, b). To the extent that higher taxes reduce saving and wealth creation these studies offer an explanation for a relation between taxes and self-employment.

Another type of study has looked at investment by self-employed. Carroll et al. (1998a) examine how the Tax Reform Act of 1986 in the U.S. affected different groups of entrepreneurs. They find that entrepreneurs whose marginal taxes were reduced the most also increased investment in physical capital most. In their sample a five percentage point increase in marginal tax reduced entrepreneurial investment expenditure by roughly

10 percent. Carroll et al. (1998b) show, with a similar approach, that a reduction in income taxes increases the probability that entrepreneurs hire labor.

A number of macroeconomic studies have also been conducted. In these the effects of taxes are sometimes analyzed. Blau (1987) examine time series of the share of self-employed in different industries. He finds a negative effect of marginal taxes in a lower income bracket, and a positive effect in a higher income bracket. The interpretation given is that high income earners may choose self-employment more often when taxes are high since this gives increased possibilities of avoiding taxes.[3]

Outline of the paper

This paper reports two complementary pieces of empirical work. In Section 2 self-employment in OECD countries are regressed over the tax-pressure and control variables.

In Section 3 a similar analysis is performed on a panel data set of Swedish counties. This data set has the advantage over OECD data that the incidence of measurement problems is greatly reduced, and the number of observations and availibility of control variables is much greater. In this data set a number of econometric problems, such as simultaneity can be more fully adressed.

2. A comparison of OECD-countries

Self-employment is measured as the share of total employment, excluding farming, as reported by the OECD (1992) for 19 countries at three points in time (1970, 1980, 1989). It is assumed that the self-employment data for 1970, 1980 and 1989 are representative for each decade, 1965–1974, 1975–1984, and 1985–1993. Other variables, also taken from OECD databases, are calculated as averages for each of these periods.

The self-employment data suffer from a number of measurement problems. One is that unpaid family workers are included in most countries. Since agriculture is excluded, however, this should be a minor problem, accounting for a fraction of 1 percent of total employment. More troublesome may be that owner-managers of incorporated businesses are not classified as self-employed in about half the countries. This implies that simple comparisons should be made with caution. In the regressions, however, a dummy is included to capture exclusion of owner-managers.

Figure 1 shows average self-employment in 1989 plotted against average tax revenue 1985–1993. The negative correlation between self-employment and the tax burden indicated in the figures is equally pronounced in the two earlier decades (not shown). As Figure 1 shows , Greece, Italy, Spain and Portugal are the countries with the highest share of self-employed. This raises a suspicion that the share of self-employed may simply decline with increasing GDP per capita. In fact, the share of self-employed decreases over the three decennia in many countries in line with increasing GDP per capita. An explanation for this is presumably that countries with lower GDP have less efficient distribution systems consisting of more small shops that often are operated by self-employed. In the regressions below this effect is controlled for by including GDP per capita as a control variable.

In the regressions reported in Table I self-employment as a share of total employment is the dependent variable. The main explanatory variables is the tax burden (as a share of GDP). As mentioned above an important control variable may be the level of GDP per capita (GDP). The rationale for this could be that shop owners tend to be self-employed, and in a less developed country there may be a more decentralized and thus less productive distribution network with more local shop owners. Another control variable is the share of the population that is below 18 or above 65 (dependency ratio), since a greater share of young and elderly tends to raise public expenditure. Also, as mentioned above, it may be important to add a dummy indicating whether owner-managers of incorporated businesses are included. Further, dummy variables for two of the three time periods are included to capture time trends, e.g. due to changing habits, technology and business cycle effects.

The dependency ratio and the owner dummy are never significant in the regressions in Table I. The coefficient for the tax burden is significant with the expected sign in all equations, even as other control variables are included. The coefficient for the tax burden becomes somewhat

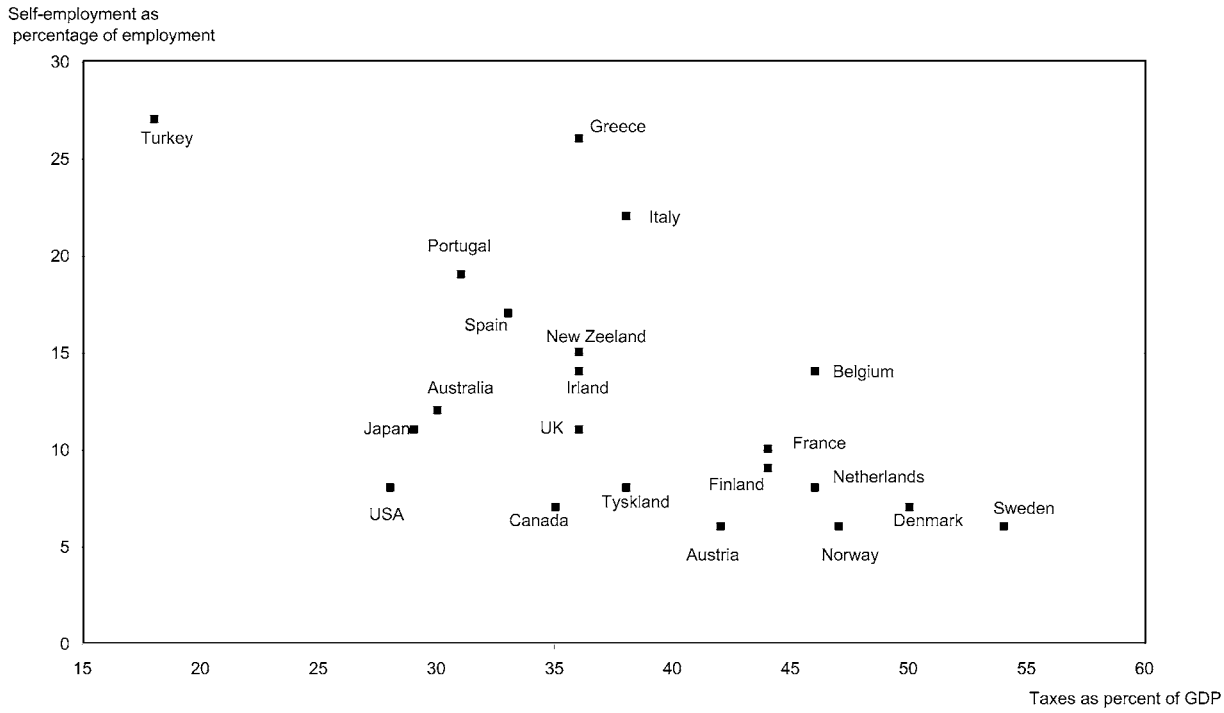

Figure 1. Self-employment as share of employment, excluding agriculture, and taxes as share of GDP, OECD-countries 1985–1993, percent.

TABLE I
Regressions of share of self-employed over explanatory variables

	(1)	(2)	(3)	(4)
Constant	0.47 (4.17)	0.53 (3.88)	0.30 (6.0)	0.33 (1.86)
GDP	–0.001 (–2.86)	–0.001 (–3.74)	–0.001 (–3.94)	–0.001 (–3.21)
Dependency ratio		–0.45 (–1.34)		–0.28 (–0.04)
Household savings			0.311 (1.91)	0.28 (2.4)
Tax	–0.29 (–3.64)	–0.278 (–3.49)	–0.23 (–2.51)	–0.196 (–2.92)
Owner dummy	0.07 (0.61)	–0.08 (–0.53)	0.02 (0.4)	–0.09 (–0.4)
Adj. R^2	0.4135	0.512	0.55	0.58

Notes: *T*-values shown in parentheses. All regressions include two time dummies (65–74, 75–84). There are 57 observations.

smaller when household savings is introduced. This is to be expected in light of the evidence discussed above that public social insurance often substitutes for household savings in high-tax countries. The size of the tax coefficient in regression (1) implies that, all else equal, a country with low taxes (30 percent of GDP) would have about 6 percentage points more self-employed as a share of employment than a country with a high tax burden (50 percent of GDP). That is quite a lot considering that the average share of self-employed is around 10 percent.

A number of other economic and social variables such as unemployment, education, the GDP-gap to the U.S.A. and employment regulation were also entered in regression equation (4) to check whether any of those change the results. These regressions are not shown since the none of the additional variables had any notable effect on the coefficient estimates for the tax variables.

Table II shows an attempt to estimate simultaneous regressions with three endogenous equations. The three simultaneous equations have dependent variables a) the share of self-employed, b) household savings as a share of GDP and c) taxes as a share of GDP. The exogenous variables in each equation can be seen in Table II.

The estimated coefficients parallel the pattern found in Table I. Higher GDP per capita seems to imply less self-employment. Household saving and taxes affect self-employment (Equation (1)) in roughly the same order of magnitude as in the simple regressions reported in Table I. But in addition Equations (2) and (3) support the idea of a reverse causation. Greater self-employment implies more household saving and lower taxes. In both cases coefficients are significant and of substantial size.

Apart from the questionable comparability of self-employment figures between countries these regressions are also open to other criticism. One is that the number of observations is small in relation to the number of variables, rendering few degrees of freedom. Most important perhaps is that the exogenous variables in Table II can be questioned. GDP for example is assumed to be exogenous in the self-employment and tax regressions, but it could itself be influenced by self-employment and taxes. Similarly there is some justification for assuming that the dependency ratio is exogenous in the household savings and tax regressions, but there are indirect mechanisms that could generate reverse causation. For example, the tax rate affects GDP, and higher GDP leads to increased life expectancy and a greater dependency ratio.

As a consequence of these problems we analyze a more reliable database in the next section.

3. Empirical analysis of Swedish counties

A twenty-year panel of 24 Swedish counties (län) is used to study the covariation between taxes and self-employment, comprising the period 1976 to 1995. As above, the self-employment data exclude agriculture. The data are described in more detail in an appendix.

As a tax measure we use the highest rate of income tax. Income tax is composed of a smaller share of central government tax, and a larger share of municipal tax. The municipal taxes are set locally and differ by up to 8 percentage points of income between municipalities. Income tax also constitutes by far the largest share of the total tax burden and is closely correlated with the total tax burden over time.

While the income tax rate is set mainly by municipalities, we use the average income tax rate in each county, consisting of several municipalities, as observations. At the municipal level data on self-employment, and the relationship between self-employment and taxes, may be distorted by commuting over municipal borders. At the county level this problem should be much reduced.

The underlying model is assumed to consist of linear relationships. We do not use the logarithmic

TABLE II
Simultaneous equation regressions of share of self-employed over explanatory variables

	(1) Self-employment	(2) Household savings	(3) Tax
Constant	0.34 (5.9)	0.31 (2.43)	–0.56 (–0.18)
GDP	–0.001 (–3.23)		0.002 (3.31)
Dependency ratio		–0.86 (–2.1)	0.20 (1.81)
Turism, share of GDP	0.14 (1.9)		
Budget deficit		–0.54 (3.9)	
Self-employm.		0.4 (2.97)	–0.39 (3.31)
Household	0.25 (1.81)		
Tax	–0.21 (–2.43)	–0.1 (–1.25)	
Owner dummy	–0.34 (–0.27)		
Adj. R^2	0.48	0.39	0.34

Note: *T*-values in parentheses. All regressions include two time dummies (65–74, 75–84). There are 57 observations.

form since the main variables, the tax rate and the share of self-employment are already ratios. Thus the coefficients are easily interpreted as the effects of changes of self-employment in terms of percent of the labour force rather than percent changes of absolute levels of these variables.

Since we use annual panel data there is an observation for each county or region and each year. Since many structural features do not change quickly from one year to the next we assume that there is a fixed component for each county, denoted by subscript *i*. Further we introduce lagged self-employment as a variable in the equation in order to capture the lingering effects that arise because low taxes in one period may induce greater inflow into self-employment which then results in higher self-employment even in subsequent years.

Annual observations may also be affected by business cycles and common trends. Therefore we add a fixed component for each time period, denoted with subscript *t*, and stochastic, normally distributed errors.

The basic regression equation can then be written as follows where *s* is the share of self-employment, *t* is the tax rate, *x* is a vector of other explanatory variables and α_i and α_t are the county and year fixed effects.

$$s_{i,t} = \alpha_i + \alpha_t + \alpha_1 s_{i,t-1} + \alpha_2 t_{i,t} + \alpha_3 x_{i,t} + u_{i,t} \quad (1)$$

One problem with this specification already mentioned is that we may have a simultaneity problem. In addition our specification of the lag structure as a Koyck lingering effects model creates problems. 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. We test for and reject the current effect model.[4] 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, $s_{i,t-1}$. Estimation by OLS may lead to biased estimates.[5]

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 $s_{i,t-1}$ by its estimated value, using the second lag of self-employment as an instrument. This mainly adresses the issue of biased estimates due to the Koyck lingering effects specification. The coefficient α_2 in equation (1) is identified by instruments that are exogenous determinants of $t_{i,t}$.

Three instruments are used for the tax variable. The first is income tax rate lagged four years. Since Sweden had 3-year election cycles during the period we analyze, a four year lag ensures that the lagged local tax was determined by the previous local government.[6] The second instrument variable is the central government component of the income tax. This has been changed quite frequently and is exogenous to the local tax that constitutes the main share of the income tax. The third instrumental variable is a measure of the central government subsidies to a region relative to their long run average. These subsidies have also been changed quite frequently and they often necessitate changes in local taxes to compensate for the revenue shortfall.

Our second approach, also based on the availability of instrument variables, is 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 additional variables reflecting the business structure, public sector employment, labour market programmes and other factors. Many such differences between regions are, however, captured by our dummy variables. In fact, the structural control variables that we do have in the regression, population density and the regional relative wage, lose significance once the

county dummy enters the regression. Also, this argument carries less weight the longer the periods of observation. The reason is that the actual rate of self-employment is then likely to be closer to the equilibrium rate, the main determinants of which should be only a number of structural labour-market parameters.[7] For this reason we also perform some 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 lower taxes may act as a magnet for self-employed people who can often choose where they open shop. 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 which is not binding at the regional level. One could argue, however, that if all regions increased self-employment and become "magnets" for self-employed then it would become more profitable for the individuals to become self-employed 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 self-employment figures to be affected merely by commuters.

4. Results

The first column in Table III shows OLS estimates of equation (1). The coefficient for the tax variable is significant at the one percent level. The coefficient estimate for taxes implies that when the income tax rate is increased by 10 percentage points (of income), then self-employment decreases by 0.6 percent of total employment in the short run. In regressions (3) this effect rises to 1.2 percent of total employment in the short run. The long-run effects are calculated by taking account of the dynamics that arise because an increase in self-employment also affects next year's self-employment and so forth. The long-run effect of an increase in the income tax rate by 10 percentage points in equation (1) is that self-employment increases by 1.4 percent of total employment, and in equation (3) by 2.4 percent of total employment.

These coefficient estimates are roughly on the same order of magnitude as that found in the comparison of OECD countries shown above. There the result was that a reduction of the tax burden from 50 to 30 percent of GDP on average

TABLE III
Estimated equation for the regional share of self-employment in total employment, 1976–1995, levels

Independent variables	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	GMM (5)
Constant	0.13	0.12			
Self-employment, lagged	0.64*	0.63*	0.57*	0.51*	0.59*
	(25.86)	(25.00)	(16.63)	(16.61)	(25.21)
Taxes	–0.06*	–0.07*	–0.11*	–0.10*	–0.08*
	(–2.94)	(–3.21)	(–3.42)	(–3.94)	(2.92)
Regional dummies	no	no	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes
R^2-adj	0.58	0.54	0.89	0.81	0.78
Ljung-Box Q-stat	1.34	1.52	1.62	1.72	1.01

Notes:
(i) * indicates significance at the 1% level.
(ii) *T*-ratios within parenthesis.
(iii) The regressions have 384 observations.
(iv) Equations (3), (4) and (5) are estimated with fixed, regional, effects.
(v) Relative wages is the ratio between regional to national wages.

increases self-employment by 6 percent of employment. If a similar reduction of the tax burden were implemented in Sweden by reducing income taxes, the income tax rate would have to be reduced by about 40 percentage points, that is it would have to be cut nearly entirely. A reduction by 40 percentage points according to the long-run estimate in regression (1) above would increase self-employment by 5.6 percent of total employment and according to regression (3) by 9.6 percent of total employment.

In column (2) the instruments discussed above are used for lagged taxes. employment. In columns (3) and (4) OLS and 2SLS are repeated, adding regional dummies to the regression. Column (5) uses the GMM estimation procedure.[8] As it turns out the coefficient estimates are not that different. The estimates for the tax coefficient are slightly lower when the tax variable is instrumented. This is what one might expect, given that the simultaneity problem implies that OLS overestimates 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.[9] This is again not a great surprise in light of the fact that we used lagged taxes, implying that the simultaneity bias may not be all that great.

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 included in the regressions that are presented.

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 IV 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 IV
Estimated equation for the regional share of self-employment in total employment, 1976–1995, First differences

Independent variables	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	GMM (5)
Constant	0.02	0.03			
Self-employment, lagged	0.13	0.9	0.07	0.06	0.08*
	(1.86)	(0.96)	(1.03)	(0.87)	(0.77)
Taxes	–0.09*	–0.07	–0.11*	–0.10*	–0.13*
	(–2.95)	(–2.37)	(–3.72)	(–3.41)	(2.92)
Relative wages	0	0	0.001	0	–0.01
	(–0.08)	(–0.02)	(0.04)	(0.01)	(–0.01)
Regional dummies	no	no	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes
R^2-adj	0.34	0.31	0.52	0.47	0.39
Ljung-Box Q-stat	1.21	1.05	0.98	0.88	0.77

Notes:
(i) * indicates significance at the 1% level.
(ii) *T*-ratios within parenthesis.
(iii) The regressions have 384 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.

Table V displays the estimates using non-overlapping four periods as the unit of observation. In these regressions the coefficient on taxes becomes much larger, since the lagged effects are included. On the other hand the coefficient on lagged self-employment becomes much smaller. If one calculates the long run effect of taxes on self-employment, the effect is on the same order of magnitude as the calculation based on Table III.

Our instrument variable regressions should have eliminated biases due to business cycle swings or of reverse causality, in particular since the instruments are fairly good. An additional way of looking at this issue further, however, 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 VI. This test indicates that the tax rate Granger-causes self-employment, but self-employment has a small, not quite significant, effect on taxes. We have also used a Box-Jenkins prewhitening procedure to calculate Granger-causality. This led to quite similar conclusions, and is therefore not reported.

5. Conclusion

Two different data sets, analyzed in this paper, indicate a negative relationship between the taxes and self-employment. The panel of OECD shows

TABLE V
Estimated equations for the share of self-employment in total employment, 1976–1995 (four-year intervals), levels

Independent variables	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	GMM (5)
Constant	0.14	0.11			
Self-employment, lagged	0.31*	0.36*	0.24*	0.22*	0.27*
	(15.6)	(13.3)	(12.6)	(13.1)	(15.6)
Taxes	–0.13*	–0.11*	–0.19*	–0.17*	–0.14*
	(–3.9)	(–3.14)	(–3.4)	(–2.9)	(3.0)
Relative wages	–0.02	–0.02	0	0.01	–0.01
	(–1.5)	(–1.7)	(0.4)	(0.6)	(0.7)
Regional dummies	no	no	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes
R^2-adj	0.42	0.45	0.71	0.69	0.68
Ljung-Box Q-stat	0.93	0.81	1.09	1.27	1.34

Notes:
(i) * indicates significance at the 1% level.
(ii) *T*-ratios within parenthesis.
(iii) The regressions have 384 observations.
(iv) Equations (3), (4) and (5) are estimated with fixed, regional, effects.
(v) Relative wages is the ratio between regional to national wages.

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

Null hypothesis	1 lag	2 lags	3 lags	4 lags	5 lags
1. Taxes do not Granger-cause self-employment	2.43 (0.09)	5.89 (0.05)	8.33 (0.02)	9.71 (0.005)	11.0 (0.002)
2. Self-employment does not Granger-cause tax rate	1.89 (0.10)	2.14 (0.09)	1.93 (0.13)	1.74 (0.17)	1.21 (0.26)

Comment: Probabilities in parentheses.

a clear negative correlation, which seems to be sustained even when a simultaneous system of equations is estimated that allows the relationships to go in both directions.

The OECD data set has a number of weaknesses, however. Even a separate sample of Swedish counties, a much more reliable data base, indicates a negative relationship between taxes and self-employment. This database contains truly exogenous instrument variables that are used to test the simultaneous nature of the relationship. This, and a test of Granger causility proved support for the hypothesis that lower taxes actually lead to increased self-employment.

It remains, perhaps, less clear how this relationship should be interpreted. Since we focus on the general tax-level our results do not reflect discriminatory taxes against self-employment as opposed to employment. Instead, they presumably reflect one of the six theoretical mechanisms discussed in the introduction that may lower self-employment in the presence of high taxation. An important task for future research is to disentangle the roles played by each of these mechanisms. An important normative question for future research is also whether more self-employment increases social welfare.

Appendix

DATA DESCRIPTION

The number of self-employed in Swedish counties and total employment are taken from the labor force survey (AKU). The share of self-employed is calculated by dividing the number of self-employed by the people employed, minus self-employment in the agriculture sector.

Population density is obtained from the Statistical Central Bureau Yearbook for 1995 and previous years have been set equal to 1995, since these numbers are constant through this time-period.

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

Income taxes are defined as average municipal tax rates in each county plus the central government tax rate for the highest income bracket. All observations are yearly from 1976–95.

Notes

[1] There is an extensive literature of the effects of social security and other welfare state arrangements on the savings rate (e.g. Feldstein 1974, 1995; Kotlikoff, 1995) and on the puzzle raised by Feldstein and Horioka (1980) regarding the strong correlation between saving and investment across countries. One explanation, consistent with our story, has been presented by Barro et al. (1995) in a model where some investments cannot be financed by foreign borrowing.

[2] Access to financing in the presence of moral hazard depends on the size of the entrepreneur's collateral. Lower individual incentives to save mean that fewer have access to a collateral. Aghion and Bolton (1992) provide an overview of studies exploring mechanisms of that kind, e.g. Evans and Jovanovic (1989), Banerjee and Newman (1991). Blanchflower and Oswald (1991), Holtz-Eatkin et al. (1994a, b), Lind and Ohlsson (1995). Lind and Ohlsson (1996) also show that a more equal distribution of wealth can be detrimental to entrepreneurship. A more equal wealth-distribution is typically an outcome of a more extensive welfare state.

[3] See also Parker (1996) for an analysis of self-employment using aggregate Brittish time-series data.

[4] The test is conducted by running the regression including lagged tax as an explanatory variable. The estimated coefficient for lagged tax is, however, never significantly different from zero. This supports the use of the lingering effects specification.

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

[6] Lagged taxes may still be highly correlated with current taxes since both are determined by voter preferences that exhibit considerable stability over time. Therefore we also tested two stage least squares regressions using only the second and third instrumental variable. This left the results qualitatively unchanged and is therefore not reported.

[7] A similar argument is often made in studies that investigate the determinants of unemployment. There, 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).

[8] 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.

[9] 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.

References

Apel, M., 1994, *Essays on Taxation and Economic Behavior*, Doctoral Dissertation, Economic Studies 18, Department of Economics, University of Uppsala.

Baumol, W. J., 1990, 'Entrepreneurship: Productive,

Unproductive, and Destructive', *Journal of Political Economy* **98**(5).

Blanchflower, D. G. and A. J. Oswald, 1991, *Does Access to Capital Help Make an Entrepreneur?*, NBER Working Paper, No. 3252.

Blau, D. M., 1987, 'A Time Series Analysis of Self-employment in the United States', *Journal of Political Economy* **95**(3), 445–467.

Carrol, R., D. Holtz-Eakin, M. Rider and H. S. Rosen, 1998a, *Entrepreneurs, Income Taxes, and Investment*, NBER Working Paper 6374.

Carrol, R., D. Holtz-Eakin, M. Rider and H. S. Rosen, 1998b, *Income Taxes and Entrepreneurs' Use of Labor*, NBER Working Paper 6578.

Evans, D. S. and B. Jovanovic, 1989, 'An Estimated Model of Entrepreneurial Choice under Liquidity Constraints', *Journal of Political Economy* **97**(4).

Evans, D. and L. Leighton, 1989, 'Some Empirical Aspects of Entrepreneurship', *American Economic Review* **79**, 519–535.

Feldstein, M. S., 1974, 'Social Security, Induced Retirement and Aggregate Capital Accumulation', *Journal of Political Economy* **82**(5).

Feldstein, M. S., 1995, *Social Security and Saving: New Time Series Evidence*, NBER Working Paper No. 5054.

Feldstein, M. S. and C. Horioka, 1980, 'Domestic Savings and International Capital Flows', *Economic Journal* **90**(358), 314–329.

Fölster, S., 1998, *Do Entrepreneurs Create Jobs?* Mimeo, The Swedish Research Institute of Trade, Stockholm.

Fuji, E. T. and C. B. Hawley, 1991, 'Empirical Aspects of Self-Employment', *Economics Letters* **36**, 323–329.

Grubb D. and W. Wells, 1993, *Employment Regulation and Patterns of Work in EC Countries*, OECD Economic Studies, No. 21.

Holtz-Eakin, D., D. Joulfaian and H. S. Rosen, 1994a, 'Sticking It Out: Entrepreneurial Survival and Liquidity Constraints', *Journal of Political Economy* **102**(1), 53–75.

Holtz-Eakin, D., D. Joulfaian and H. S. Rosen, 1994b, 'Entrepreneurial Decisions and Liquidity Constraints', *Rand Journal of Economics* **25**(2), 334–347.

Ilmakunnas, P., V. Kanniainen and U. Lammi, 1998, *Entrepreneurship, Economic Risks, and Risk-Insurance in the Welfare State*, mimeo, Departement of Economics, University of Helsinki.

Kihlstrom, R. E. and J. J. Laffont, 1979, 'A General Equilibrium Entrepreneurial Theory of Firm Foundation Based on Risk Aversion', **87**, 719–748.

Koskela, E. and M. Virén, 1994, 'Taxation and Household Saving in Open Economies – Evidence from the Nordic Countries', *Scandinavian Journal of Economics* **96**(3), 425–441.

Kotlikoff, L. J.,1995, Privatization of Social Security: How It Works and Why It Matters, NBER Working Paper No. 5330.

Laussel, D. and M. Le Breton, 1995, 'A General Equilibrium Theory of Firm Formation Based on Individual Unobservable Skills', *European Economic Review* **39**, 1303–1319.

Lindh, T. and H. Ohlsson, 1996, Self-Employment and Windfall Gains: Evidence from the Swedish Lottery', *Economic Journal* **106**(439), 1515–1526.

Manning, A., 1992, 'Multiple Equilibria in the British Labour Market: Some Empirical Evidence', *European Economic Review* **36**, 1333–1365.

Murphy, K. M., A. Schleifer and R. W. Vishny, 1991, 'The Allocation of Talent: Implications for Growth', *Quarterly Journal of Economics*, 503–530.

OECD Employment Outlook, July 1992, p. 158.

Parker, S. C., 1996, 'A Time Series Model of Self-Employment under Uncertainty', *Economica* **63**(251), 459–475.

Persson, T. and G. Tabellini, 1994, 'Is Inequality Harmful for Growth?', *American Economic Review* **84**(3), 600–621.

Schumpeter, J. A., 1970, *Capitalism, Socialism and Democracy*, London: Unwin University Books.

Sinn, H.-W., 1996, 'Social Insurance, Incentives and Risk-Taking', *International Tax and Public Finance* **3**, 259–280.

Thurik, R., 1999, *The Dutsch Polder Model: Shifting from the Managed Economy to the Entrepreneurial Economy*, Paper presented at the AEA meeting in New York, January 1999.

Quadrini, V., 1995, *Entrepreneurship, Saving and Social Mobility*, Mimeo, Department of Economics, University of Pennsylvania.