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SELF-EMPLOYMENT AND WEALTH INEQUALITY

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Is the decision to become and stay self-employed constrained by access to credit? If this is the case, a more unequal wealth distribution will—for empirically observed distributions—imply more self-employed, since the number of people able to provide collateral will be higher. Swedish data between 1920 and 1992 suggest that wealth inequality and the share of self-employed among those working are positively related. The data, therefore, are consistent with the hypothesis that liquidity constraints are binding on the decision to become and stay self-employed.

1. INTRODUCTION

Suppose that the ability to put up a sufficient collateral to obtain financing is a binding restriction on people seeking self-employment. We should then expect to find a relation between the evolution of the wealth distribution and the number of self-employed. The objective of this paper is to study whether the wealth distribution and the share of self-employed among those working in Sweden are connected. We construct a simple model of the flow between the pools of self-employed and employees in the spirit of Aghion and Bolton (1991). The model predicts a positive relation between equality in the wealth distribution and the ratio of employees to self-employed, i.e. increased equality decreases the share of self-employed. The probabilities to become and stay self-employed are tied to the wealth of the agent. This is because it is necessary to provide collateral for the financing of the enterprise. We find the predicted relation to be statistically significant in Swedish data between 1920 and 1992.

Aghion and Bolton (1992) provide an overview of theoretical work exploring mechanisms of a similar kind, e.g. Banerjee and Newman (1991). Empirical evidence is available from studies of cross-section and longitudinal data. Time series studies are more rare.[1]

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[1]De Wit (1993a) provides a comprehensive survey of the literature on self-employment. De Wit (1993b) estimates a detailed general equilibrium model. He finds that earnings differentials do not affect the choice of self-employment while liquidity constraints do. Blanchflower and Oswald (1991) conclude that the receipt of gifts or inheritances significantly affects the probability of becoming self-employed. Holtz-Eakin *et al.* (1994a and 1994b) also find that exit and entry of self-employed are correlated with receipt of inheritance. Lindh and Ohlsson (1996) confirm this on Swedish cross-section data and further find that lottery winnings significantly increase the probability of being self-employed. Van Praag and Van Ophem (1995) separate the effects of willingness and opportunity to become self-employed and find that opportunity, especially financing, is the main constraint. Black *et al.* (1996) provide evidence that time series of firm registrations are positively related to net housing wealth, explained by house ownership being the dominant form of collateral for self-employment credit. Taylor (1996) reports the same finding in cross-section micro data.

OECD (1992) contains a wealth of information on recent trends in self-employment in the OECD countries. We find two facts especially important for our study. First, the previous decreasing trend in the self-employment share has been reversed during the 1980s. Second, a substantial fraction of the labor force enters or leaves self-employment during a year. The majority of the self-employed have no employees. The trend is generally that the proportion without employees is growing.[2]

Self-employed work longer hours for less pay, at least reported median earnings are lower than for employees in most countries. However, there is more income inequality among self-employed than among employees. There is both some upper and some lower fraction of the income distribution where self-employed are more concentrated than employees. In the well-to-do group, self-employed with employees are over-represented.

Moreover, self-employed are more often male, married, and older. Attitude surveys indicate that the main motivating factor—dominating the money earning prospects—for choosing self-employment is a desire for independence. Data on flows in and out of self-employment indicate that about 90 percent of those self-employed the previous year are still self-employed the next year. The corresponding figure is about 80 percent for quarterly and monthly measurements.

Job security legislation is associated with more self-employment, because firms prefer to subcontract for many types of jobs, where temporary employment would have been used otherwise. Tax rules and social security rules often provide opportunities for tax evasion for self-employed, but the tax system may also act as a barrier to become self-employed.

The paper is organized as follows: Section 2 develops a simple flow equilibrium model. Section 3 presents the data, the estimation of wealth distribution parameters, and the estimations where the share of self-employed is related to the estimated wealth distribution parameters. Finally Section 4 concludes and summarizes our findings.

2. Theory and Model

A larger population share able to finance self-employment by their own means should yield a larger proportion of self-employed in the economy, if credit constraints are important. Furthermore, the supply of credit would be larger than otherwise if a large proportion of wealth is owned by people with more wealth than they need for personal safety and financing. This could be expected to reduce the need for collateral.

The equality of the wealth distribution is, however, not unambiguously related to the share of self-employment. On the one extreme, with a completely equal distribution either nobody or everybody would have the means for self-financing. On the other extreme, if all wealth belonged to a single individual, this

[2]In most countries unpaid family workers are classified as self-employed. Outside of agriculture this is an insignificant fraction (on average slightly above 1 percent). A more troublesome classification issue is that owner-managers of incorporated businesses are often (in about half of the OECD countries) not classified as self-employed but as employees, although they would, in general, report themselves as self-employed. In Sweden self-employment status is based on self-assessment only since 1987.

individual would have to take his chances with the incentive and monitoring problems, unless he wants to run the whole economy as his own enterprise.

There is therefore no linear relation between the number of self-employed and wealth equality. In empirically observed wealth distributions, however, only a small minority has more wealth than a reasonable collateral requirement. Transfers from the very rich to the very poor will tend to reduce the number of self-employed by reducing the supply of capital and increase equality in terms of concentration around the median. Transfers from the poor to the just not quite rich enough, would increase the number of self-employed, but at the same time decrease equality.

Aghion and Bolton (1991) formalize similar ideas in a dynamic setup. Consider a closed economy with a continuum of agents, who live one period and divide income between consumption and bequests to a single off-spring. Work can be done for certain wages or as self-employed (with risk attached) for an expected higher return. There is an efficient mutual fund market for financing. Effort can raise expected returns, to an increasing marginal cost. Demand for capital comes from those with wealth below the start-up requirement for self-employment and supply from those with wealth above this level. In equilibrium some will choose to work for wages. If effort cannot be contracted, borrowers will not exert optimal amounts of effort leading to a shortage of self-employment due to credit constraints. If contracts *can* be made on the supply of effort, the distribution of wealth does not impose any credit constraint on the choice of self-employment.

The objective of Aghion and Bolton is to analyze the evolution of the wealth distribution in general, but what is interesting to us is the suggested mechanism: the number of self-employed will depend on the share of people able to finance self-employment by collateral.

2.1. *Flow Model*

The crucial simplifying assumption of our model is that—in the absence of capital market imperfections—the ratio of employees to self-employed depends on some natural constant probabilities to become self-employed and to fail if already self-employed. If capital markets are imperfect, these probabilities will be affected by the ability to finance operations. The average entry probability decreases and the average exit probability increases if fewer people can put up the necessary collateral.

The need for credit may vary between different types of self-employment, but at least living-costs for some initial period are required. Shifts in the mix between self-employment with low and high collateral demands will then affect actual probabilities.[3] Changing factor costs, trade competition, government interventions, etc., would also affect the probabilities. The validity of isolating the collateral requirement can only be determined empirically.

[3]For example, an increase in capital intensity in agriculture will also increase collateral requirements decreasing entry and increasing exit probabilities in that sector. A concurrent increase in demand for services with low capital intensity will, however, work in the other direction. The economy-wide net effect of structural changes is therefore ambiguous.

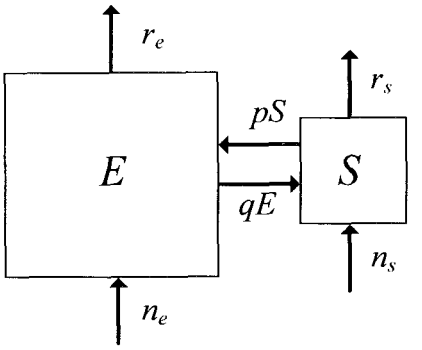


Figure 1. Flows Into and Out of the Pools of Employees and Self-employed

Inflows and outflows to employment are schematically illustrated in Figure 1. To simplify the algebra at this point let E be the *share* of employees in total employment while the rest, S, is the corresponding share of self-employed in total employment. Let p be the probability (in a given time period) that a self-employed becomes an employee, and q the probability that an employee becomes self-employed, then pS and qE describe the flow between shares. In Figure 1, r_e and r_s denote outflows from the shares. The corresponding inflows are denoted by n_e and n_s. Since $E+S=1$, inflows and outflows from employment must cancel, and consequently

$$dE+dS=0. \tag{1}$$

The flow between the shares then determines the ratio E/S, i.e. employees per self-employed since total employment cancels out in the ratio. It follows that

$$dS=qE-pS+n_s-r_s=-dE. \tag{2}$$

Computing the annual changes in employees and self-employed in our data verify that we make no large error if we assume that annual flow equilibrium holds.[4] Note that this does not prevent a slow long-run drift in the shares, p and q are different in different time periods

$$\frac{E}{S}=\frac{p}{q}. \tag{3}$$

There are constants P and Q to which p and q tend, if there are no binding liquidity constraints. We may think of Q as a natural or cultural propensity to

[4]From Swedish micro data (see Lindh and Ohlsson, 1996) we know that about 1 percent of new entrants to the labor force become self-employed while roughly 20 percent of retirees are self-employed. With some 40 years of working for each individual and equal-sized cohorts, r_s-r_e can be roughly computed to be below 0.5 percent of the working population. In our data dS is between 0 and -0.005 annually. Flow equilibrium, $qE=pS$, between the pools of employees and self-employed, therefore, seems to be a good approximation.

seek self-employment. $1-P$ on the other hand is interpreted as the natural proportion able to succeed as self-employed. We assume P and Q to be independent of wealth and constant over time.

Let $1-a$ be the proportion of the employees wealthy enough to put up the necessary collateral for the average credit—or threshold value—necessary to become self-employed.[5] Furthermore, suppose that $1-c$ of the self-employed have wealth enough to retain credit ratings and secure further financing. The actual exit and entry probabilities then are

$$p = P + c(1-P) = c + (1-c)P, \tag{4}$$
$$q = (1-a)Q.$$

From (3) and (4) we then obtain

$$\frac{E}{S} = \frac{P}{Q}\frac{1}{1-a} + \frac{1-P}{Q}\frac{c}{1-a}. \tag{5}$$

Thus, increases in a or c imply that E/S also will increase. An increasing share of the population *below* the threshold value, thus, implies a decrease in the share of self-employed among those working. The collateral requirement will be considerably above median wealth in empirically relevant cases. Increased equality in the sense that the distribution becomes more concentrated around the median, therefore, implies that a increases for a given threshold.

To obtain simple parametric equality measures we assume that the distribution of the logarithm of wealth at time t is either the logistic distribution or the Pareto distribution. The latter usually fits the richest percentiles well while the lognormal fits the middle percentiles of the wealth distribution better. The logistic distribution function is

$$F_L(w) = \frac{\left(\frac{w}{w_0}\right)^b}{1+\left(\frac{w}{w_0}\right)^b} \quad \text{if } w \geq 0 \text{ and 0 otherwise,} \tag{6}$$

where w_0 is the median wealth. Since $b/4$ is the slope of the logistic distribution function in the inflection point (the median) a higher b will indicate a distribution more concentrated around the median. Both b and w_0 can be estimated from easily available wealth distribution data. As b approaches 2 the logistic distribution converges towards the lognormal.

The Pareto distribution is similar in its right tail and converges to the logistic distribution as w increases (see Fisk, 1961 for details).

$$F_P(w) = 1 - \left(\frac{w}{w_0}\right)^{-b} \quad \text{if } w \geq w_0 \geq 0 \text{ and 0 otherwise,} \tag{7}$$

[5]Used in the sense, that given e.g. $a = F(w_a)$ where F is the cumulative distribution function, then w_a is the "average credit" or threshold value.

where w_0 is the minimal wealth or cutoff value of the distribution. The parameter b has a similar—though less clear-cut—interpretation as in the logistic case. These distributions provide convenient benchmarks and parametrically simple measures of inequality in the segments of the population that have wealth around the threshold value.

3. Evidence

3.1. *The Data*

Sweden has experienced a very strong trend of increasing equality in the wealth distribution over time. This trend stagnates in the 1970s and even reverses somewhat over the 1980s, as can be seen in Figure 2. The income distribution, of course, shows a similar trend.[6]

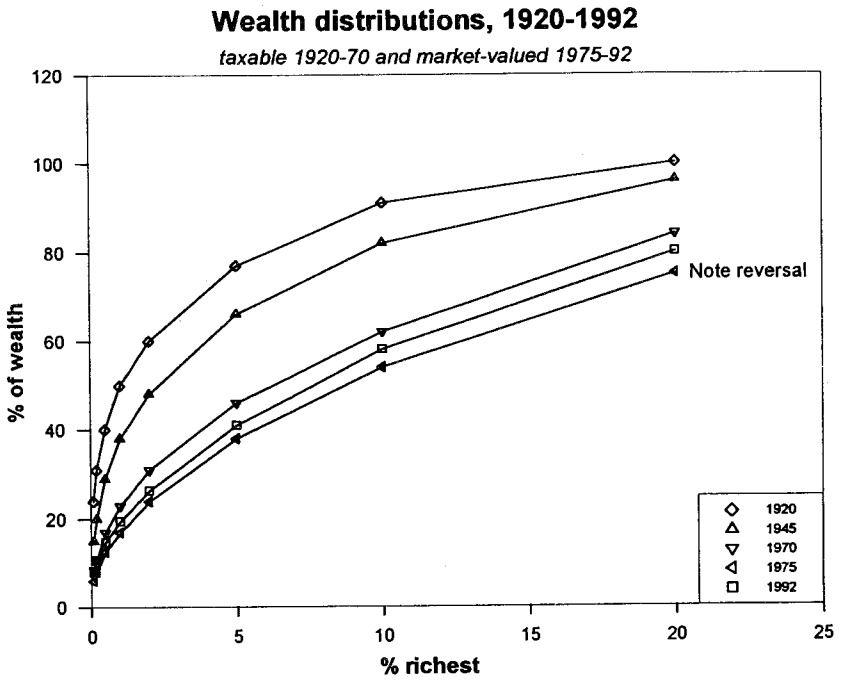
The ratio of employees to self-employed (see the lower panel in Figure 3 for the 1910–85 period) is almost constant—giving some support for the assumption of constant natural probabilities—in the data from 1870 up to around World War II. Then it increases rapidly to stagnate somewhat in the 1970s. As can be seen in the upper panel this reflects in a steeply decreasing share of self-employed in total employment from the 1950s up to the end of the 1970s. Around 1980 the self-employment share increases slightly again, then decreases again and seemingly recovers again in the recession—but part of this may be due to a break in data definitions, see footnote 2. Details about the data sources are in the Appendix.

Structural changes in the economy, such as the rapidly decreasing employment in the agricultural sector, might significantly bias the proportions entering and leaving the working population. Other structural changes that may influence the ratio is public employment and the increasing female labor force participation rate. Since most women in Sweden, who have entered the labor force, work within the public sector, these are essentially correlated phenomena.

This, however, does not alter the pattern of variation in E/S much even if the actual levels are changed. The general tendencies are the same over the period, also when we exclude government employees and the agricultural sector. The exclusion of the public sector only decreases the level of the ratio proportionally. Thus, the growth of the public sector seems to have had no effect on the mix in the private sector. Excluding the agricultural sector, however, emphasizes the variations in the ratio, but preserves the timing of variation around the trend.

We do not know how the structural changes might have affected the distribution of wealth, but it is clear from Figure 2 that the period when the public sector expands rapidly in Sweden in associated with stagnation both in the equality process and in the share of self-employment. Anyway, it seems that the data are at first glance consistent with the hypothesis that the proportion of self-employed has decreased with greater equality in Sweden.

[6]For a current assessment of recent changes in the income distribution, see Björklund and Freeman (1994).



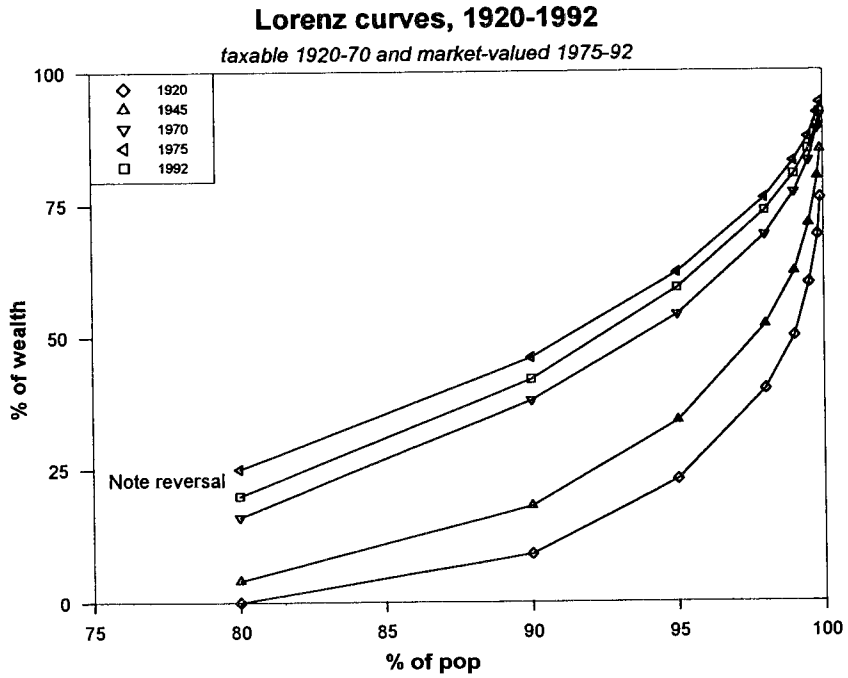


Figure 2. A Selection of Wealth Distributions and Lorenz Curves. *Sources in the Appendix.*

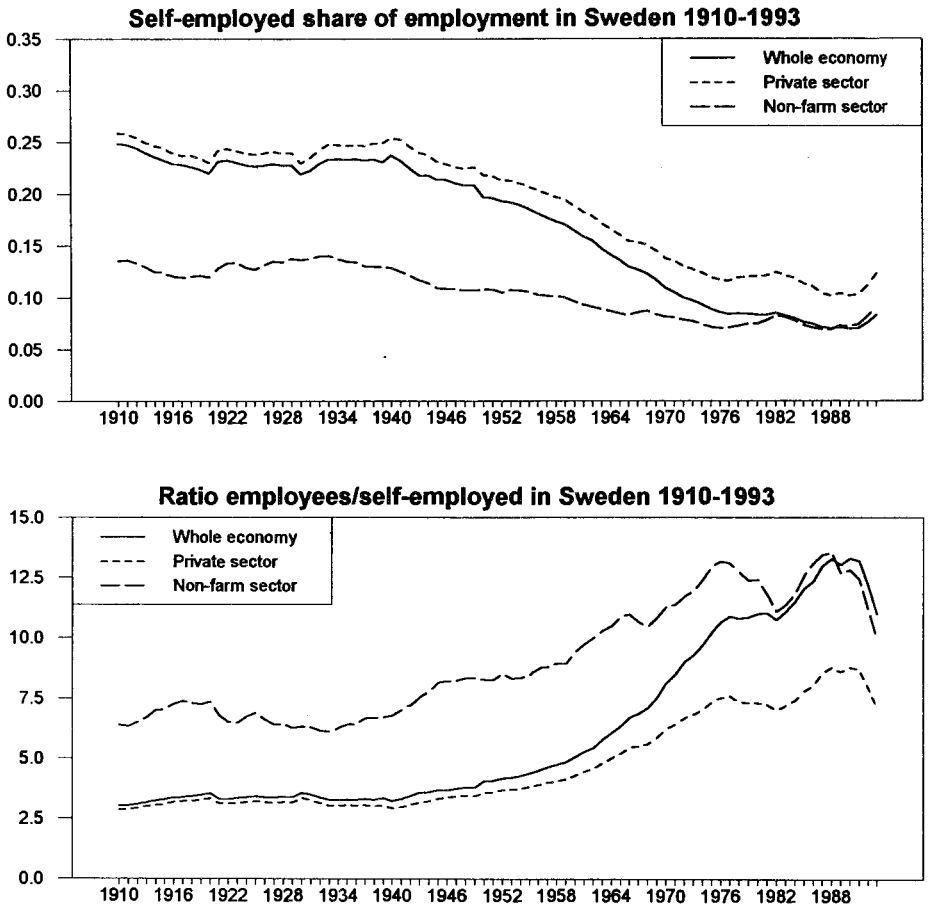


Figure 3. Self-employment in Sweden. *Sources in the Appendix.*

3.2. *Estimation of the Wealth Distribution Parameters*

The parameters b and w_0 of the logistic distribution can easily be estimated when data are available on the population below a range of wealth limits.[7] The available older data were unfortunately only published as the proportion of total wealth of the richest percentages of the population. This permits calculation of the average wealth, w_a, within these groups, but not the actual wealth limits. The parameters were, therefore, estimated by approximations using these class data (described in the Appendix) but checked in the latter part of the series against

[7]A legitimate question is why the median should need to be estimated at all, since the data (sometimes) provide information on that. The distribution was estimated on the upper 20 percent strata that does not include the median, so it is only a segment of a hybrid real distribution. The estimated median will, therefore, be higher than the real population median, since the logistic distribution assumes the whole population have positive net wealth. This is far from the case, in 1920 only about 20 percent had positive net wealth, the proportion growing over time to reach about 50 percent in 1985. The estimated distribution thus describes the evolution of equality only in the upper wealth classes around the threshold value that is of interest here.

estimates from true wealth limit data (which are available on request). We do get an error in the level but the variation is reasonably well captured in the approximations.

To fit the logistic to the data we take logarithms, add an error term u, and rearrange the distribution equation (6)

$$\log w = \log(w_0) + \frac{1}{b}\log\left(\frac{F_L}{1-F_L}\right) + u, \tag{8}$$

to take advantage of the fact that the logodds are given numbers and hence contain no measurement error.

The data used in the estimation of distribution parameters can be found in Table A1 in the Appendix. The parameter estimates are shown in Figure 2 and reported in Table A3 in the Appendix. Note that in 1975 there are one tax-valued wealth distribution and one market-valued distribution. Market-valued wealth is considerably more equally distributed than tax-valued since tax assessment of real estate only is a fraction of the market value. Real estate is a much larger fraction in low wealth holdings and consequently tax-assessed wealth will be less equally distributed.

Given a range of wealth classes $F_{Li} = F_L(w_i)$ we estimate (8) assuming that the wealth limit for $(F_{Li} + F_{L,i-1})/2$ is given by w_{ai} the average wealth in the class. For the part of the distribution above the median (which all data refer to), $F_L(w)$ is a concave function. The density of the distribution decreases with wealth so the class median wealth is less than the class mean wealth. It follows that $(F_{Li} + F_{L,i-1})/2 < F_L(w_{ai})$, so the logodds used in (8) are slightly lower than they should be, a bias which decreases in the upper intervals. Using class mean wealth as a dependent variable gives a systematic measurement error which is partly captured in the constant, i.e. the estimate of $\log(w_0)$.

The estimation of parameters of the Pareto distribution uses $-\log(1-F_P)$ instead of the logodds on the RHS of (8). In this case we can calculate the relation between w_a and the actual wealth limits of the class by the conditional expectation of wealth given that it is above the wealth limit w. Then the estimation can be corrected for the bias in the dependent variable, which only affects the constant directly. This is not possible to do for the logistic, since the relevant integral has no general analytic solution. It can be shown that the wealth limit for the richest i percentile of the Pareto distribution, w_i, can be calculated from w_{ai} by

$$w_i = \frac{b-1}{b} w_{ai}. \tag{9}$$

We first estimate the b parameter from the average data and then recalculate the dependent variable to obtain a corrected estimate of w_0.

The fit of the estimating equations is good and, as b increases, the two different estimates are progressively closer to each other. That is expected since a Pareto distribution gets closer to the logistic as b increases.

When we estimate the parameters of the Pareto distribution, the average wealth per household in the top percentiles is calculated. In this case we, therefore, use the overlapping classes in Table A1 directly.

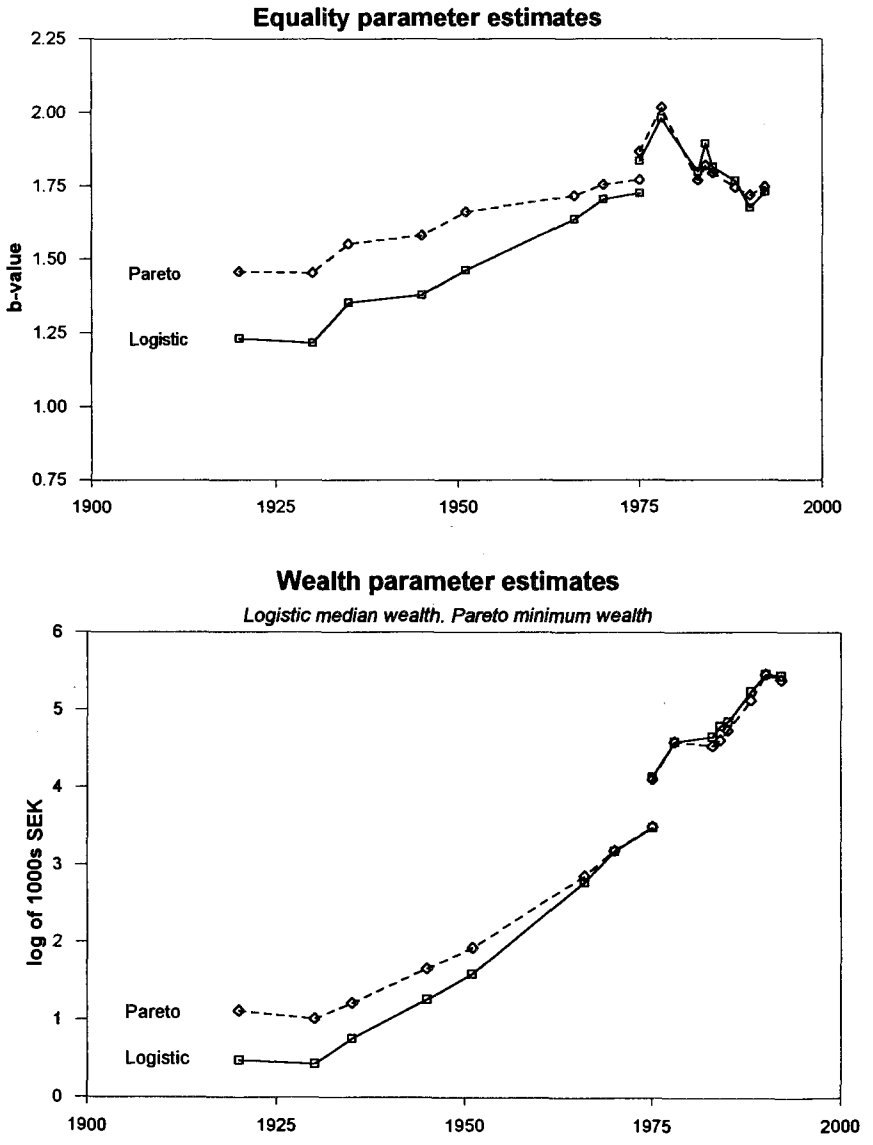


Figure 4. Estimated Equality and Wealth Parameters. Note the jump as the wealth concept changes from taxable to market-valued wealth

The increase of b over time (see Figure 4) reflects the general increase in equality, as the distribution becomes more concentrated around the median and the variance decreases. Thus, the increasing level of E/S is generally consistent with the wealth parameter estimates. From Figure 4 we also see that the estimates of the median for the logistic distribution and the cut-off value for the Pareto are very close to each other, which means that the Pareto estimates imply a considerably higher median wealth. The estimated Pareto distribution will tend to overestimate the population share above a threshold value.

3.3. *Estimation of the Relation Between Self-Employment and Wealth Inequality*

The appropriate threshold level is difficult to measure directly. The variation in alternative income is the best proxy we can think of. A simple and tractable way of catching this is to use annual wage costs as a proxy for the collateral threshold, assuming a constant relation between the wage level and the necessary amount of financing for the average self-employment project.[8] For many types of self-employment, especially in services, the main start-up cost is advance payment for own labor.

Lack of data for the early years forces us to assume that the wealth distribution is the same for employees and self-employed. We have compared the wealth distributions for employees and self-employed when possible. Self-employed have higher average and median wealth, but otherwise the distributions are very similar. The equality measure therefore approximately applies to both distributions, while the aggregate threshold is a weighted average. We use the aggregate E/S ratio.

In addition to this threshold proxy, $\bar{w}$, and the two estimated wealth parameters—$\hat{w}_0$ that measures the drift in the general level of wealth and $\hat{b}$ that measures concentration or equality in the distribution. Our model predicts that E/S should be positively related to the ratio w/w_0, in the presence of liquidity constraints. Increases in the threshold relative to the general wealth level should push down the share of self-employed. E/S should also be positively related to b under our maintained hypothesis.

First we test whether there is such a relation in the data. The estimated models are simply

$$\frac{E}{S}=\beta_0+\beta_1\left(\frac{\bar{w}}{\hat{w}_{0j}}\right)+\beta_2\hat{b}_j+u, \qquad j=L, P. \tag{10}$$

The regressions were run with the data in Table A2 in the Appendix. Results for a linear specification are found in Table 1. It is not surprising to find significant

TABLE 1

LINEAR MODEL ESTIMATES

Dep. Var. E/S	Logistic	Pareto	Detrended Logistic	Detrended Pareto
Constant	−19.03	−1.47	0.00	0.00
	(5.44)	(0.42)	(0.00)	(0.00)
Wealth threshold	2.47	4.68	0.18	0.97
	(2.69)	(9.60)	(0.46)	(1.03)
Wealth equality	12.41	−1.59	3.99	2.50
	(7.47)	(0.62)	(2.41)	(1.01)
Adj. R^2	0.78	0.93	0.18	0.15
Test of joint significance $\chi^2(2)$	65.79	234.82	12.48	13.66
p-value	0.000	0.000	0.002	0.001

Note: OLS point estimates with heteroskedastic-consistent errors. 16 observations between 1920 and 1992. Absolute t-values in parentheses. Detrended variables are deviations from a quadratic trend.

[8]It could be noted that Swedish start-up subsidies of self-employment for unemployed are scaled in a similar manner to correspond to six months of unemployment benefits.

TABLE 2

LOGLINEAR MODEL ESTIMATES

Dep. Var. Log(E/S)	Logistic	Pareto	Detrended Logistic	Detrended Pareto
Constant	−1.86	0.25	0.00	0.00
	(4.59)	(0.42)	(0.00)	(0.00)
Log(wealth threshold)	0.83	1.38	0.21	0.45
	(3.06)	(7.72)	(0.96)	(2.22)
Wealth equality	1.84	0.28	0.74	0.44
	(8.98)	(0.66)	(2.88)	(1.47)
Adj. R^2	0.84	0.92	0.37	0.34
Test of joint significance $\chi^2(2)$	92.56	195.99	19.54	32.61
p-value	0.000	0.000	0.000	0.000

Note: OLS point estimates with heteroskedastic-consistent errors. 16 observations between 1920 and 1992. Absolute t-values in parentheses. Detrended variables are deviations from a quadratic trend.

coefficients in the cases where we have level regressions, since all of our variables have a positive trend over time. The Pareto case, however, does not have the predicted sign on the equality parameter although the coefficient is insignificant. Detrending the variables using a quadratic trend gives different estimation results. The wealth equality variable remains significantly positive in the logistic case and we now get the predicted sign in the Pareto case. The relation cannot be attributed to the trends.

The form of equation (5) and the distribution functions indicate that a theoretically preferred specification is to use the logarithms of E/S and the logarithm of $\bar{w}/\hat{w}_{0j}$. The results in Table 2 improve in both cases although the wealth equality variable in the Pareto case is still insignificant, but now has the predicted sign.

Given the same wealth distribution for both groups and assuming that the wealth threshold for both entry and exit are the same, i.e. the share below the threshold is $c=a$, equation (5) becomes[9]

$$\frac{E}{S}=\frac{P}{Q}+\frac{1}{Q}\frac{a}{1-a}. \tag{11}$$

We, therefore, estimate the model

$$\frac{E}{S}=\beta_0+\beta_1\frac{a_j}{1-a_j}+u, \qquad j=L, P, \tag{12}$$

where $a_j=F_j(\bar{w}; \hat{w}_{0j}, \hat{b}_j)$. The natural probabilities can then be computed from the estimated parameters $\hat{\beta}_0$ and $\hat{\beta}_1$. The results are in Table 3.

The estimated coefficients of the threshold ratio are strongly significant, even when detrended variables are used. The point estimates of the natural probabilities in the logistic case are not entirely unreasonable. Since a is around 0.9 we would tend to infer that the failure rate among self-employed $p=0.9$ and the entry rate

[9]However, c is likely to be much smaller than a. The constant therefore would tend to be overestimated while the coefficient on the logodds would tend to be underestimated. This bias is ambiguous with respect to the indirect estimates of P and Q, see equation (5).

TABLE 3

FLOW MODEL ESTIMATES

Dep. Var. E/S	Logistic	Pareto	Detrended Logistic	Detrended Pareto
Constant	0.12	3.01	0.00	0.00
	(0.06)	(5.30)	(0.00)	(0.00)
Threshold ratio $a/(1-a)$	1.34	1.03	0.22	0.25
	(3.82)	(7.30)	(4.10)	(3.17)
Implied entry prob. Q	0.75	0.97		
Implied exit prob. P	0.09	2.92		
Adj. R^2	0.67	0.85	0.12	0.20

Note: OLS point estimates with heteroskedastic-consistent errors. 16 observations between 1920 and 1992. Absolute t-values in parentheses. Detrended variables are deviations from a quadratic trend.

from employees $q=0.075$. This tallies with $qE=pS$, since E/S is indeed around 12. However, observed annual exit rates from self-employment are around 0.1. The constant is very imprecisely estimated so no great significance should be attached to these point estimates anyway. However, given the crudity of both our data and the simplifying assumptions of the model, the results are quite encouraging.

4. CONCLUSIONS

Self-employment is thought to be important for economic prosperity by many economists. Self-employed people are regarded as entrepreneurs. They not only employ themselves but also others in the long run. Their innovations generate new economic growth for the benefit of all. The share of self-employed in the industrialized economies has been decreasing, at least since the 1950s. It seems natural to relate this trend to the problems of sluggish productivity growth. Without doubting for a moment that there may be a shortage of innovative entrepreneurs in the economy, it should be noted that the most dramatic decrease in the proportion of self-employed coincides with a period of high growth in Sweden while the increases in the proportion coincides with slow or even negative growth. In this paper we have very little to say about the impact of self-employment on growth.[10]

Instead we have focused on one specific determinant of self-employment—the access to finance and, in particular, the relation between inequality in the wealth distribution and the share of self-employed among those working. If self-employed are liquidity constrained such a relation is expected.

[10]Since we had the data available we did some regressions of the GDP growth rate on the share of self-employed. With no lags there was a negative relation. When we included some lags under the reasonable hypothesis that growth effects may take some time to show up, there was no indication of a significant short-run relation between these variables. We were not surprised. Self-employment should simply not be equated with entrepreneurship. Self-employed workers, as defined in labor market statistics, are only to a small extent innovative entrepreneurs pursuing growth enhancing business projects. Much of the Swedish decline in the self-employment share is due to the drastic shrinkage of job opportunities in the agricultural sector.

The model we use does not build on formal optimization. Instead a simple flow equilibrium condition establishes a relation between wealth distribution parameters and the share of self-employed. This is in line with previous research which shows that non-pecuniary motives seem to dominate in the decision to become self-employed. Our simple model suggests that, in the absence of liquidity constraints, the share of self-employment would be determined by some natural probabilities and would have no relation to variations in the distribution of wealth. The model predicts, if liquidity constraints do matter, that this share is an increasing function of the share of people above the wealth limit, which is necessary to provide collateral for financing self-employment.

Swedish data between 1920 and 1992 are consistent with the hypothesis that increased equality of the wealth distribution decreases the number of self-employed. Theoretical arguments for this hypothesis have been made in the literature. To our knowledge this is the first empirical evidence found in support of the hypothesis. Our results also support the evidence of liquidity constraints on self-employment found by other researchers using micro data.

Appendix: The Data

Swedish data on the distribution of wealth have been pieced together from several sources; tax-valued wealth distributions 1920, 1930, 1935, 1945, 1951, 1966, and 1975 from Spånt (1979); the market-valued wealth distribution 1975 is also in Spånt (1979) while 1978, 1983, 1984, and 1985 can be found in Jansson and Johansson (1988). The remaining wealth data (1988, 1990, 1992) are found in Be 21 SM 9401, Statistics Sweden.[11] Statistics Sweden (1960) contains total taxed wealth for 1920 and 1930 which is missing in Spånt. Total taxed wealth for 1988, 1990, and 1992 is in Be 20 SM 9001, 9201, and 9401.

Spånt's data are based on wealth declarations for tax purposes, sampled in a wide variety of ways, and gives the distribution only as percentages of total tax declared net wealth within the x percent richest strata in the population. This determined our approach to the estimation of wealth parameters. The market-valued wealth data are based on household survey data (HINK). The main difference is that real estate is valued for tax purposes at a fraction of its market value. Currently the assessment ratio for houses in Sweden is 75 percent, but the historic variation is vast. The main effect of this is to make the tax valued distribution considerably more unequal than the market valued, since real estate makes up a much larger proportion of the wealth in the lower strata. The market-valued distribution is also much more sensitive to fluctuations in house prices.

Data on annual wages, employees and self-employed have been linked from different sources. The number of self-employed and employees 1870–1950 and wage sum data 1870–1950 are found in Jungenfelt (1966). Employment data for 1960–93 and wage data 1950–93 are from Statistiska Meddelanden Series N published by Statistics Sweden.

[11]SM stands for *Statistiska Meddelanden* and 9401 indicates the year 1994, while Be 21 indicates the specific publication series. Below other publications from Statistics Sweden are only denoted by their code.

Wage costs 1920–50 are from Table 7 in Jungenfelt (1966); 1950–74 from SM N 1975 : 98 appendix 4, Table 4A; 1970–84 from N 10 SM 8501 Table H : 6; 1985–89 the same table in N 10 SM 9001; 1980–93 N 10 SM 9401, Table 4. The 1950 ratio linked wage data from Statistics Sweden to Jungenfelt. The 1920–69 stretch of this series was then linked to the 1970–89 series (1970–84 and 1985–89 are comparable) by the arithmetic mean ratio 1970–74 of the two series. Finally this was linked to the 1980–93 series by the arithmetic mean ratio in the overlap.

Average annual numbers of employees and self-employed 1920–50 are from Table 1 in Jungenfelt (1966); 1960–74 are computed from employment in Table 43, and number of employees only in Table 37 of appendix 5 of SM N 1975 : 98; 1970–84 and 1985–89 numbers are taken from Table 5 : 2 in appendix 5 of N 10 SM 8501, N 10 SM 9001; 1980–93 from Table 6 in N 10 SM 9401. The definitions of self-employed in different sources vary, but should in principle be close to the definition of the Swedish Labor Force Surveys, which after 1977 includes unpaid family workers with ownership in the family firm, but only from 1987 includes some owners of limited liability companies. In the Jungenfelt data, private services and commerce are included only from 1910 and the construction sector only from 1930.

The lacuna 1951–59 in the statistics of employees and self-employed has been filled by interpolation on the number of active income earners in the taxation statistics 1943–66. These data, however, are subject to a major change in definition between 1950 and 1951, which we have adjusted for using the study by Gunnarsson and Lindh (1997). 1920–50 from Jungenfelt was linked by the adjusted ratio 1950 to active income earners 1950–66. This was linked to the 1960–74 series by the geometric mean of the ratio in the overlap. Since the 1970–89 series had identical data for 1970, this was simply added from 1970. The 1980–93 series was identical in the overlap so the remaining years were just added to get the complete series for employees and self-employed.

For the data used in preparing Figure 3, we simplified and only used a direct ratio linking 1960, which was the only year where any gap could be distinguished by the naked eye. The earlier data are based on tax assessments thereby automatically excluding unpaid family members, while modern data are based on the Labor Force Surveys. Public employment was taken from the same sources as above. Except for the period 1980–93 this is the case for agricultural employment, too. The last period agricultural employment is from Table 2 : 3 in Appendix 2 of N 10 SM 9401.

To arrive at annual wage estimates the wage costs were divided by the employees. To compensate for the difference in level between taxable and market-valued wealth, annual wages 1975–92 were inflated in the estimations by the ratio between market-valued and tax-valued total wealth to get comparable data.

TABLE A1

PERCENTAGES OF TOTAL NET WEALTH OWNED BY THE RICHEST XX PERCENT

	Percentage of Taxable Wealth By Year							
Percent	1920	1930	1935	1945	1951	1966	1970	1975
0.01	9	—	6.5	—	—	3.6	3.3	3
0.025	—	—	—	—	—	—	—	—
0.03	15	13	11	9	7	5.5	5	4.7
0.05	—	—	—	—	—	—	—	—
0.1	24	21	18	15	12	9	8.5	8
0.2	31	28	23	20	17	12	11	10
0.5	40	37	33	29	25	18	17	15
1	50	47	42	38	33	24	23	21
2	60	58	53	48	43	32	31	28
5	77	74	70	66	60	48	46	44
10	91	88	84	82	76	64	62	60
20	100	98	97	96	92	82	84	80
Wealth, taxable	14.2	15.3	15.9	25.6	31.5	101	141	198
Population	2,845	3,177	3,344	3,457	3,523	3,975	4,146	4,135

	Percentage of Market-valued Wealth By Year							
Percent	1975	1978	1983	1984	1985	1988	1990	1992
0.01	2.2	1.7	2.8	2.5	2.4	3	3.1	2.9
0.025	—	2.7	4	3.5	3.9	4.4	4.8	4.5
0.03	3.7	—	—	—	—	—	—	—
0.05	—	3.7	5.2	4.5	5.0	5.7	6.5	5.9
0.1	6	5.1	6.7	5.8	6.5	7.3	8.6	7.9
0.2	8	7.2	8.8	7.6	8.3	9.3	11.1	10.5
0.5	12.5	11.4	13	11.3	12.0	13.5	15.6	14.8
1	17	16.6	17.7	15.7	16.5	18.4	20.7	19.5
2	24	24.1	24.4	22.2	23.1	25.4	28	26.4
5	38	38.6	38.4	36.2	37	40.1	42.6	40.9
10	54	55	55	53	53	57	59	58
20	75	76	76	75	75	78	79	80
Wealth, market-valued	354	496	681	732	815	1,267.8	1,707.8	1,596.6
Population	4,107	4,359	4,470	4,511	4,376	4,592	4,576	4,686

Note: Population is 1000s of households, wealth is billions of current SEK.

TABLE A2

ESTIMATION DATA ON ANNUAL WAGES AND THE RATIO OF EMPLOYEES TO SELF-EMPLOYED

Year	Annual Wages 1,000 SEK	Ratio empl/self-empl	Year	Annual Wages 1,000 SEK	Ratio empl/self-empl
1920	2.89	3.72194	1978	74.08	10.79537
1930	2.19	3.74214	1983	111.57	11.08288
1935	2.20	3.45166	1984	120.69	11.50760
1945	3.98	3.86476	1985	129.75	12.06074
1951	7.21	4.00924	1988	162.30	13.29601
1966	22.68	6.70053	1990	201.13	13.32074
1970	30.32	8.11769	1992	223.33	12.15141
1975	50.58	10.21920			

Note: In the estimations the threshold value is twice the annual wages, and when using market-valued wealth it is further multiplied by the ratio between market-valued and taxable wealth.

TABLE A3

ESTIMATED DISTRIBUTION PARAMETERS

Year	Logistic distribution b	Logistic distribution w_0	Pareto distribution b	Pareto distribution w_0
Taxable wealth				
1920	1.23	1.6	1.46	3.1
1930	1.22	1.5	1.45	2.8
1935	1.35	2.1	1.55	3.4
1945	1.38	3.5	1.58	5.3
1951	1.46	4.9	1.66	6.9
1966	1.64	16.0	1.72	17.4
1970	1.70	23.9	1.75	24.3
1975	1.72	32.5	1.77	32.9
Market-valued wealth				
1975	1.83	62.4	1.87	60.6
1978	1.98	98.0	2.02	98.3
1983	1.80	105.0	1.77	93.2
1984	1.89	120.1	1.82	100.5
1985	1.81	127.3	1.79	114.1
1988	1.77	187.2	1.74	167.5
1990	1.67	233.8	1.72	233.2
1992	1.73	229.0	1.75	217.4

Note: The scale of the w_0 parameters is 1000s of current SEK.

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