On-the-job training, firm resources and unemployment risks: an analysis of the Swedish recession 1991-1993

Carl le Grand *

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Abstract

Two general questions are posed in this paper: (a) In what ways do characteristics of the firm where the worker is employed have an influence on the worker's risk to become unemployed? (b) How do general and specific skills acquired in the firm affect the worker's unemployment risk?

The empirical analyses are based on three matched data sets: (i) survey data from the 1991 Swedish Level of Living Survey on individual and job related characteristics of the employees; (ii) register data on annual economic reports of private firms; and (iii) register data from the National Labor Market Board on registered unemployment.

The main findings are:
First, the resources and economic situation of the firm affect the workers' risks of becoming unemployed in several ways: The risks are larger for workers employed in small-scale firms, in labor intensive firms, in firms with small or negative profits, and/or in firms with a high debt to equity ratio. Moreover, these firm-level effects do not seem to be explained by the selection of productive, high capacity workers to resourceful, capital intensive and productive firms.
Second, the effect on unemployment risks of the acquisition of skills within the firm is conditioned by the degree of transferability of such skills to other firms. A worker with skills that are firm specific will not be better off than a worker with relatively low job skills, while a worker with skills that can be of use with other employers has much less unemployment risks.

* Carl le Grand, Swedish Institute for Social Research, Stockholm University, SE-106 91, Stockholm, Sweden. Phone: 08-16 26 46. E-mail: carl.le.grand@sofi.su.se.

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1. Introduction

A tremendous amount of research has been directed towards understanding the causes of unemployment. The reason is, of course, that it is regarded as a major social and economic evil. Unemployment implies economic costs and welfare losses for the society as a whole. For the individuals directly affected by it, unemployment entails immediate income losses, reduced future earnings capacity, as well as decreased physical and mental well being.

Previous empirical research on unemployment can be classified into three major strands: First, unemployment has been studied as a macro-economic phenomenon. These analyses, such as that on the association between unemployment, inflation, and wage setting and bargaining systems, are based on aggregate data. Second, studies based on micro data on individuals have been concerned with the social situation, attitudes and well-being of unemployed persons. Third, micro-level studies estimating the determinants of unemployment duration and the transition from unemployment to employment. Evaluations of labor market programs may be included as a sub-group within these types of studies. However, analyses of the transitions from employment into unemployment, that is, determinants of the risks for employed workers to become unemployed, are surprisingly rare in the literature.

Two general questions are posed in this paper. First, what characteristics of the firm where the worker is employed affect the worker's risk to become unemployed? Secondly, do the unemployment risks vary according to the amount and type of training that workers receive in the firm? Three matched data sets are used, survey data from the 1991 Swedish Level of Living Survey on individual and job related characteristics of the employees; register data on annual firm reports; and register data from the National Labor Market Board on registered unemployment.

The paper is organized as follows: In the remainder of this introductory section previous studies on the transitions from employment to unemployment are briefly reviewed, and then I describe the Swedish crisis at the beginning of the 1990's, which forms the setting of the study. In the next section a simple model of the process from employment to unemployment is

formulated. After describing data and variables, the empirical results are presented. Finally, the findings are summarized and discussed.

Previous studies

Based on results from previous research on downward mobility in general, and transitions from employment to unemployment in particular, the following generalizations can be made as to how unemployment risks vary between demographic groups and between individuals with different characteristics:[1]

(a) Unemployment is higher for young workers, for workers with short labor market experience and for workers with short tenure with the last employer.
(b) Education decreases the risk of becoming unemployed.
(c) Immigrants, both first and second generation, have higher unemployment risks than other groups.
(d) In contrast to many other countries, differences in unemployment rates between men and women have been small in Sweden during the last decades. One important reason for the equalization of unemployment risks between the sexes, is arguably the increase in labor market attachment of Swedish women. However, men tended to be more exposed to the surge in unemployment than women in the 1990-1993 period. In 1993 the unemployment rate was 9.7 for men and 6.6 for women. The reason for this is that the drop in employment was much more severe in the private sector, where men dominate, than in the public sector, where women dominate.
(e) Workers' positions in the occupational class system affect unemployment risks in that blue-collar workers have higher unemployment risks than white-collar workers, and in that, within both of these two groups, workers in lower positions have higher risks than those in higher positions.

To my knowledge, the only Swedish study on the impact of firm and organizational characteristics on workers' unemployment risks is Korpi and Sidebäck (1998) who linked the

[1] Carroll and Mayer (1986), Rosenfeld (1992), Sørensen and Tuma (1981). For Sweden, see Korpi and Sidebäck (1998), Sidebäck (1994).

Swedish Establishment Survey with the Level of Living Survey 1991 (LNU). The former data set contains information on organizational characteristics based on interviews with the top manager of the LNU respondents' workplaces. The preliminary results reported are that organization level variables - indicators on competition and product demand, promotion chances and the hierarchical structure within the workplace - had no or almost no effect on the unemployment risks.

The Swedish economic crisis of the 1990's: a background description

The period analyzed in this study, 1991 to 1993, was a dramatic one in modern Swedish economic history. During these years the labor market was transformed from one of full employment to mass unemployment. Sweden was one of the very few advanced capitalist nations who were able to avoid mass unemployment during the 1970's and 1980's. The Swedish economy was particularly hard-hit by the oil shock 1973-1974 since it coincided with the rise of sharp low-cost competition for some of Sweden's core industries ship-building, iron and steel, and forest products. In spite of this, unemployment was kept low, fluctuating between about 1.5 and 3.5 percent up to 1991.

The turning point came with the serious economic crisis starting in 1990. Whereas labor shortage was among the most serious problems at the beginning of the year, by the year's end Sweden was part of the international recession. For three years the GDP decreased; open unemployment exploded from 1.6 percent in 1990, to more than 8 percent in 1992. The total yearly inflow into unemployment increased by more than 80 percent between 1991 and 1992 (from about 260 000 persons to 473 000). Moreover, the percentage of this inflow caused by cut-downs and bankruptcy increased from about 10 percent in 1991 to almost 30 percent in 1992. At the same time, the number of persons involved in active labor market programs increased to the highest level ever recorded. Employment fell by 375 000 persons in the private sector and by 170 000 in the public sector between 1990 and 1993. The main part of the job losses was found in the construction and manufacturing industries. Especially young

people suffered from the crisis. In 1990 as much as 75 percent of those 20 years of age had a job, while the corresponding figure in 1993 had gone down to only 27 percent.[2]

It is beyond the scope of this paper to try to explain why the international recession became so serious in Sweden. However, it seems that increased international dependency of the Swedish economy during the 1980's interacted with a number of short-term triggering causes occurring at the same time. The course of events includes a shift in economic policy from fighting unemployment to holding down inflation, the implementation of a tax reform, which made it much more costly to borrow money, and, subsequently, leading to sharp falls in real estate prices and in domestic demand. In addition to this, a serious currency crisis developed with exploding interest rates (for a short while rising to an absurd level of 500 percent) and a rapidly swelling budget deficit.

2. A model of the unemployment process and hypotheses

As a tool for understanding the transition from employment to unemployment, a simple model has been constructed. The unemployment risk of a worker is assumed to be a function of the probability that the following three sequential events occur:

(1) *Work force reductions*. The probability that the firm where the worker is employed cuts down on the work force, and if so, how much (The maximum reduction of the work force is, of course, a total close down of the firm.);

(2) *Dismissal*. The probability that, given work force reductions, a certain worker in the firm is selected to be discharged;

(3) *Not finding a job*. The probability that a dismissed worker cannot find a new job, and therefore ends up being unemployed.[3] Determinants of these three events will be elaborated below.

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[2] The figures in this paragraph are based on the Labour Force Surveys, either taken from Björklund et al (1996) or from my own calculations of micro data.

[3] I here assume the existence of on-the-job search for workers receiving notice of future displacement, since otherwise a dismissal will automatically result in unemployment.

Determinants of work force reductions: hypotheses on the firm's resources and economic capacity

Research from both the U.S. and Sweden shows that recessions are characterized by an increase in job destruction while the slowdown in job creation is relatively mild; see Davis et al (1996) and Persson (1999). Further, Persson (1999) finds that the main source of employment changes in Sweden between 1986 and 1995 was the destruction of jobs at already existing, contracting establishments. Both the creation of jobs by new firms and destruction of jobs by closing firms were low. Furthermore, Arai and Heyman (2000) report that contracting establishments stand for 80 percent of total separations during the 1989-1998 period (also, see Andersson (1999) for an analysis of job creation and destruction in Swedish manufacturing industry 1972-1996).

Thus, to simplify, the decrease in employment 1991-1993 can be regarded as equal to job destruction in existing firms. More specifically, the probability that the firm cuts down personnel can be modeled as a function of a vector of firm characteristics, and of characteristics in the firm's environment.

Four hypotheses on the influence of firm characteristics on the probability of work force reductions are formulated on the basis of the answers to two questions:

A. *Given strong macro economic shocks, which firms can manage better than others?*

- Firms with a sound economic situation, measured as high profits, have better chances than other firms to avoid cut-downs. Thus, workers engaged in profitable firms have less risks of unemployment than workers in firms with the opposite characteristics have.

This hypothesis may be regarded as in accordance with both common sense and standard economic arguments. According to the "lean production" argument, however, such an

outcome is by no means self-evident, since ”downsizing” the reduction of ”unnecessary” staff is a method to increase profits.[4]

- Firms with high debts-to-equity ratios, in particular long-term debts, were especially vulnerable during the period of exploding interest rates and credit rationing at the beginning of the 1990's. Clearly, in such a situation firms with a large debts-to-equity ratio can be expected to run larger risks of going bankrupt than other firms (see Bergström and Lindberg (1998), for a Swedish study on the influence of financial leverage on hiring decisions of firms).
- According to theories of economic dualism,[5] large-scale firms - in terms of number of employees, turnover and capital stock - have larger resources and are less exposed to business fluctuations. Such firms are therefore able to offer their employees more stable employment conditions and can, at least to a certain degree, practice labor hoarding during a serious recession.

The reason for this is that large-scale firms tend to act on monopolistic or oligopolistic product markets, and have more political influence, better contacts with important economic actors (such as banks, and other financial institutions) than small-scale firms have. Moreover, another possible strategy for large firms is to transfer variations in product demands to small-scaled subcontractors, that is, to switch to in-house production of components and parts during a recession.

B. The second question is *which type of firms, given the economic situation and the resources, are most inclined to dismiss their workers?*

- Firms with a large capital to labor ratio, i.e., firms with a capital-intensive production, will be less inclined to dismiss their workers than firms with a labor-intensive production do.

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[4] According to the downsizing hypothesis, however, the time order is that increased profits are preceded by workforce reduction, and not, as modelled in the analyses below, that profits at time t affect workforce reductions at time t+1.

[5] E.g. Averitt (1968), Kalleberg et al (1981), Ryan (1981).

The rationale for this hypothesis is, firstly, that since labor costs, by definition, constitute a small proportion of total costs in capital-intensive firms, labor hoarding is not such a great sacrifice. Secondly, because the workers in capital intensive firms must be entrusted to handle costly capital equipment in a reliable way, their bargaining power tends to increase. Thus, the higher costs for carelessness and destruction of costly equipment in capital intensive firms, together with the relatively small significance of labor costs, tend to reduce the unemployment risks of the employees in such firms (Hodson (1984).

Another possible factor affecting the probability of dismissals is the labor turnover of the firm. A high quit rate in the firm will lead to a reduced workforce without any dismissals being necessary. We have no information on labor turnover in our data, but it is in my view reasonable to believe that a substantial part of voluntary shifts between employers is captured by including industry and occupational group as covariates in the empirical models. Moreover, during the recession of the early 1990's, labor mobility across firms decreased dramatically.

Determinants of dismissals: the importance of the worker's degree of replaceability and decision-making power

During normal fluctuations in the business cycle, it is assumed that workers in 'closed positions' within firm internal labor markets (or 'insiders' with another terminology) will be sheltered against unemployment, see Sørensen (1983) and (1990).[6] In other words, it is reasonable to argue, as for example Gottfries (1992) does, that during normal economic conditions the quit rate is sufficiently large to enable most firms to adjust their employment by variation in hiring, i.e., without laying off insiders.[7] However, during the period being studied here, many of these protected employees also became exposed to unemployment risks, as the quit rate dropped dramatically. Accordingly, when the whole economy suffers from a severe chock, the overall hiring rate will decrease. Quit rates will therefore decrease since there will

[6] This line of reasoning is supported by the findings of Arai and Heyman (2000) on the basis of Swedish establishment-level data of hires and separations 1989-1998 that employment trend are governed by jobs with permanent contracts while temporary employment seems to work as an adjustment buffer.

[7] Also, see Oswald (1993).

be fewer opportunities with other employers. During such times, reducing hirings is not enough to cope with reduced demand for labor. A tremendous amount of human capital was probably lost during these years, since a large number of highly skilled workers became dismissed and were unable to find new jobs where their skills could be utilized.

Still, even if employees within closed positions were also hit by dismissals during the early 1990's crisis, they can be supposed to have been less hit compared to other employees. Therefore, controlling for variations in demand changes between industries, indicators of closed positions will strongly affect unemployment risks. In the empirical analyzes below two indicators of open and closed positions will be used: Years of employer seniority and a dummy for a temporary versus a permanent employment contract.

It is reasonable to assume that the first measures taken by the typical Swedish employer, given the necessity to cut down on personnel, is to stop hiring, to dismiss temporary workers, and to induce older workers to retire voluntarily - perhaps in cooperation with the trade unions. When these measures are not sufficient, it will be assumed that the employer utilizes two basic criteria when deciding upon which workers to discharge: (a) *Replaceability*, that is, the employees are ranked by how easy it is to replace them with external labor. (b) *Decision-making power*, that is, the more an employee is involved in important decisions in the firm (such as who to dismiss), the less likely it is that he or she will be dismissed; for a similar argument, see Korpi and Sidebäck (1998).

As for the replaceability of workers, my main interest here concerns the impact of on-the-job training. The data being used includes direct information on the skills acquired in the firm, and also whether such skills are transferable to other firms. Standard human capital theory as developed by Becker (1964) posits that the worker pays all the costs for training in the firm if the skills acquired are general, that is, transferable and of use with other employers. If the skills are specific useful only with the current employer the worker and the employer share the costs for training. However, recent studies from other countries have shown that employers often share the costs and returns to both general and specific training with their employees.[8]

[8] Acemoglu & Pischke (1999), Loewenstein and Spletzer (1999).

Acemoglu & Pischke (1999) present a model, which implies that when the wage structure is compressed which to a high degree is applicable to Sweden the employers may pay also for the workers' investments in general training. The reason is that the employer makes greater profits from more skilled workers and, therefore, finds it profitable to invest in all types of training that increases the workers' marginal product (skills). Thus, a compressed wage structure induces firms to provide and pay for general training. The implications of this line of reasoning are that on-the-job training, whatever its nature, constitutes an investment cost for the employer, which will be lost if the worker leaves the firm. This argument is supported by research from Sweden that shows that internal training tends to be a pure benefit for the worker since his or her lifetime earnings will be higher.[9]

- The more skill accumulation within the firm required for the respondent's job, the less is the worker's risk of being discharged. The degree to which the skill is transferable is not assumed to affect the risk of dismissals since the employer has paid for, at least part of, the costs of both types of training. However, skill transferability is assumed to affect the risk for not finding a new job for those who lose their jobs (see below).

Moreover, regardless of how much training the employer paid for, a worker with skills, which is scarce on the external market is more difficult to replace than other workers. In other words, the more difficult it is to recruit persons with a certain skill on the external labor market, the less is the unemployment risk for workers with such skills.[10] All else equal, workers in unskilled jobs, with less experience and with short education are more replaceable than workers with the opposite characteristics, which is in line with results from previous research.[11]

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[9] Björklund and Regnér (1993).

[10] This reasoning is based on the assumption that there is a shortage in the external labor market of most types of general skills during normal business conditions. Therefore, if employers dismiss workers with general skills during a recession they will find it difficult and costly to hire such workers when the economic situation has improved.

[11] The lower unemployment risks of workers with long firm tenure and of those with a permanent employment contract may, at least partly, be explained by their high firm-specific skills. But, as argued above, it can also be interpreted as due to these workers having a closed employment position and to the protective labor legislation of such workers. In principle,

Two indicators of a worker's degree of decision-making power will be used. First, occupational class is used as a crude measure. White-collar workers at high levels will on an average have more influence over the selection of workers to be discharged, and all else equal they will avoid deciding that they or their closest colleagues will have to leave.

Second, I will include a measure on the degree of physically demanding work tasks, which is expected to have a positive influence on unemployment risks. The argument for this is that workers with physically strenuous work-tasks seldom have access to decision-making circles at higher levels in the firm. Furthermore, workers in manual work tend to more often hold "open" positions, that is, positions that are filled and rewarded on the basis of demand and supply in the external labor market.

Determinants of search resources: hypotheses on not finding a new job

The final link in the chain leading up to unemployment concerns the chances of finding a new job for those who have lost their job. There are three possible outcomes for discharged workers: (a) to find a new job, which was difficult at the beginning of the 1990's since the number of vacancies was very small; (b) to withdraw from the labor force;[12] (c) to become unemployed.

Ideally, information on all these possible transitions would have been desirable. However, I only know if (c) has occurred or not, which may bias some of the estimates. Hopefully, this problem can be dealt with in future work.[13]

Swedish employers must by law follow the rule of "last in, first out" when reducing the staff. However, departures from this rule may be made by making agreements with the local trade union. See Oswald (1993) concerning the prevalence of inverse seniority rules for lay-offs in Britain, Canada and the US.

[12] Labor force statistics show that this was an option primarily for young and old workers (to go back to school and to retire, respectively). However, very few Swedish women withdrew from the labor force to become full-time housewives.

[13] More specifically, this limitation of the data implies that the estimated effects of various predictors on the unemployment risk will yield a lower bound for the 'true' effects. Moreover, some regressors may be correlated with the probability of leaving the labor force. This may

From previous research we can expect that individual resources, such as education and experience, will increase the chances of finding a new job, while individuals with an immigrant background will have reduced chances.

As for skills acquired in the previous firm, the expectation is that the unemployment risks differ between workers who have specific and general skills. As argued above, both general and specific skills are assumed to reduce the probability of becoming dismissed. However, given that a worker is dismissed, skills acquired in the previous firm will increase the chances of finding a new job only if the skill is general, that is, transferable to other firms. If, by contrast, the skill is firm-specific, it will instead reduce the probability of finding a new job. The rationale for this is that workers with firm-specific skills are less able to find a new job that is acceptable to them (i.e., above their reservation wage) compared to other workers.[14]

- When combining the negative effect of specific skills on dismissals and the positive effect of not finding a new job, the net effect of specific skills on unemployment risks will be close to zero. General skills will, however, have a strong negative effect on unemployment risks.

3. Data and variables

Three interrelated sets of data are used. First, information on the individuals' characteristics, their jobs, and of industry and establishment size has been collected in the Swedish Level of Living Survey 1991 (LNU). The sample is representative of the Swedish adult population (aged 18-75) and had a response rate of 79 percent. Out of 5,306 respondents in total, there were 3,099 wage earners with useable data and these were used in the analyses of "all employees".

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lead to a mistaken conclusion that a negative coefficient implies a higher chance of keeping an employment.

[14] The higher reservation wage of workers with specific skills can be due to, first, that the dismissed worker, at least initially, believes that he or she will get back the old job, and, second, that even if the individual has no hope of going back the old job, he or she may still have a minimum acceptable wage rate that is higher than the relevant open market wage due to perceptions of fairness and relative deprivation; e.g., see Akerlof and Yellen (1990).

Second, information on prospective unemployment was obtained by linking information from the National Labor Market Board on the starting date of unemployment of the LNU respondents who were registered at a public employment office subsequent to the interview in 1991 up to December 1992. There are strong arguments for expecting registration at an employment office to be a relatively reliable indicator of real unemployment. Firstly, such a registration is necessary in order to obtain unemployment benefits, and, secondly, there is a legal obligation of employers to report all vacancies to the employment office, which implies that the offices provide comprehensive information on job openings.

The third data set contains unique information on the annual economic report of the firm for those workers who were employed in a private firm, which has a legal obligation to provide such a report (mostly joint-stock companies).[15] For analyses based on these data, usable information was obtained for 1,000 employees.[16]

A short description of the variables used in the empirical analyses will be given below. More detailed information on the operationalization is given in the appendix.

The dependent variable is *unemployment*, coded as 1 if the worker at least once after the interview up to and including December 1992 was registered at an employment office as looking for a job and having no permanent job, and 0 for all other workers. In other words, we use a rather broad definition of unemployment, which includes some types of ”part-time” unemployment, for example, those respondents who have a temporary job and look for a permanent one. As much as 17.5 percent of all workers in our data became unemployed according to this broad definition.

Firm-level variables

All firm-level variables refer to 1991. However, in the case of missing values for 1991 the

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[15] These data, which are accessible to the public, have been collected by Per Weidenman, Market M M Analys AB (a private consulting firm).

[16] Arai (199) using the same data sets has examined the observations lost when data on individuals are matched with data on firms. He concludes that the lost individual observations are not systematically different from the individual obervations with non-missing firm data.

average of 1990 and 1992 was used. In spite of this procedure, some missing values remained, which were imputed on the basis of information on the other independent variables. Of the final sample size of 1,000, the number of cases with imputed values varies from 26 to 51 between the variables.

Four indicators of economic scale are used: *Establishment size*, the number of employees at the respondent's workplace. This variable is an exception to the other firm variables since it is included as a question in the LNU survey and is hence available for all workers, including public sector workers. The other three measures are: *total assets*, *total sales*, and *capital stock*. All these four variables have been transformed into logarithmic units.[17]

Two measures of labor/capital intensity are used: *Capital to labor ratio* is the logarithm of fixed capital (equipment and structures) per employee; and *labor cost ratio*, the ratio of labor costs to total costs.

Profitability and proceeds are measured by four variables: *Profit rate* is the ratio of profit to number of employees. *Sales per employee* is the logarithm of the ratio of total sales to number of employees. *Negative net income* is a dummy coded as 1 if the firm had negative net proceeds. *Negative capital returns* is a dummy coded as 1 if the firm had negative returns to equity capital.

Finally, the degree of the firm's indebtedness is measured by *long-term liability ratio*, long-term liabilities divided by total assets; and by *debt-to-equity rate*, measured as the ratio of all debts to equity capital.

General and specific job skills

The amount of general skills acquired in the firm has been constructed as the product of the amount of *total job skills* acquired in the firm and *skill transferability*. Total skills is measured as the approximate number of months it takes to learn to perform the respondent's job "… reasonably well, in addition to the skill required to get the job". Skill transferability is

[17] There are no theoretical arguments for any specific functional form of the association between the firm-level independent variables and unemployment risks. I have, therefore, used the form that seems to suit data the best.

constructed according to whether the respondent knew ”many”, ”some”, ”a few” or ”no” other employers where the skills acquired in the firm would be of great use.[18] The answers were coded as 1 for many and as 0 for no employers. The other two replies were coded as 0.20 for ”a few” and 0.80 for ”some”.[19]

General skills was then the measured as [Total skills × Skill transferability], and *specific skills* as [Total skills × (1 - Skill transferability)]. In other words, the sum of general and specific skills of a worker constitutes the total amount of skills acquired in the firm.[20]

Control variables

In order to make inferences on causal relationships between the above described variables and unemployment risks, we should (ideally) include covariates that approaches a random assignment of workers across firms and to jobs with specific or general skill accumulation. The causal interpretation of regression coefficients is, of course, a major problem in all empirical analyzes of non-experimental data. The nature of the data used here allows no other strategy but “selection on observables” (Angrist & Krueger 1999), that is, the inclusion of control variables. The following controls have been included, that, in my view, can be assumed to affect the sorting of individuals to firms with different resources, economic capacity and opportunities for skill accumulation:

First, I include conventional human capital variables, such as years of *schooling*, *seniority* (years of employer tenure), and years of labor market *experience*, including a square term. Second, in addition to these variables, dummies for *female*, *immigrant* and *temporary employment contract*, and an index of *physically demanding working conditions*

[18] The replies to the question were distributed as follows: Many employers 43 %, some 29 %, a few 9 %, no other employers 19 %.

[19] The scaling of the latter two replies is somewhat arbitrary, but experiments with other scalings (e.g. 0, 0.3, 0.6 and 1) indicate that the variable is not very sensitive for this.

[20] The correlation between general and specific skills is –0.122, and the correlation between the logarithmic transformations of the two variables is –0.120.

were included as controls.[21] Third, beside selection on individual and job characteristics, variations in the firms' type of production, product markets, and organizational structure are taken into account by including dummies for *industry* and *occupational class*. Industry is included in order to take into account of the fact that the severity of the recession varied between different sectors of the economy. Industry is measured by ten dummy variables with the engineering industry as the reference category. Occupational class is measured by four dummy variables: white-collar workers on middle and low levels, and skilled and unskilled blue-collar workers. The reference group is high level white-collar workers.

Since the dependent variable is binary, logistic regression is used.[22] First, "baseline" models of all workers are estimated with the following predictors: (a) individual and job characteristics, (b) occupational class, industry and establishment size. Second, the impact of general and specific skills acquired in the firm is analyzed in models with and without controls for the baseline model variables. Third, only workers employed in private firms containing information on annual reports are included. In the first exploratory analyses, each firm level variable is included one by one, with and without control for baseline model variables. Finally, in a "total" model, a selection of firm-level variables is jointly estimated together with job and individual characteristics, including job skills.

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[21] Physically demanding working conditions is a summative index of seven standardized item scores measuring exposure to (a) gas, dust, or smoke (b) heavy shaking or vibrations (c) noise (d) toxic, acid, or explosive substances (e) heavy lifting (f) work in bent or inconvenient positions, and (g) work that makes the respondent sweaty. The use of factor scores instead of this scale does not change the results in any substantial way.

[22] The results are reported in terms of odds ratios, i.e, the estimated proportional changes in p/(1-p) when the independent variable changes with one unit. Here, p is the probability that the worker becomes unemployed. More formally, the equation estimated is $p/(1-p) = \exp(\beta_k X_k)$ where X are predictors and β coefficients to be estimated.

4. Results

Baseline models

Model A in Table 1 includes individual characteristics, employer seniority, physical working conditions and a dummy for temporary employment. In model B, occupational class, industry, and establishment size constitute the only explanatory variables, and in model C all the independent variables of the A and B specifications are jointly included.

Overall, the results are in line with previous research. It should be noticed, however, that the coefficients of the individual and job related characteristics change very little between models C, and A and B, respectively, although the coefficients of occupational class are somewhat weakened after controlling for individual and job related attributes (compare models B and C). This result indicates that, generally, individual and structural factors tend to have mutually independent impacts on the probability of a worker becoming unemployed. In other words, the influence of individual and job attributes on unemployment can only to a limited extent be explained by workers and jobs being differently allocated across structural settings, such as class, industry and organizational size.

Furthermore, we see that model A has a relatively high explanatory power - the pseudo R^2 is almost 20 percent - which to a large extent is due to the strong impact of seniority and type of employment contract.[23] The unemployment risk of workers with a temporary employment contract is as much as 4.5 times the risk of permanently employed workers (this is line with the results reported by Arai and Heyman (2000) on the basis of data on establishment level hires and separations). Moreover, even when keeping temporary employment constant, already after two years of employer tenure the odds ratio decrease to about 0.45 of those with less

[23] Pseudo R^2 = 1 - L1/L0, where L0 is the value of a log-likelihood function with a constant only, and L1 is the likelihood value of the estimated model. R^2=0 implies that the model has no better predicitve power than the constant only model, and R^2=1 implies perfect prediction, that is, that the log-likelihood value of the estimated model is 0.

than one year of service.[24] After about 10 years of seniority the odds of being unemployed is almost 0.15 of the odds ratio of a newly hired worker (with a permanent contract). The results clearly show that, in contrast to explanatory models of earnings, seniority is of much greater importance for reducing the unemployment risks than general work experience.[25] Although significant, the effect of labor market experience is comparably weak. Moreover, experience squared does not show a significant effect, which indicates that there is no curve-linear effect of experience with respect to unemployment risks, in contrast to earnings.

[24] Note that since a dummy for a temporary contract is included in the model, the reference category for the seniority variable should be interpretated as workers with a permanent contract with less than one year of senirority.

[25] A model where the quadratic term of experience is dropped does not lead to another conclusion.

Table 1. The impact of individual and job characteristics, class, industry and size (Logistic regression on unemployment risks 1991-1992)

	Model A		**Model B**		**Model C**	
	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Schooling	0.870	0.019 ***			0.937	0.025 **
Experience	0.955	0.016 ***			0.959	0.016 ***
(experience)^2/100	1.043	0.040			1.041	0.041
Female	0.985	0.115			1.262	0.160 *
Immigrant	1.442	0.218 **			1.478	0.237 **
Temporary contract	4.469	0.709 ***			5.887	1.008 ***
Physically inconvenient work	1.248	0.069 ***			1.179	0.076 **
Seniority: (reference is seniority = 0)						
1 year	0.809	0.169			0.815	0.118
2 years	0.449	0.103 ***			0.452	0.057 ***
3-5 years	0.382	0.082 ***			0.396	0.044 ***
6-10 years	0.279	0.067 ***			0.314	0.034 ***
11-15 years	0.156	0.044 ***			0.190	0.025 ***
16-25 years	0.128	0.037 ***			0.165	0.023 ***
more than 25 years	0.160	0.058 ***			0.214	0.038 ***
Class: (reference is high level white-collar workers)						
White-collar w., middle			1.298	0.295	1.176	0.296
White-collar w., lower			2.178	0.479 ***	1.781	0.463 **
Skilled workers			2.980	0.649 ***	1.819	0.499 **
Unskilled workers			3.583	0.737 ***	1.908	0.511 **
Industry: (reference is engineering industry)						
Other manufacturing			0.855	0.168	0.701	0.149 *
Construction industry			1.246	0.279	1.013	0.249
Trade			0.795	0.165	0.480	0.111 ***
Transport etc.			0.726	0.201	0.483	0.150 **
Banking, insurance			0.754	0.196	0.574	0.160 **
Other private services			0.791	0.193	0.461	0.124 ***
Public administration			0.396	0.145 **	0.278	0.115 ***
Social care, health			0.710	0.128 **	0.342	0.077 ***
Education, research			0.625	0.161 *	0.354	0.106 ***
Other public services			0.541	0.119 ***	0.464	0.114 ***
log (establishment size)			0.845	0.024 ***	0.847	0.027 ***
Log Likelihood	-1180.4		-1380.6		-1142.5	
df	14		15		29	
Chi^2	571.77		171.41		647.71	
Pseudo R^2	0.195		0.058		0.221	

Notes: *** p< .01 ** p< .05 * p< .10
N = 3141 in all models

As expected, employees with a long education run less risks of being unemployed than those with a low education, and workers with physically inconvenient work run larger risks of being unemployed than other workers. Furthermore, while employees with an immigrant background experience higher unemployment risks compared to those who are born in Sweden, there are no or very small differences in unemployment risks between men and women.[26] It should be noted that the higher unemployment risks for immigrants is net of seniority and contract type. Thus, over and above their higher unemployment propensity due to more often having a temporary contract and having shorter firm tenure, immigrants have higher unemployment risks than workers born in Sweden. It is an important task for future research to establish whether this difference in unemployment risks is due to discrimination against foreign born workers on the Swedish labor market or not.

Among the structural variables, the class effect on unemployment risk is strong (see model B). As expected, workers in low-level positions run much higher risks of being unemployed than workers in high positions. The odds are about 3.5 times and 3 times larger for unskilled and skilled blue-collar workers, respectively, compared to high level white-collar workers. Low level white-collar workers have about 2.2 times larger unemployment odds than high white-collar workers. As mentioned above, the class coefficients are reduced after control for individual and job related attributes in model C.

More detailed analyses (not presented in the table) reveal that it is the inclusion of physical working conditions and temporary contract, which reduce the class effects on unemployment.

The industry effects on unemployment are surprisingly weak in model B. We find, as expected, that public sector employees have smaller unemployment risks than private sector employees,

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[26] The lack of gender effects on unemployment may seem somewhat surprising, given that the first phase of the recession of the 1990's mostly affected male dominated occupations and industries in the construction and manufacturing industries. The result is also contrary to that of Korpi and Sidebäck (1998) who found that women had smaller risks than men. The reason for this difference is most likely that my definition of unemployment includes some "part-time" unemployed. Sidebäck (1994) has shown that the unemployment risks of Swedish female workers are relatively high when only the risk for "part-time" unemployment is analyzed, but relatively low when "full-time" unemployment risks are analyzed.

but we find small differences *within* the private sector. In model C where individual characteristics are controlled for, the impact of industry generally becomes somewhat stronger, and we can now also discern industry differences among private sector workers, namely that workers in the engineering and construction industries had significantly higher risks than workers employed in other industries.

Finally, establishment size has a relatively strong negative impact on unemployment risks. The result indicates that the unemployment odds for a worker employed in an establishment with 1000 employees is about 20 percent lower compared with a worker in an establishment with 50 employees.[27] The effect of the firm's economic scale will be further discussed below when only employees in private firms are analyzed.

Job skills

The impact of job skills acquired in the firm is shown in Table 2. In accordance with our hypothesis, employees who have accumulated general skills in their firms have much lower unemployment risks; both compared to those with specific skills of the same amount and to those with no job skills. For workers with specific skills, there is even a weak, but non-significant, tendency to have higher unemployment risks than those without any job skills, after control for individual an job characteristics (see models B and C). The conclusion is therefore that only skills acquired in the firm that is of a general character decreases unemployment risks. For workers with specific skills two opposing mechanisms seem to counteract each other: workers with specific skills run less risks of being laid off by the employer, but given that this occurs such workers find it more difficult to find a new suitable job. The net effect on registered unemployment is therefore around zero.

When comparing the pseudo R^2 and the log likelihood statistics of models C in Table 1 and 2, we see that although job skills are relevant for understanding differences in unemployment risks among employees, their effects to a large extent seem to take place indirectly by class, industry, size and individual differences. In other words, there seems to be a selection by

[27] [ln(.85)*ln(1000)]-[ln(.85)*ln(50)] = -.211

means of individual attributes into jobs with different access to internal training. Furthermore, such jobs are differently distributed within the class and industry structure, and vary between workplaces of different size. However, there remains a significant net effect of general skills, which implies that they give additional resources to prevent unemployment.

Table 2: The impact of job characteristics
(Logistic regression on unemployment risks 1991-1992)

	Model A		**Model B**		**Model C**	
	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
(log) General job skills	0.733	0.027 ***	0.893	0.041 **	0.871	0.044 ***
(log) Specific job skills	0.912	0.045 *	1.085	0.061	1.083	0.063
Control for Individual and job characteristics?	NO		YES		YES	
Control for class, industry and size?	NO		NO		YES	
Log Likelihood	-1428.8		-1175.7		-1137.0	
df	2		16		31	
Chi^2	74.98		581.20		559.20	
Pseudo R^2	0.026		0.198		0.225	

Notes: *** p<.01 ** p<.05 * p<.10
N = 3141 in all models
The model in column B include, in addition to job skills, schooling, labor force experience, experience squared, seniority dummies, and dummies for female, immigrant and temporary contract, and an index of physically inconvenient work.
The model in column C include, in addition to the variables included in column B, dummies for occupational class, dummies for industry, and establishment size.

Firm characteristics

Table 3 presents the results when the impact of the firm's economic situation on the employees' unemployment risks is analyzed. These models only include workers who are employed in private firms with the legal obligation to publish annual economic reports. The sample size is reduced to less than one third of the full sample of Tables 1 and 2.

Each of the eleven firm-level variables is entered one by one in separate models. The results show that all firm characteristics in all models are significantly related to unemployment risks in the expected directions. Furthermore, controls for individual and job attributes, class and

industry do not affects the odds ratios of the firm-level variables very much (compare the results in columns A, B, and C). In other words, firm characteristics seem to have an independent effect on workers' unemployment risks, in addition to the observed individual and positional characteristics of the employees. Therefore, the preliminary conclusion is that the notion of highly productive workers being sorted into highly productive firms is erroneous.

We have seen from Table 1 that workers in large organizations to some extent are sheltered from unemployment. This conclusion is further strengthened in Table 3 where other indicators of economic scale and resources are included as predictors. The conclusion is that workers employed in large sized firms, with large assets, sales and capital stock, run considerably lower risks of becoming unemployed than workers in firms with the opposite characteristics do.[28]

Also, in accordance with our expectation, workers employed in firms with a high capital to labor ratio have a lower probability to become unemployed than workers in firms where labor accounts for a high proportion of total costs. Thus, it seems that employers are less inclined to dismiss workers in firms where labor costs are of relatively small significance, and where the work force must be trusted of taking care of costly capital equipment.

Perhaps more in line with orthodox economic and common sense thinking, is the fourth type of findings, namely that the higher the firm's profits and revenues, the lower are the unemployment risks of the employees.

Finally, the debt situation of the firm had an impact on the employees' unemployment risks. During the turbulent period in 1991 and 1992 when the interest rate exploded, firms with a high ratio of long-term debts ended up in a precarious situation, which increased the

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[28] However, as mentioned above, we are only able to measure if the worker has become unemployed or not. In other words, among those workers who has not become unemployed, we do not know whether the worker is still employed or has left the labor force. Therefore, the negative association between firm size and unemployment risks can be interpreted in two ways. First, that employment size increases the workers' chances of keeping their employment. Second, that workers in large firms are more likely to leave the labor force than workers in small firms, because larger firms are more likely to work out early retirement plans for their workers.

propensity for dismissals and bankruptcy, and hence the unemployment risks for workers in those firms increased.

Table 3. The impact of firm characteristics - employees in private firms only (Logistic regression on unemployment risks 1991-1992) [a]

Firm Characteristics:	A: Bivariate models			B: Controlling for Individual Characteristics [b]			C: Controlling for Individual Characteristics, Class and Industry [c]		
	Odds Ratio	Std. Err.	R^2 [4]	Odds Ratio	Std. Err.	R^2	Odds Ratio	Std. Err.	R^2
Economic Scale:									
(log) Total assets	0.829	0.029 ***	0.031	0.853	0.032 ***	0.144	0.849	0.033 ***	0.159
(log) Total sales	0.815	0.030 ***	0.033	0.830	0.033 ***	0.148	0.828	0.034 ***	0.163
(log) Capital stock	0.852	0.027 ***	0.028	0.879	0.030 ***	0.140	0.873	0.031 ***	0.156
Capital/labor intensity:									
(log) Capital to labor ratio	0.893	0.038 ***	0.007	0.897	0.041 **	0.131	0.906	0.043 **	0.146
Labor costs/total costs	12.385	7.104 ***	0.019	14.560	8.978 ***	0.144	15.141	10.392 ***	0.157
Profitability and proceeds									
Profit/employee/100	0.966	0.009 ***	0.022	0.965	0.010 ***	0.145	0.967	0.010 ***	0.158
log(Sales/employee)	0.619	0.060 ***	0.029	0.608	0.059 ***	0.153	0.604	0.062 ***	0.166
Negative net result	1.892	0.304 ***	0.015	2.052	0.360 ***	0.142	2.214	0.402 ***	0.160
Negative capital return	1.862	0.299 ***	0.015	2.060	0.362 ***	0.142	2.214	0.402 ***	0.160
Indebtedness:									
Long-term debt ratio	2.633	0.892 ***	0.008	2.345	0.853 **	0.131	2.607	0.971 ***	0.148
Debts to equity rate	1.021	0.006 ***	0.012	1.020	0.007 ***	0.133	1.021	0.007 ***	0.151

Notes: *** $p \leq .001$ ** $p \leq .05$ * $p \leq .10$

(a) N = 1 000 in all models.

(b) The model in column B include, in addition to the firm variable, years of education, years of labor force experience, experience squared, seniority dummies, dummies for female, immigrant and temporary contract, and an index of physically inconvenient work.

(c) The model in column C include, in addition to the variables included in column B, dummies for occupational class, and industry.

4) R^2 is the pseudo R^2.

Table 4 presents results when indicators on all four aspects of the firm's economic situation are analyzed jointly. Since many of these indicators are strongly interrelated and assumed to capture the same theoretical construct, it became necessary to reduce their number in order to obtain interpretable coefficients. Therefore, three additive indices were constructed for three of

the four types of firm characteristics - economic scale, profitability and debts. However, since labor intensity and capital-to-labor ratio were only moderately correlated, we did not

Table 4. Firm and job characteristics- employees in private firms only
(Logistic regression on unemployment risks 1991-1992)

	Model A		**Model B**		**Model C**		**Model D**		**Model E**	
	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.	Odds Ratio	Std. Err.
Economic Scale (index):	0.692	0.067 ***	0.751	0.078 ***	0.752	0.084 **	0.684	0.067 ***	0.745	0.082 ***
Labor Intensity	3.024	2.025 *	3.575	2.536 *	3.112	2.402	3.341	2.243 *	3.174	2.445
Economic Result (index)	0.646	0.090 ***	0.575	0.088 ***	0.553	0.088 ***	0.649	0.092 ***	0.557	0.089 ***
Debts (index)	1.214	0.586	1.190	0.125 *	1.205	0.129 *	1.212	0.119 **	1.209	0.131 *
(log) General job skills							0.799	0.049 ***	0.883	0.073
(log) Specific job skills							0.873	0.076	0.969	0.096
Control for Individual characteristics?	NO		YES		YES		NO		YES	
Control for class and industry?	NO		NO		YES		NO		YES	
Log Likelihood	-474.19		-415.47		-408.14		-466.95		-407.01	
df	4		18		29		6		31	
Chi^2	63.42		180.86		195.52		77.89		197.77	
Pseudo R^2	0.063		0.179		0.193		0.077		0.196	

Notes: *** $p \leq .001$ ** $p \leq .05$ * $p \leq .10$
N = 1 000 in all models.
The model in column B include, in addition to the firm variables, schooling, labor force experience, experience squared, seniority dummies, dummies for female, immigrant and temporary contract, and an index of physically inconvenient work.
The model in column C and D include, in addition to the variables included in column B, dummies for occupational class, and dummies for industry.

combine them into a joint measure. Only the labor to total costs ratio is used in Table 4, because it has a stronger association to unemployment than capital/labor ratio. In model A, these four firm-level variables are included as the only predictors to unemployment risks. In model B controls for individual resources are added, and in model C also industry and occupational class. Model D includes only the firm-level variables together with general and specific job skills. In model E, finally, all the predictors of the previous models are included together.

Table 4 shows that economic scale and profitability have a significant negative effect on unemployment risks in all five models. In other words, even when we compare workers with broadly similar individual characteristics, in broadly similar types of jobs within the same type of industry, workers in large-scale and profitable firms have a pronounced lower risk to become unemployed. After controlling for economic scale and profitability, the coefficients of both labor intensity and debts are weak and unstable. More detailed analyses, not presented in the table, show that large-scale firms tend to be more capital intensive, and that both large scale firms and high profit firms tend to have a relatively small debt rate.

The explanatory power of the four firm-level variables in model A, as measured by pseudo R^2 and Chi^2, is stronger than a model where only class and industry are predictors, but weaker compared to a model with only individual characteristics as predictors.

From models D and E, finally, it can be seen that the coefficient of general job skills becomes unstable when only private firm employees are analyzed. The point-estimate of the variable is similar to that reported in Table 2, model C, but the standard error increases so that now the estimate is not significantly different from zero.

5. Conclusions

Although more research is needed on the issue of transitions from employment to unemployment, some important preliminary conclusions can be made on the basis of the findings presented here.

First, the firm's resources and economic condition affect the workers' risks of becoming unemployed in several significant ways. Unemployment risks are greater for workers

employed in (a) small-scale firms, (b) in labor intensive firms, (c) in firms with small or negative profits, and/or (d) in firms with a high debt to equity ratio. Moreover, it should be noticed that these firm-level effects do not seem to be explained, neither by the selection of productive, high capacity workers to resourceful, capital intensive and productive firms, nor by an uneven distribution of such firms across industries and occupational groups. These results, therefore, give support to the arguments posed in the literature on dual economies and economic segmentation, that the location of a worker within a segmented economic structure will affect his or her labor market outcome, independently of the worker's own resources and ability.

Moreover, the finding that employment in large scale firms considerably reduces the unemployment risks clearly runs counter to the popular belief that it was primarily large, "inflexible" firms that collapsed during the crises of the 1990's, while small-scale organizations were more able to adapt to a new, unstable economic environment. My results are instead in line with the conclusions of Davis et al (1996: Chapter 4) that "conventional wisdom about the job-creating prowess of small businesses rests on statistical fallacies and misleading interpretations of the data", and that although small manufacturing firms and plants exhibit higher gross job creation, the net creation rates are not higher since the gross job destruction rates are also higher. On the basis of the results from a study of job flows in Swedish manufacturing industry 1972-1996, Andersson (1999:80) draws the same conclusion, or more specifically ... "that in fact smaller plants to a higher degree than larger have contributed to the negative trend in employment, and that the majority of jobs in fact have been created in larger plants." (My translation from Swedish.)

Second, concerning the influence of on-the-job training on unemployment risks, the conclusion is that the degree of the transferability of skills acquired in the firm is of utmost importance for whether the acquisition of such skills is decreasing the workers' unemployment risks or not. A worker with skills that are of use only within the firm will not be better off than a worker with relatively low job skills, while a worker with skills that can be of use with other employers has much less unemployment risks.

One possible implication of these results is that the effects of on-the-job training and firm characteristics constitute "uncompensated differentials" in the labor market, since on-the-job

training as well as some firm characteristics (scale and capital intensity) have positive impacts on earnings.[29] Thus, the argument is the antithesis of the economic theory of equalizing differentials, namely that workers receive pure benefits by working in large-scale, capital intensive and profitable firms, and by receiving training in their firms, since they both receive higher earnings and are protected from unemployment, given the assumption that there are no important unmeasured selection mechanisms (cf. Sørensen 1996).

The moral, if these interpretations are accepted, is that a Swedish worker who wants to avoid unemployment during a severe recession should try to become employed in a large-scale organization with a high capital to labor ratio, and a sound economic situation in terms of profits and debts. In addition, among such firms the worker should try to find an employer who offers enhancement of job skills of a general character, i.e., skills that is transferable to other firms. An employment with such an employer does not imply a price in terms of lower earnings. On the contrary, it seems that the relative earnings will tend to be higher. One important issue for future research is according to which criteria the queues for such safe and well-paid jobs are ordered.

These are possible interpretations of the findings presented here. One important objection, which is naturally raised, is that the period being analyzed in this study was unique in the perspective of Swedish post-war labor market history. Therefore, one may ask to what extent the results would be different if the analyses were conducted for a more normal labor market period; a question that is especially valid for the finding that specific skills do not affect unemployment risks. It is reasonable to assume that employers are more cautious to discharge workers with specific skills during a less turbulent economic situation. Future research hopefully will resolve these matters, as well as many other questions that remain concerning the important but still largely unexplored issue of the transition from employment into unemployment.

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[29] Brown and Medoff (1989); for Sweden, see Arai (1999) and le Grand (1989).

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Appendix: Description of variables

Unemployment (0-1)	1 = The employee had been registered as unemployed at the public employment office as having no permanent job at least once after the interview in 1991 up to December 1992.
Schooling	Number of years in education
Experience	Number of years in the labor force. A square term of experience is also used in the models, to take curvelinear effects into account.
Female (0-1)	1 = women
Immigrant (0-1)	1 = The respondent's both parents were foreign citizens when the respondent was born.
Seniority	Number of years employed with the current employer. Seniority is measured by seven binary variables - 1 year, 2 years, 3-5 years, 6-10 years, 11-15 years, 16-25 years, and more than 25 years of seniority. Less than 1 year is the reference category.
Occupational Class	Measured by four binary variables based on the "socioekonomisk indelning" of Statistics Sweden: middle level white-collar workers, low level white-collar workers, skilled blue-collar workers, unskilled blue-collar workers. High level white-collar workers is the reference category.
Industry	Measured by ten binary variables based on SNI classification of industries of Statistics Sweden: other manufacturing (except engineering industry), construction, trade, transport and communication, banking and insurance, other private services, public administration, social care and health, education and research, other public services. Engineering industry is the reference category. When employees in private corporations are analyzed the latter four public sector dominated categories are collapsed into one group.
Establishment Size	The logarithm of total number of employees at the establishment.
Physically inconvenient working conditions	An standardized additive index measuring exposure to (a) gas, dust or smoke, (b) subjected to heavy shaking or vibrations, (c) noise, (d) coming into contact with toxic matters, acids or explosive substances, (e) heavy weights to lift, (f) forced to work in bent or inconvenient positions, g) gets sweaty while working.
General skills (months)	The logarithm of the product of "*Job skills*" and "*Skill transferability*". Job skills is coded in approximate number of months on the basis of answers to the question "In addition to the skill required when getting the job, how long does it take to learn to perform your job reasonable well?". Skill transferability is constructed on the basis of the question "Do you know of any other employers where you would have good use for what you've learnt in the present job?" The answers are coded as "No" = 0, Yes a few = 0.20; yes some = 0.80; Yes many = 1.
Specific skills (months)	The logarithm of total job skills minus general skills (see general skills above)
Total assets	The logarithm of all assets of the firm
Total sales	The logarithm of total turnover of the firm.
Capital stock	The logarithm of the total capital stock of the firm
Capital to labor ratio	The ratio of the value of all fixed assets, including machines and other equipment, to the number of employees.
Labor intensity	The ratio of labor costs to total costs.
Profit/employee	(Sales + financial revenues-10% of equity capital -financial costs-labor costs)/No. of employees.[(a)] To eliminate the exaggerate influence of outliers, maximum and minimum values were truncated to 14000 and -350 respectively (the 99th and 1st percentile of the distribution).
Sales per employee	The logarithm of the ratio of sales to the number of employees.
Negative net result (0-1)	1 = The firm had negative net proceeds rate (measured as the ratio of proceeds net of financial revenues and costs to total sales.
Negative capital return (0-1)	1 = The firm had negative returns to equity capital (measured as the ratio of proceeds net of financial revenues and costs to adjusted equity capital.[(b)]
Long-term debt ratio	Long-term liabilities divided to total assets;
Debt to equity rate	[All liabilities + (tax rate*untaxed reserves)]/adjusted equity capital.

Notes:

(a) Unfortunately, we had no information on the costs of input goods. After control for industry, however, I believe that the accurateness of this measure is satisfactory.

(b) Adjusted equity capital is the sum of (1-tax rate)*untaxed reserves and equity capital.