

Long term effects of public policy for displaced workers in Sweden – shipyard workers in the West and miners in the North*

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19 January 2011

Abstract

The objective of this paper is to study the long term effects of policy measures for displaced workers. Our focus is on the individuals affected by the closure of the Uddevalla Shipyard in western Sweden in 1985 and the cutbacks at the LKAB mines in northern Sweden in 1983. These workers not only experienced job loss, but were also target groups for extraordinary labour market policies. Using register data from Statistics Sweden (labour market status, earnings, education etc.), we follow those affected until 1999. We compare their experiences with the development of a large sample of other workers who lost their jobs because of plant closures in 1987–88 but who did not receive extraordinary measures. Estimations of the net effect of the extraordinary measures find that they did have positive long-term effects for the displaced shipyard workers and miners. They have higher employment, not higher unemployment, and higher earnings than the comparison group.

Keywords: involuntary job loss, displacement, plant closures, cutbacks, labour market policy, employment, unemployment, earnings

EconLit subject descriptors: J650, J680, L620, L720

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*We have benefited greatly from the efforts of Marcus Eliason. The project started when we both were at Dept of Economics, University of Gothenburg, Sweden. We thank the Swedish Council for Research in the Humanities and Social Sciences (HSFR) and the Swedish Institute for Labour Market Policy Evaluation (IFAU) for generous financial support. Helpful comments from two anonymous referees, Kerstin Fransson, Peter Fredriksson, Daniel Hamermesh, Kristiina Huttunen, Erik Mellander, Ulf Westerberg, Olle Westerlund, and seminar participants at ERMES, Université Panthéon-Assas, Paris II; IFAU; the Swedish Ministry of Finance; and Umeå University are gratefully acknowledged. Some of the work with this paper was done when Ohlsson enjoyed the hospitality of LEM and ERMES, Université Panthéon-Assas, Paris II. Any opinions expressed in this paper do not necessarily correspond to those of the European Foundation for the Improvement of Living and Working Conditions.

1 Introduction

The ongoing restructuring of market economies creates benefits for many but may be at the expense of significant losses for those displaced in the process. Currently, we observe how manufacturing and some service jobs move from Western Europe and the United States to low cost countries such as Eastern Europe and Asia, as exemplified by automobile manufacture and financial services. However, job loss due to global restructuring is hardly a new phenomenon. In the early 1980s it occurred on a grand scale in heavy industry such as mining, steel and shipbuilding. What policy lessons can be drawn from these earlier experiences?

Among the most extensive policy responses to restructuring occurred in Sweden in the 1980s and probably the most prominent of policy interventions were the extraordinary policy measures following the closure of the Uddevalla Shipyard on the West coast and the cutbacks at the LKAB mining company in the far North. Enough time has now elapsed to allow an evaluation of the long-term effects of these policies. Previous evaluations, subjects of our respective PhD thesis, can be found in Ohlsson and Westerlund (1987) and Storrie (1993) and were based on survey data. Since then Statistics Sweden has made great advances in the development of census and tax registers for research purposes. Moreover, registers have been digitally back-dated to the early 1980s. In the previous studies the displaced miners and shipyard workers were identified through contacts with the two firms back in the 1980s. Crucially, their personal identity numbers were also obtained at that time. This now permits a register based follow-up of the labour market experiences of the miners and shipyard workers from when they lost their jobs up to the end of the millennium. It also enables the identification of a more appropriate control group than was previously available.

It is very well established in research from the United States that job displacement has long-term effects on earnings (Ruhm, 1991; Jacobson et al., 1993; Stevens, 1997). The evidence from Europe is both sparser and less unanimous. Gregory and Jukes (2001) compare the evidence in European countries with the United States evidence and conclude that the losses on re-engagement in Europe are lower, possibly negligible and, where they exist, are more quickly overcome. Similarly, Huttunen et al. (2010) found rather small long-run effects in Norway.

However, Eliason and Storrie (2006) find significant long term negative effects for employment, unemployment and earnings in Sweden.¹ As the comparison group in this paper, those displaced without extraordinary measures, constitutes the study group in the Eliason and Storrie (2006) paper, our point of departure is that there are long term negative effects. This paper then examines whether the extraordinary measures implemented in Uddevalla and in the North yielded long-term effects compared with other displaced workers, who did not receive extraordinary policy measures.

¹Eliason and Storrie (2009), using the same data set, report that the overall mortality risk among men increased considerably during the first four years after the job loss.

The short-term costs of displacement are usually attributed to foregone earnings during unemployment and loss of firm- and industry-specific human capital (Hamermesh, 1987). The literature is less explicit concerning the mechanisms behind the longer-term effects. The unemployment scarring literature, for example, Ellwood (1982), Arulampalam (2001), Böheim and Taylor (2002), refers to a number of factors such as permanent loss of firm-specific human capital, the deterioration of general human capital during a spell of unemployment, and that potential employers may use previous labour market history as a signal of productivity. However, Stevens (1997) showed that long-term earnings effects may be related to multiple job losses and Hall (1995) also suggests that the persistence might be explained by high turnover among subsequent low-tenured jobs.

Eliason and Storrie (2006) could not fully determine the mechanisms behind the negative effects. However, the displaced Swedish workers did not experience much initial unemployment so they attribute less credence to the unemployment scarring explanation. They also note that the employment rate differential between the displaced and non-displaced was almost eradicated three years after the initial displacement. However, with the advent of the very severe recession that hit the Swedish economy in the early 1990s, the employment rate differential then increased. Thus they place more emphasis on the recurrent job loss hypothesis.

Despite a very extensive ALMP literature, it is extremely rare that measures specifically addressed to workers displaced as result of restructuring are properly evaluated. There are, of course, innumerable case study follow-ups of workers displaced at restructuring where active policy measures have been applied. Exceptionally few of these studies have any possibility of determining the added value of policy on labour market outcomes, due to the lack of an appropriate control group. While there are registers or other sampling frames of unemployed people from which to extract a control group of non-participants, there is no obvious and easily accessible such sampling frame for displaced workers. The Kluve et al. (2007) overview of over 100 European evaluations of ALMP measures could only identify one that focused on displaced workers and that fulfilled the basic scientific requirements in this respect. Winter-Ebmer (2006) evaluates the extensive and innovative redundancy project conducted by the Austrian Steel Foundation by comparing the outcome of those ex-employees of the firm that participated in the programme with those who did not. Obviously this raises some difficult selection problems.

We are not aware of *any* research on the effects of labour market policy addressing displacement in the long term. This is hardly surprising as the data requirements for such research are immense. Register data are essential for research on long term effects as they overcome the serious problems of recall bias and sample attrition. The linked employer-employee register data can also identify all other workers who lost their jobs due to a plant closure in the mid 1980s.² These closures were not accompanied by the extraordinary measures in Uddevalla and LKAB and

²Dustmann and Meghir (2005) point out that a major difficulty is that one in general observes separations not displacement. This problem can be overcome by focusing on plant closures.

so constitute the appropriate counterfactual case required for the evaluation of extraordinary measures.

In accordance with the evidence from the previous case studies Ohlsson and Westerlund (1987) and Storrie (1993) based on survey data, we find no evidence of the extraordinary measures having any significant short run effect on employment or unemployment rates or earnings of those receiving extraordinary policy measures. However, after 6–8 years significant policy effects do emerge. It is hardly immediately obvious why positive effects are found only in the long term.

We do observe, however, a clear increase in the level of schooling (largely corresponding to the advanced secondary education typically received by 16 to 18 year olds) among those receiving extraordinary measures compared to the comparison group. Indeed, a distinguishing feature of the extraordinary measures was a much broader orientation of the types of measures available to these workers compared to more traditional labour market policy. We interpret our results as showing that it was this broader orientation that yielded the long-run results.

Previous research indicates that the costs of job displacement are related to losses of firm specific capital and, therefore, that the effects of job displacement may be long-lasting. The lack of short term effects of policy reported in this paper indicates that the quick-fix of a limited set of job specific skills is not sufficient to compensate for the loss of specific human capital that may have been built up over many years. General, non-specific human capital, takes time to yield benefits both due to the duration of the education itself and possibly due to the time required to find an appropriate match for skills that are not so obviously related to a particular occupation or match with a particular employer. Finally, we note that while our main result is that extraordinary labour market policy measures have positive long-term effects, we do not address the question of whether these effects were cost effective.

The paper is organized as follows: We present our two cases in the beginning Section 2. The previous evidence in the short term results is the topic of the rest of Section 2. Section 3 presents the data. In this section we present the study and comparison groups used in the present study. The rest of Section 3 is the core of the paper. Here we present the evidence on the long term effects of public policy on labour market status and earnings. Section 4 concludes.

2 The two cases and short run labour market outcome

In this section, we briefly summarize the two cases.³ We describe the crises that hit the companies, the policy responses and the subsequent short run labour market outcomes.

³The LKAB research project was financed by The National Labour Market Board (AMS). The Uddevalla Shipyard research project was financed by The Swedish Expert Group For Labour Market Policy Evaluation Studies (EFA).

2.1 The Uddevalla Shipyard and LKAB mining company closures

The Uddevalla Shipyard

The crisis, the company and the employees. One of the most dramatic changes in the structure of the post-war Swedish labour market was the rise and fall of the shipbuilding industry. Fuelled by the post war boom, the industry exhibited exceptionally high returns to equity (Bergström and Södersten, 1979). Even if profitability subsequently declined substantially the sector continued to grow and by the early 1970s, Sweden was the largest shipyard producer in Europe (launched dead weight tonnes) and second only to Japan in the world, see Heseler (1988). The closure process began in 1971, with the closure of Lindholmens Shipyard in Gothenburg, and just over ten years later the production of ships had ceased to exist. Given the world-wide market share of shipbuilding in such a small country as Sweden, its subsequent rapid contraction constitutes a remarkable case of rapid structural change. The industry was largely based on the West coast (and predominately close to Gothenburg). The regional decline in shipbuilding was accompanied by rapid increase in automobile manufacturing at Volvo and SAAB.

Uddevalla shipyard was founded in 1946 and by 1959 it was the third largest in the world, in terms of launched tonnage, and had over 3,700 employees. As it began to incur losses the State became joint owner in 1963 and shed over 1,000 jobs up to the end of the decade. During the seventies employment again increased and in 1978 the yard launched the largest ship ever built in Sweden. However, given its specialization in large oil tankers, the collapse of this market at the end of the decade led to massive losses. In December 1984, the decision was taken by the company, by then fully state owned, to close the yard.

The response. As with the closure of all other major shipyards the closure of the Uddevalla yard led to extraordinary policy measures. However, both in terms of funds allocated and the wide range of measures implemented, the Uddevalla Package announced in 1985 was probably the most ambitious policy response to a single plant closure ever in Sweden. Apart from the more traditional labour market and industrial policy measures, the package included the construction of a motorway (linking the town with Gothenburg), the building of a tourist centre and tax rebates in order to persuade Volvo to locate an automobile assembly plant on the old yard site. The total cost of the Uddevalla Package was SEK 1,482 million.⁴ Most of these funds were spent on the motorway. SEK 127 million were allocated to active labour market policy measures (exclusively directed to the yard employees) and a further SEK 350 million were spent on industrial policy measures. Thus, while the Uddevalla case may be seen as a typical policy response to the closure of this industry, the scale of the response was unusually large.

⁴This corresponds to GBP 260 million, EUR 310 million and USD 410 million in 2010 value.

The LKAB mining company

The crisis, the company and the employees. In the middle of the 1970s, the production of steel in Western Europe started to decrease and capacity at the state owned LKAB mining company, in Norrbotten in northern Sweden, could not be fully utilized because of the contracting market. The management, however, chose not to reduce the labour force as the difficulties were considered to be temporary. Between 1979 and 1982 the company received SEK 4,000 million from the state, to enable continued operation.⁵ However, by early 1982, the expected recovery did not occur LKAB gave notice of just under 800 projected redundancies. During 1982, the demand for iron ore decreased further, leading to an additional 1,100 redundancies. When the first bout of redundancies was announced the company employed 6,200 persons. 1,800 of the redundancies were enacted and occurred by means of cutbacks at two mines and the closure of a third mine. Among the displaced, 200 were women and 400 were white-collared workers. Most left between May and August 1983 with a few leaving slightly earlier.

The response. A collective agreement on voluntary redundancies awarded various early retirement benefits for older blue collar workers and white collar workers. From May 1983, LKAB offered a one-off severance pay of SEK 60,000 to the blue collar workers who quitted at their own request.⁶ For white collar workers, an agreement was made concerning similar allowances for voluntary redundancy. Those who voluntarily left LKAB earlier got less severance pay. In the case of the blue collar workers, the severance pay was the same as in a normal labour force reduction process and was thus based on seniority. Apart from the oldest blue collar workers, who, to a large extent, accepted early retirement, it was primarily the younger blue collar workers who left LKAB. However, for the white collar workers, the actual process differed from a normal labour force reduction process based on seniority. The severance payments can be viewed as the price the company had to pay to circumvent seniority.

After the 1982 parliamentary elections, the new Social Democrat government proposed the creation of a special organization with the aim of facilitating the finding of new jobs for the redundant LKAB workers. The Malmfältsdelegation (the Ore Mines District Delegation), was intended to be operational from 1 July 1983, i.e., the point of time at which the first employees were to have been given notice. However, about 1,000 persons had already left the company before the organization started operation. The Malmfältsdelegation was granted SEK 309 million by the Swedish Parliament, corresponding to SEK 170,000 per redundant employee.⁷ Of this sum, SEK 14.5 million was intended for labour market training, while SEK 262 million was allocated to job-creating measures in the form of relief works and special projects. The remaining funds were intended for administration and

⁵This corresponds to GBP 820 million, EUR 960 million or USD 1,270 million in 2010 value.

⁶This corresponds to GBP 12,000, EUR 14,000 or USD 19,000 in 2010 value.

⁷The total grant corresponds to GBP 65 million, EUR 75 million or USD 100 million in 2010 value. The per capita grant is equivalent to GBP 35,000, EUR 41,000 or USD 54,000 in 2010 value.

Table 1: The labour market situation a few years after closure and cutbacks.

	The Uddevalla closure	The LKAB cutbacks	
	September 1987 ≈ 2.5 years after	June 1985 ≈ 2 years after	October 1986 ≈ 3.5 years after
Labour market status, %:			
Employed	63	50	49
Labour market policy measures	11	14	4
Unemployed	2	3	8
Not in the labour force	24	33	39

Note: The Uddevalla sample of people younger than 58 when they left, the LKAB sample consists of people who were younger than 60 when they left.
Sources: Storrie (1993) and Ohlsson and Westerlund (1987)

follow-up studies. The special organization faced fewer constraints than the regular labour market policy authorities. There were no restrictions on where to buy training nor on the design of job creation measures. Moreover, it could provide training benefits to those participating in university education and pay premia to those who completed training programmes. Finally, it awarded grants for business start ups and the former LKAB workers received more extensive employment exchanges services. Geographical mobility was not, however, a priority of the special organization.

2.2 Short term results – previous evidence

In Table 1, we present the labour market status of the displaced workers a few years after the closure in Uddevalla and the cutbacks of LKAB, based on our earlier surveys.

In Uddevalla, in terms of the avoidance of unemployment, the labour market outcome for both the yard workers, and the region as a whole, suggested a very successful policy. During the 2½-year follow-up period, there were never more than 47 unemployed (of a total work force of 2,165). By the end of the follow-up period, 24 percent of the workforce had permanently exited the labour force, see Table 1. 11 percent were temporarily out of the labour force (largely in labour market programmes, especially re-training). 47 percent were classified as employed in the regular labour market and a further 16 percent as employed with some form of wage subsidy. In the context of the duration of the follow-up period it is relevant to point out that for a large number of individuals, their labour market status, even 2½ years after the closure, depended upon the extraordinary (and temporary) labour market policy measures, see Storrie (1993).

Due to the difficulties in obtaining an appropriate control group, there was no evaluation of the total effect of the extraordinary measures. However, there is a tentative comparison of the labour market outcome of the Uddevalla workers with

a Danish shipyard closure, which was not accompanied with extraordinary policy measures, see Andersen and Storrie (1996). It was found that unemployment was much lower in the Swedish case, particularly among older workers. However, the employment rate was higher in the Danish case.

Storrie (1993) did however take up two policy issues. A particular feature of policy in the Uddevalla case was the very active involvement of the trade unions and management in policy implementation. It was found that this led to white-collar workers and those with long seniority receiving a disproportionately large part of the policy package. It was also found that the length of individual notice served increased the probability of avoiding an initial period of joblessness.

The previous evaluation of the LKAB cutbacks was based on three surveys. The three waves of mail surveys were carried out in March 1984, March 1985, and October 1986. Engström and Ohlsson (1986) summarized the findings. The short run results correspond to what would have happened if the regular active labour market policy measures had been expanded. Employment was not higher and unemployment spells were not shorter. It was not possible to find that vacancy durations had become shorter. The earnings of the displaced workers were not higher in the short run, and there were no effects of more training. Moreover, it was not clear if the job creation measures had been successful. Other work reported in Engström et al. (1988) and Engström and Löfgren (1989), was concerned with the effect that intensified employment services had on unemployment durations and unemployment risks for those made redundant, compared to a group of job seekers from the inland of northern Sweden. The basic result of the latter study was that there was no evidence that unemployment durations were lower, and that the risk of becoming unemployed was shorter for the displaced LKAB workers.

3 Evaluation of policy in the long run

This section describes which groups were identified in order to evaluate the long term impact of the extraordinary policy measures and the register data used to perform the follow up. It also provides a descriptive presentation of the long-term labour market outcomes based on register data. The effects of policy are then estimated with econometric models.

3.1 Data

We identify three groups of displaced workers; the displaced Uddevalla shipyard workers, the displaced LKAB miners, and all displaced due to plant closures 1987–88.

1. The displaced Uddevalla workers are all 2,163 individuals who were employed at the shipyard immediately prior to the announcement to initiate closure procedures with the trade unions. Information was made available

directly from the company's personnel files and included the personal identity number. This is a strength of this case compared to the LKAB sample. It is also the case that the problem of selectivity for a plant closure is less severe than for a cutback. Those who lose their jobs at a cutback are not chosen at random. Seniority often is the key criteria in Sweden but severance payments may make people to self select to leave. The possibility of reemploying laid off workers may also cause excess layoffs.

2. LKAB laid off 1,829 workers. After the exclusion of those who died during the displacement process, those older than 60 years and those who had moved abroad there remained 1,576 individuals at the time of the first mail follow up survey in March 1984. There were 1,041 responses to the survey (66.1 percent).⁸ This constitutes the sample available for the LKAB workers as the personal identity number of those not responding were not kept. From an attrition study done at the time there are no indications that the labour market situation for those not responding was very different than for those in our sample, see Appendix B.
3. Displaced due to plant closures 1987–88. This is the data set used in Eliason and Storrie (2006), which provides full details of how the extraction was conducted. The linked employee establishment data set allows the identification of closing establishments and the personal identity number of the employees. The choice of these years is simply governed by the need to have data for a period before the job loss. It was not possible to go back any further, this means that the main events in our two cases took place some years before the events of this comparison group. The sample used here contains the employees from all the closures in 1987 and 1988 of establishments with at least ten employees. An advantage of the sample compared to most other research using register data is that it can identify workers who separate early in the closure process. Hamermesh and Pfann (2008) suggest that this is an important issue as those leaving at the end of the closure process, who often are studied in other research, may not be a random sample of the work force. There are 19,617 displaced workers in this sample.

With the identification of the personal identity number a large number of human capital variables can be obtained from various registers, mainly used for census and taxation purposes. See Eliason and Storrie (2006) for a full description of the sources and definitions. In the next section we focus on three labour market outcomes defined as follows: employment status in November each year, incidence of insured unemployment (including part time unemployment and participation in labour market training) anytime during the year, and annual earnings.⁹ Those without wage income and compensation for unemployment and not covered by labour

⁸Of these most, 672, left during April–July 1983.

⁹We have reason to believe that insured unemployment covers a very large proportion of unemployment as defined by the labour force survey (International Labour Organisation [ILO] defini-

market policy measures during the year are defined as not being in the labour force. A key dependent variable used in the estimations is earnings. The employer files all wage payments to the tax authorities and, because practically all transfers in the Swedish welfare state, such as disability pensions and sickness and unemployment benefits, are liable to tax, the National Social Insurance Board also files income statements on such transfers (together with nontaxable social-assistance payments). The tax registers are also the source for the wealth variables.

3.2 Descriptive presentation of the long run labour market outcomes

Table 2 compares the labour market status for the three samples identified at the end of the observation period, in 1999, by age group. Young is defined as being 30 years or younger in 1985, which means younger than 45 years in 1999. The middle-aged were 31–40 years old in 1985 and 45–54 in 1999. The old were 41–50 in 1985 and 55–64 in 1999. And finally, the retired were 51– in 1985 and 65– in 1999. The samples are not balanced, the groups are only slightly smaller 1999 compared to the 1980s due to death and emigration.

For all three non-retired age groups the employment rate of the ex Uddevalla and LKAB workers was higher than the group of all job losers with the exception of old LKAB workers. This is some indication that the special policy measures implemented in the two cases may have had some positive effect.

Regarding the differences between Uddevalla and LKAB one could have expected a better outcome in Uddevalla as it has a more diversified labour market than the LKAB region and is within commuting distance to the important industrial centres of Trollhättan and Gothenburg. This turns out only partly to be the case as the Uddevalla group has the highest employment outcome for the youngest and LKAB for the middle aged. The main differences are, however, to be found in the old group where the ex-Uddevalla workers have almost 10 percentage points higher employment rate than the LKAB workers.

One might suspect that geographical mobility has affected the probability that people are employed. Table 3 shows the relationship between geographical mobility and employment shares. About a third of the Uddevalla workers and the LKAB had moved in 1999.

The fact that the worker displacement at LKAB were primarily due to cutbacks and not closures raises the issue of whether the displaced have been re-employed at the firm. This is the case to a relatively large extent. By 1999, 20.8 percent of the non-retired LKAB workers were re-employed. And 32.0 percent of the non-retired LKAB workers were re-employed by LKAB sometime during the period

tion). Between 1988 and 1992, roughly 70 percent of the ILO-defined unemployed received benefits (Björklund, 1996). Moreover, a large proportion of those not receiving benefits are those without an employment record, but all workers in our sample, with the exception of some of the unemployed from the North of the country were employed before displacement. The different measurement periods, determined by the availability of data, obviously imply that employment and unemployment are not exclusive states.

Table 2: The long term labour market outcome by age group in 1999, percent.

	Uddevalla	LKAB	job losers, plant closures
Young –30 1985, –44 1999			
Employed	88.2	84.7	79.7
Unemployed or Labour market policy measures	18.1	18.7	22.6
Not in the labour force	5.8	6.0	9.7
Middle-aged 31–40 1985, 45–54 1999			
Employed	81.7	87.1	77.7
Unemployed or Labour market policy measures	17.8	18.5	18.2
Not in the labour force	9.1	3.1	13.4
Old 41–50 1985, 55–64 1999			
Employed	62.5	53.1	58.0
Unemployed or Labour market policy measures	19.4	20.3	18.0
Not in the labour force	18.7	23.8	25.9
Retired 51– 1985, 65– 1999			
Employed	5.3	2.4	5.5
Unemployed or Labour market policy measures	1.4	1.6	1.4
Not in the labour force	84.9	83.9	84.7

Table 3: Place of residence and employment shares 1999.

sample	place of residence	number	share of sample, percent	employment share, percent
Uddevalla	Uddevalla	861	65.7	77.2
	elsewhere	450	34.3	75.8
	total	1,311	100	76.7
LKAB	Kiruna	344	49.4	79.4
	Gällivare	136	19.5	79.4
	elsewhere	217	31.1	78.8
	total	697	100	79.2

1985–1999.

The employment rate in 1999 for young LKAB workers who had never been re-employed was 83.4 percent. This is slightly lower than for all young LKAB workers, 84.7 percent, see Table 3. The pattern is similar for middle-aged and old LKAB workers, the employment rate among those never re-employed in 1999 were 84.2 percent and 51.0 percent. The corresponding shares including those sometime re-employed were 87.1 percent and 53.1 percent.

3.3 Estimations of the long run impact of labour market policy

Our three samples differ in many respects, for instance, the share of women, the share born abroad and age. We have, therefore, used regression models to control for the differences in measurable characteristics when estimating the effects of the extraordinary measures. The strategy is to match on gender, age and country of birth (using interaction variables) while controlling for other covariates by regression. The “treatment” effects for different subgroups are estimated by the interaction variables. Indicators for Uddevalla and LKAB are interacted with (i) year dummy variables, with (ii) year dummy variables also interacted with an indicator for women, with (iii) year dummy variables interacted with an indicator for those born abroad and with (iv) year dummy variables interacted with indicators for age cohorts: Middle-aged (31–40 in 1985, 45–54 in 1999), Old (41–50 in 1985, 55–64 in 1999) and Retired (51– in 1985, 65– in 1999). The estimated coefficients for the year dummy variables capture evolution for the reference category which is young men born in Sweden.

We estimate linear probability models for the likelihood of being employed (1985–1999) and the likelihood of being unemployed or in active measures (1983–1999). Individuals are included in the estimations as long as they are younger than

the statutory retirement age 65.

Table 4 reports the estimations results for the control variables. The employment and unemployment probabilities have the expected variation with age. We have also included explanatory variables that capture the situation prior to displacement.¹⁰ Being married prior to displacement increases the employment probability and decreases the unemployment probability. The impact of having children younger than 18 years prior to displacement is not significant in most cases. The education level prior to displacement 1983 has the expected impact. The unemployment probability of an individual with long university education is considerably lower than for an individual with only short primary education. Higher household wealth prior to displacement increases the employment probability and decreases the unemployment probability.

We have also included the unemployment rate in the municipality where the displaced lived when becoming displaced as explanatory variable. This is a time varying variable, but we keep the municipality the same for each individual over time as mobility is endogenous. The municipal level unemployment rate will capture the variation over time and across the country of the general economic conditions that the displaced individuals have experienced. The estimated impact of the municipal level unemployment rate has the expected negative impact on the employment probability and the expected positive impact on the unemployment probability.

As mentioned above, we have also included interaction dummy variables between year and, respectively, Uddevalla and LKAB. The estimated coefficients of the interaction variables measure the difference in employment and unemployment probabilities each year for the Uddevalla and LKAB workers compared to the group of job losers because of plant closures for young men born in Sweden. Figure 1 shows how the estimated employment probabilities, as measured by how the interaction dummy variables have evolved for Uddevalla. The figures also reports the 95 percent confidence interval around the estimated employment probabilities. The parameter estimates are reported in the first column in Table A.2 in Appendix A. Figure 2 shows how the corresponding estimated employment probabilities for LKAB, while column 7 in Table A.2 in Appendix A reports the parameter estimated.

The Uddevalla workers' employment probability was not significantly higher than that of the comparison group until 1994. In 1995, however, the Uddevalla employment probability becomes significantly higher. From 1992 and onwards the LKAB workers also do better than the baseline comparison group of all other job losers. The final outcomes during the second half of the 1990s for the Uddevalla workers and LKAB workers are quite similar. From a policy perspective the most striking result is that since the mid 1990s the employment probability of the young male Uddevalla and LKAB workers is about 10 percentage points higher than the

¹⁰For the Uddevalla sample this means the situation in 1984, for the LKAB sample 1983 and for the job losers 1986.

Table 4: Employment, unemployment and earnings of Uddevalla and LKAB compared to job losers, 1983/85–1999.

	employment, linear probability	unemployment, linear probability	log earnings, OLS
age	0.42 (36.4)	0.21 (26.6)	1.81 (58.7)
age ² /100	-1.67 (35.9)	-0.81 (23.9)	-6.89 (54.0)
age ³ /10,000	2.91 (36.6)	1.29 (21.7)	11.5 (51.3)
age ⁴ /1,000,000	-1.86 (38.2)	-0.74 (19.9)	-7.03 (49.8)
year indicators	yes	yes	yes
woman * year indicators	yes	yes	yes
born abroad * year indicators	yes	yes	yes
the situation prior to displacement:			
married	0.029 (6.69)	-0.035 (8.76)	0.048 (4.45)
child 0–6, indicator	0.004 (0.91)	0.008 (1.67)	-0.081 (6.93)
child 7–12, indicator	0.017 (3.84)	-0.003 (0.76)	0.041 (3.42)
child 13–15, indicator	0.003 (0.55)	-0.001 (0.11)	0.026 (1.87)
child 16–17, indicator	0.011 (1.67)	-0.003 (0.56)	0.034 (2.10)
lower secondary education, indicator	0.020 (3.30)	-0.016 (2.83)	0.105 (6.99)
short upper secondary education, indicator	0.047 (8.66)	0.005 (1.09)	0.133 (10.4)
long upper secondary education, indicator	0.065 (10.6)	-0.075 (14.0)	0.308 (19.8)
short university education, indicator	0.116 (18.2)	-0.115 (20.0)	0.403 (22.9)
long university education, indicator	0.120 (17.3)	-0.109 (16.5)	0.623 (30.0)
log household wealth	0.0076 (15.5)	-0.0045 (9.42)	0.0223 (17.6)
unemployment rate, municipality where the displaced lived in the year of displacement	-0.892 (10.0)	2.269 (26.4)	-2.601 (11.8)
n of observations	285,548	327,685	285,625
n of individuals	20,993	21,016	21,009
<i>F</i>	100.3	68.52	109.7
Prob <i>F</i>	0.000	0.000	0.000
<i>R</i> ²	0.155	0.086	0.204

Notes. Absolute *t*-values in parentheses. The standard errors are clustered. Reference category for education is primary education. Unemployment also includes those in active labour market policy measures. Interaction dummy variables between year, woman * year, born abroad * year, birth cohort * year and, respectively, Uddevalla and LKAB are included. The estimated coefficients for the reference categories, Uddevalla and LKAB young men born in Sweden, are reported in Figures 1–6. Tables A.2–A.4 report the estimated coefficients for all these interaction variables.

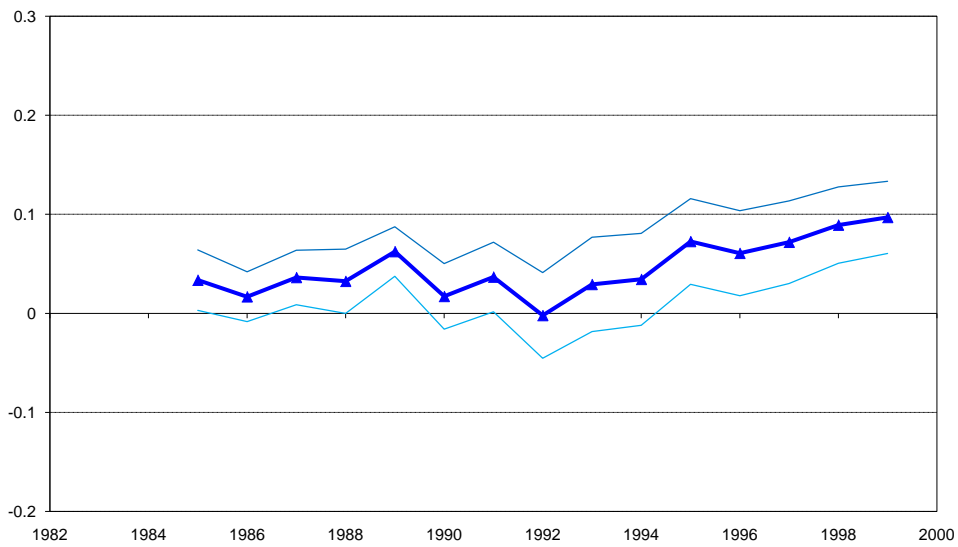


Figure 1: Estimated probability of being employed in November for Uddevalla workers relative to the reference group of job losers, young men born in Sweden, 1985–1999.

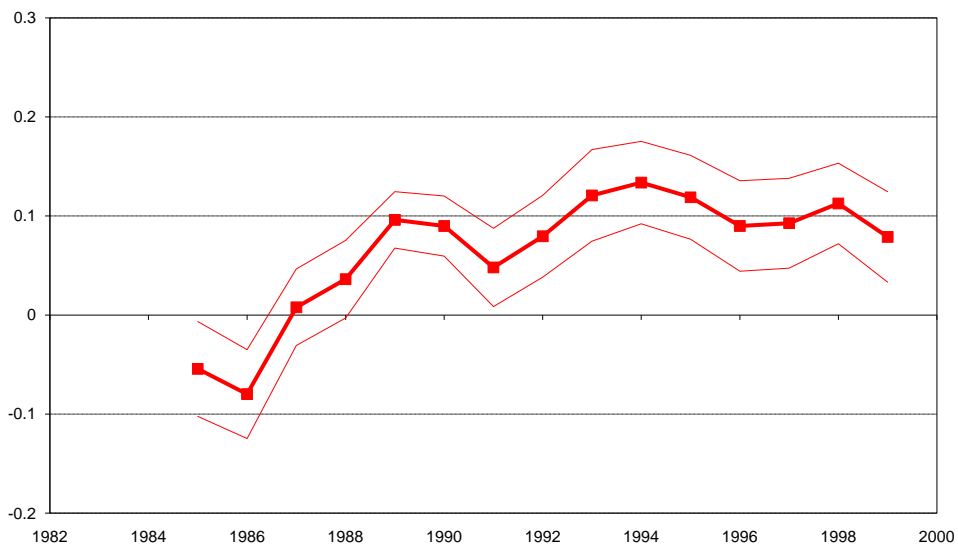


Figure 2: Estimated probability of being employed in November for LKAB workers relative to the reference group of job losers, young men born in Sweden, 1985–1999.

employment probability of the other job losers.

Re-employment affects the path of the estimated employment probabilities for the LKAB workers. The estimated probabilities are lower if only never re-employed LKAB workers are included.¹¹ The path for the LKAB workers is still above that of the Uddevalla workers in the beginning of the 1990s.

The paths for female Uddevalla and LKAB workers do not differ significantly from those in Figure 1 and Figure 2 except for a few scattered years. The parameter estimates can be found in Table A.2 in Appendix A. The same is true for Uddevalla and LKAB workers born abroad.

The paths for Uddevalla and LKAB workers in the age cohort Middle-aged do not differ significantly either from those in Figure 1 and Figure 2. The age cohorts Old and Retired, on the other hand, have significantly lower employment probabilities many of the years during the studied period.

Figure 3 and Figure 4 show how the estimated unemployment (and in active labour market policy measures) probabilities have evolved.¹² The picture is similar to that of the employment probabilities. The young male Uddevalla workers' unemployment probability peaked in 1986. By 1988, their unemployment probability was down to the level of the comparison group. During the rest of the studied period there was hardly any difference between the Uddevalla workers and the comparison group in the unemployment probability.

The unemployment probability of the young male LKAB workers was very high, but by 1987 it was below that of the comparison group. During the economic crisis years in Sweden in the beginning of the 1990s, the unemployment probability of the LKAB workers rebounds somewhat. The LKAB workers' unemployment probability, however, stayed well below that of the comparison group during the rest of the studied period. Reemployment at LKAB is probably one reason for this. Another likely reason for this result is that we control for the municipal level unemployment rate in the estimations. As these unemployment rates are high in northern Sweden, the potential gains from migration become large.

The unemployment paths for female Uddevalla workers do not differ significantly from that in Figure 3. Female LKAB workers have significantly higher unemployment probabilities than those in Figure 4 during the first years of the studied period. The parameter estimates can be found in Table A.3 in Appendix A. The unemployment paths for Uddevalla and LKAB workers born abroad do not differ from those in Figure 3 and Figure 4.

The unemployment paths for Uddevalla and LKAB workers in the age cohort Middle-aged do not differ significantly either from those in Figure 3 and Figure 4. The age cohorts Old and Retired, on the other hand, have significantly lower unemployment probabilities some years and significantly higher unemployment probabilities other years.

The estimation results for the control variables in the earnings equation are also

¹¹The estimation results are available on request.

¹²The parameter estimates are reported in Appendix A, Table A.3.

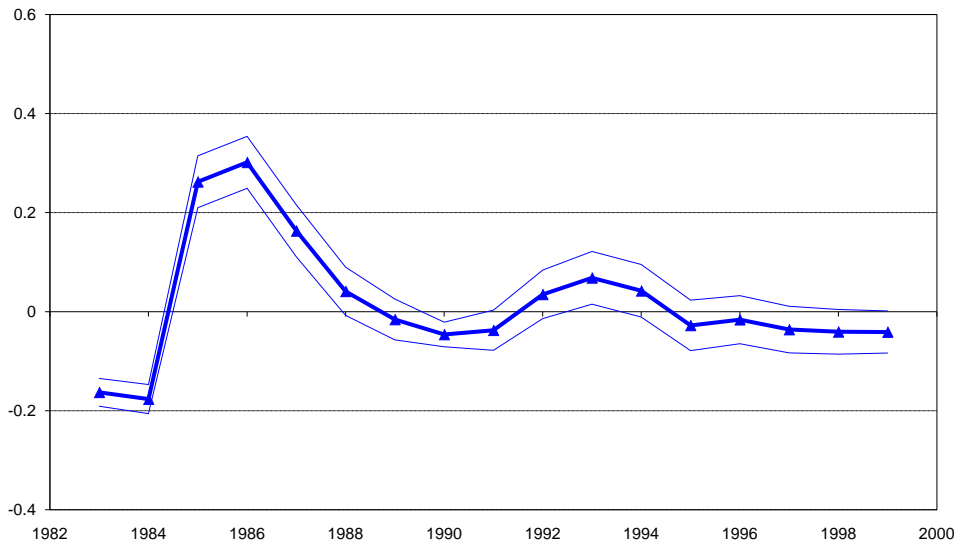


Figure 3: Estimated probability of being unemployed or in active labour market policy measures during the year for Uddevalla workers relative to the reference group of job losers, young men born in Sweden, 1983–1999.

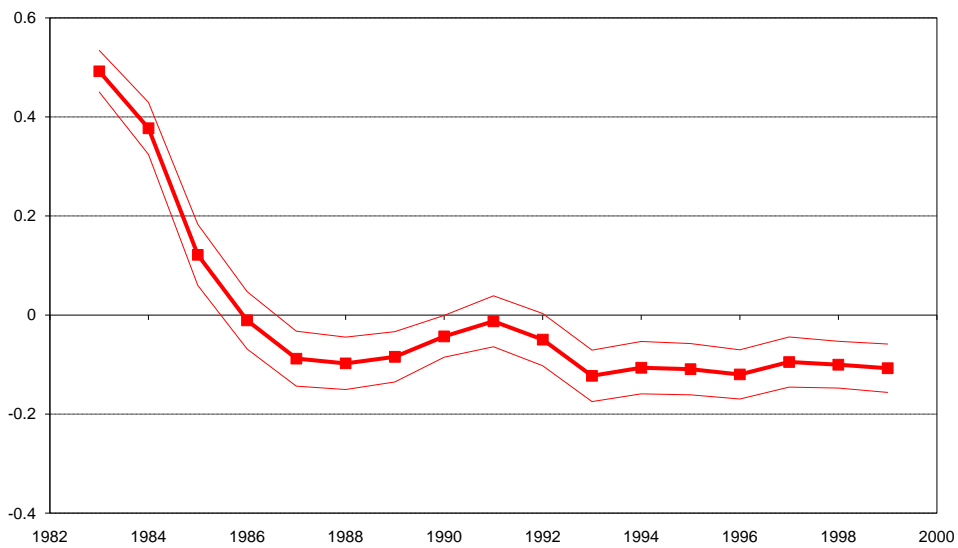


Figure 4: Estimated probability of being unemployed or in active labour market policy measures during the year for LKAB workers relative to the reference group of job losers, young men born in Sweden, 1983–1999.

presented in Table 4. The age-earnings profiles have the expected shapes. Being married prior to displacement increases annual earnings during the period by 5 percent. The education level prior to displacement affects earnings during the whole period 1983–1999. Those with a long university education prior to displacement earn, on average, 62 percent more than those with only short primary education. There is a positive and significant relationship between household wealth prior to displacement and earnings during the period. The estimated impact of the municipal level unemployment rate has the expected negative impact on earnings.

Figure 5 and Figure 6 show the estimated earnings paths for young male Uddevalla and LKAB workers born in Sweden. Table A.4 in Appendix A reports the parameter estimates. Earnings drop after the job loss, in 1987 for Uddevalla and in 1984 for LKAB. The Uddevalla and LKAB workers earn more than the job losers in the comparison group from the beginning of the 1990s. The earnings differential is around 25 percent in the end of the 1990s. It is also interesting to note that earnings for the groups follow a very similar pattern as for the employment probabilities during the 1990s, see Figure 1 and Figure 2.

The earnings paths for female Uddevalla and LKAB workers do not differ significantly from those in Figure 5 and Figure 6. The parameter estimates can be found in Table A.4 in Appendix A. The earnings of Uddevalla workers born abroad are significantly higher than those in Figure 5 a few years. LKAB workers born abroad have significantly higher earnings than those in Figure 6 during the first years of the studied period. The earnings paths of different age cohorts become significantly lower than those in the figures more and more years the older the cohort, see Table A.4 in Appendix A.

3.4 Discussion and interpretation of the results

The important results of this study are that the employment rate and earnings are significantly higher in the long term for the Uddevalla and LKAB workers, who received extraordinary measures, than those of the group of job losers because of plant closure who did not receive such measures. The time profiles of the employment and earnings differentials are very similar. It would, therefore, appear that the employment rate is the main determinant of the earnings differential over this period and not wage rates or working time.

In the north, the important LKAB company did rather well during the 1990s. The relatively favourable outcome for the LKAB case was to a relatively large extent due to re-employment in the company. This indicates the value of firm specific human capital when the firm continues to recruit labour. Thus for the LKAB workers who have stayed in the North, the pros of having non-redundant firm specific human capital has outweighed the con of living in a depressed area. To illustrate the latter, by the end of the study period (November, 1999), the percentage of the labour force either unemployed or in active measures in the Norrbotten County (the North) was as high as 14.6 percent. The corresponding figure in Western Götaland (the West) was 8.4 percent.

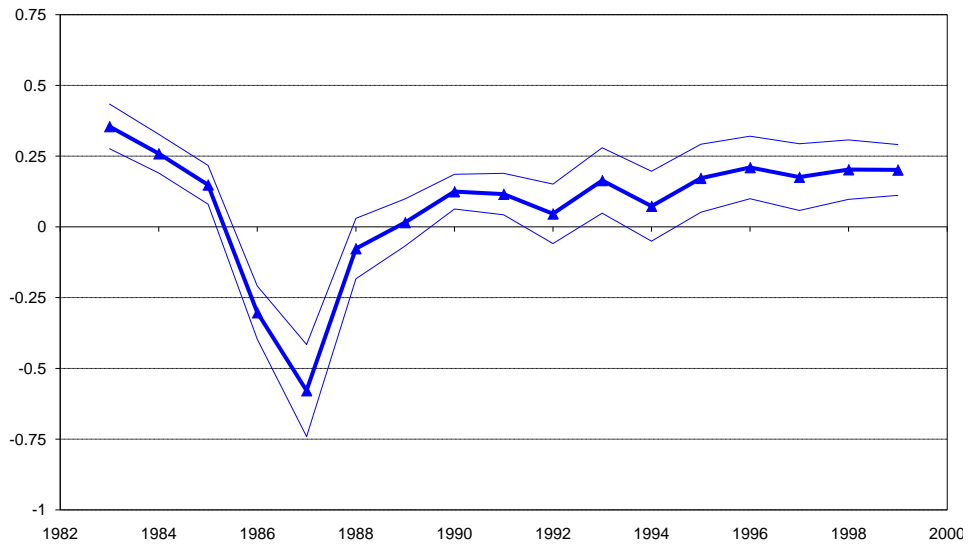


Figure 5: Earnings during the year for Uddevalla workers relative to the reference group of job losers, young men born in Sweden, 1983–1999.

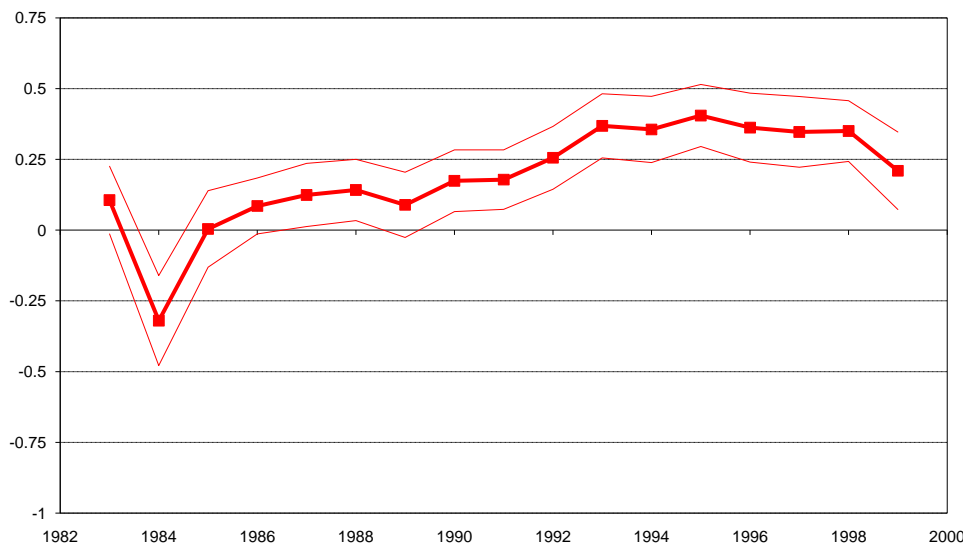


Figure 6: Earnings during the year for LKAB workers relative to the reference group of job losers, young men born in Sweden, 1983–1999.

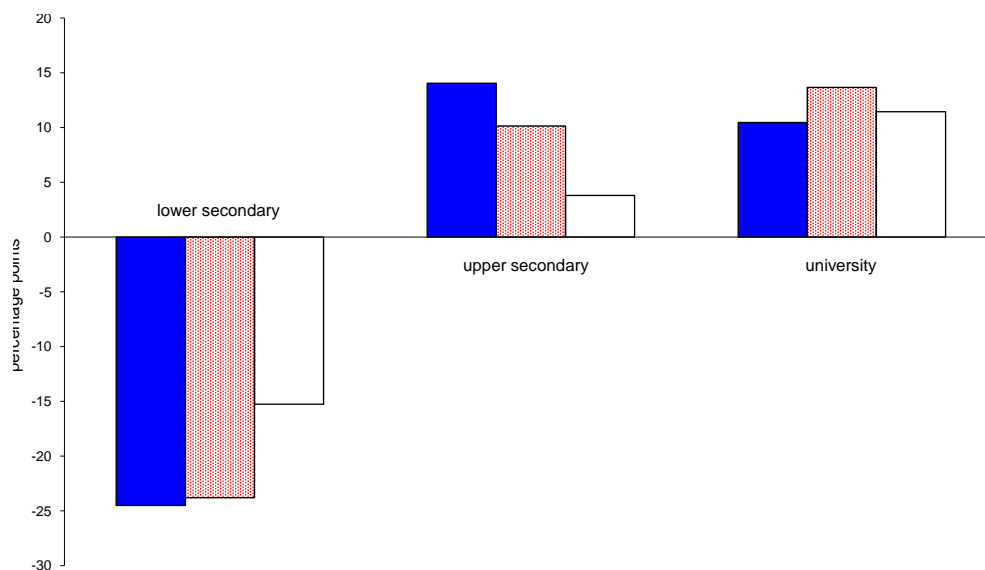


Figure 7: Change in highest education, 1983–1999.

It remains to explain why we find positive effects of extraordinary measures in the long term. How can the time profiles be explained and in particular why do largest effects occur towards the end of the follow-up period? Figure 7 reports the change in the highest level education attained by the Uddevalla, LKAB and all other job losers group, between 1983 and 1999.¹³ It shows very different rates of change in the educational attainment at upper secondary level, and especially for the Uddevalla workers.

This is a very interesting observation. It suggests that the better labour market outcome, in particular for the Uddevalla workers, was due to the heavy investment in basic general human capital that was a special feature of both extraordinary policy packages. Metalworkers and miners, especially in the early 1980s often had a very low level of formal schooling. Lower secondary is the level typically attained by 16 year olds. In 1983, 52.6 percent of the Uddevalla workers had at most lower secondary education. This share was almost halved by 1999. The corresponding share among the LKAB workers with lower secondary education in 1983 was considerably lower, 34.2 percent. But by 1999, the share was down to 10.4 percent. Among the job losers in the plant closure sample 38.7 percent had lower secondary education at the most in 1983. This share only decreased by 15.3 percentage points during the period until 1999.

Our results suggest that much can be gained from increasing the basic level of education to that normally attained by 18 year old school leavers. This also

¹³The calculations are made for those 65 years or younger in 1999 with information on education in 1983 and in 1999. There are 1,253 observations for Uddevalla, 681 observations for LKAB and 13,856 observations for the comparison group.

would explain why effects were only found in the long term. Obviously there is an appreciable “locking-in effect” as the process of upgrading from basic education to upper secondary education is typically of a relatively long duration. Moreover such human capital accumulation is not obviously relevant for a particular specific occupation or firm. Matching is likely to be a long process.

Our observation is that basic general human capital is important. This is also consistent with the result reported in Lamo et al. (2010). They find that specialized education, compared to general education, reduces the mobility of workers and, consequently, their ability to adjust to changes in the economy.

Our results are also consistent with the findings reported in Stenberg and Westerglund (2008). This paper evaluates the effects of upper secondary comprehensive adult education on the earnings of long-term unemployed. It turns out that the Swedish Adult Education Initiative, in force 1997–2002, resulted in substantial earnings effects after two semesters of study and longer. Stenberg (2009), however, shows that it takes several years before earnings increase after adult education. Participants in adult education tend to take a long time to pass courses, there are also considerable flows in to and out of adult education over time.

4 Concluding remarks

The objective of this paper was to study the long term effects of public policy measures for displaced workers. Our focus was on the individuals affected by the closure of the Uddevalla Shipyard in western Sweden in 1985 and the cutbacks at the LKAB iron ore mines in northern Sweden in 1983, and who received extraordinary labour market measures. Using register data from Statistics Sweden we followed those affected until 1999. We compare their labour market outcomes with those of a large sample other workers who lost their jobs due to plant closures in 1987–88 but who did not receive extraordinary measures.

In accordance with the previous evidence on these cases using survey data, we find no evidence in the register data of the extraordinary measures having any significant short run effect on employment or unemployment rates or earnings. However, after 6–8 years significant policy effects do emerge in terms of a higher employment probability, not higher unemployment probability and higher earnings than those in the comparison group only receiving the regular labour market policy measures.

The Uddevalla and LKAB workers have had higher employment and earnings than the comparison group of job losers during the whole period since the beginning of the 1990s. The long-run labour market outcomes (labour market status and earnings) for the Uddevalla and LKAB employees are remarkably similar. This is somewhat surprising as the labour market in the West is appreciably better than in the North of Sweden.

However, the LKAB mining company did well during the 1990s. The relatively favourable outcome for the LKAB case was to a relatively large extent due to re-

employment in the company. This indicates the value of firm specific human capital when the firm continues to recruit labour. Thus for the LKAB workers who have stayed in the North, the pros of having non-redundant firm specific human capital has outweighed the con of living in a depressed area.

It is not immediately obvious why positive effects of the measures are found only in the long term. We do observe, however, a clear increase in the level of schooling (largely corresponding to the education typically received by 16 to 18 year olds) among those receiving extraordinary measures compared to the comparison group. Indeed, compared to more traditional labour market policy, a distinguishing feature of the extraordinary measures was a much broader orientation of the types of measures available to these workers including much formal education. We interpret our results as showing that this orientation was an important factor behind the positive results. This is also in line with the findings in Winter-Ebmer (2006).

Previous research on the costs of job displacement indicate that they are related to the loss of firm specific capital and, consequentially, that the empirical findings of long-term costs suggest that these losses may be long-lasting. The lack of short term effects of policy reported in this paper indicate that the quick-fix of a limited set of job skills are not sufficient to compensate for the loss of specific human capital that may have been built up over many years. General, non-specific human capital, takes time to yield benefits both due to the duration of the education itself and possibly due to the time required to find an appropriate match for skills that are not so obviously related to a particular occupation or match with a particular employer.

Finally, we note that while our main result is that extraordinary labour market policy measures have positive long-term effects, we do not address the question of whether these effects were cost effective. Whether these benefits are so large that they outweigh the social costs of the measures is an open question. It also an open question to what extent policy has compensated the displaced for the private costs of their job loss.

Appendix A: Descriptive statistics and additional estimation results

The total number of people in our three samples is 22,821. However, 12 Uddevalla workers and 3 LKAB workers are also on the sample with job losers because of plants closures. These 15 people are not included in the analysis, leaving the total sample to 22,791 people. In many cases we restrict the analysis to those younger than 65 years old. This sample consists of 18,605 individuals in the beginning of the studied period. This number is reduced over the years because of retirement, emigration, and death.

Table A.1 reports the descriptive statistics. The first row for each variable reports the mean, the standard deviation for continuous variables is reported within parentheses and the number of observations can be found within brackets in the last row for each variable.

We transform household wealth nonlinearly to take into account that the (conditional) distributions of household wealth is strongly skewed. The transformation we apply is the so-called inverse hyperbolic sine transformation (Burbidge et al., 1988), which is close to a log transformation but can also accommodate zeros of the original variable,

$$z = \sinh^{-1}(y) = \ln\left(y + \sqrt{y^2 + 1}\right). \quad (1)$$

This transformation has been applied in the literature on wealth and transfers (see, e.g., Browning and Crossley, 2009; Hochguertel and Ohlsson, 2009). In our data, the approximation is sufficiently close to a log transformation.¹⁴

Table A.2 reports the estimated coefficients in the employment model for the indicators for Uddevalla and LKAB interacted with (i) year dummy variables, with (ii) year dummy variables also interacted with an indicator for women, with (iii) year dummy variables interacted with an indicator for those born abroad and with (iv) year dummy variables interacted with indicators for age cohorts. These coefficients in the base columns are also graphed in Figure 1–Figure 2. The rest of the estimation results can be found in Table 4.

Table A.3 and Table A.4 report the corresponding information on estimated coefficients from the unemployment model and the earnings model.

¹⁴ $z \approx \ln(2) + \ln(y)$ for $y \geq 2$.

Table A.1: Descriptive statistics.

	Uddevalla	LKAB	job losers, plant closures
woman, percent	7.7 [1,370]	13.4 [718]	45.1 [16,517]
born abroad, percent	2.8 [1,369]	3.8 [718]	15.5 [16,517]
the situation prior to displacement:			
age	35.2 (8.9) [1,370]	32.3 (6.8) [718]	31.5 (10.0) [16,517]
married	49.4 [1,370]	41.0 [718]	33.7 [16,445]
child 0–6, percent	22.9 [1,370]	32.7 [718]	18.8 [16,313]
child 7–12, percent	25.0	25.5	16.4
child 13–15, percent	13.7	12.3	9.9
child 16–17, percent	10.7	5.6	6.2
primary education, percent	32.5 [1,308]	10.8 [697]	13.0 [15,071]
lower secondary education, percent	19.0	23.7	23.6
short upper secondary education, percent	33.9	39.0	37.5
long upper secondary education, percent	9.0	16.8	12.9
short university education, percent	3.2	7.9	7.2
long university education, percent	2.4	1.9	5.8
household wealth, SEK ₁₉₈₆ 1,000	880 (1,253) [1,370]	466 (755) [718]	768 (2,420) [16,477]
unemployment in municipality, percent	4.6 (0.8) [1,370]	8.9 (2.6) [717]	2.8 (1.3) [16,431]
employed November 1985, percent	95.0 [1,370]	81.3 [717]	83.1 [16,354]
unemployed or in active labour market policy measures 1983, percent	2.6 [1,370]	79.5 [718]	16.1 [16,158]
earnings 1983, SEK 1,000	23 79.0 (27.0) [1,369]	71.9 (34.5) [718]	53.7 (46.7) [15,436]

Notes. The statistics concern those in the samples used in the estimations reported in Table 4, i.e., those younger than 65. Standard deviations for continuous variables in parentheses.

Table A.2: ‘‘Treatment’’ effects on employment, 1985–1999.

	Uddevalla										LKAB									
	interaction with:					interaction with:					interaction with:					interaction with:				
	Base	Woman	Born abroad	Middle-aged	Old	Retired	Base	Woman	Born abroad	Middle-aged	Old	Retired	Base	Woman	Born abroad	Middle-aged	Old	Retired		
1985	0.034**	0.037*	0.053*	-0.018	-0.021	-0.018	-0.054**	-0.050	-0.058	-0.015	-0.018	-0.054**	-0.050	-0.058	-0.053	-0.015	-0.342***			
1986	0.017	0.001	0.047	-0.026	-0.044***	-0.312***	-0.080***	-0.044	0.017	0.034	-0.357***	-0.080***	-0.044	0.017	0.017	0.034	-0.357***			
1987	0.036***	-0.024	-0.116**	-0.017	-0.038**	-0.347***	0.008	-0.039	0.058	0.009	-0.380***	0.008	-0.039	0.058	-0.027	0.009	-0.380***			
1988	0.032**	-0.043	-0.103	-0.017	-0.021	-0.290***	0.036*	-0.036	0.053	0.022	-0.284***	0.036*	-0.036	0.053	0.019	0.022	-0.284***			
1989	0.062***	-0.022	-0.061	-0.028	-0.059***	-0.298***	0.096***	-0.021	0.011	-0.047*	-0.373***	0.096***	-0.021	0.011	-0.014	-0.047*	-0.373***			
1990	0.017	-0.056	0.028	0.022	-0.036	-0.201***	0.090***	-0.039	0.075	-0.035	-0.346***	0.090***	-0.039	0.075	-0.011	-0.035	-0.346***			
1991	0.037**	-0.052	0.079	-0.005	-0.016	-0.157***	0.048**	-0.043	0.144*	-0.034	-0.294***	0.048**	-0.043	0.144*	0.040	-0.034	-0.294***			
1992	-0.002	-0.037	0.084	0.030	0.044	-0.059**	-0.079***	0.006	0.101	-0.034	-0.292***	-0.079***	0.006	0.101	0.005	-0.034	-0.292***			
1993	0.029	-0.008	0.074	-0.003	0.010	0.014	0.121***	-0.025	0.077	-0.021	-0.289***	0.121***	-0.025	0.077	0.045	-0.021	-0.289***			
1994	0.034	-0.062	0.104	-0.017	-0.025	0.005	0.134***	-0.032	0.090	-0.058	-0.380***	0.134***	-0.032	0.090	0.003	-0.058	-0.380***			
1995	0.073***	-0.053	0.018	-0.049*	-0.028	-0.003	0.119***	-0.008	-0.030	-0.044	-0.311***	0.119***	-0.008	-0.030	0.005	-0.044	-0.311***			
1996	0.061***	-0.105**	0.029	-0.033	-0.007	0.075*	0.090***	-0.010	0.043	-0.065	-0.252***	0.090***	-0.010	0.043	-0.002	-0.065	-0.252***			
1997	0.072***	-0.011	0.022	-0.062**	-0.029	0.090**	0.093***	-0.027	-0.043	-0.082*	-0.292***	0.093***	-0.027	-0.043	-0.009	-0.082*	-0.292***			
1998	0.089***	-0.064	-0.026	-0.067**	-0.063**	0.075	0.113***	-0.003	-0.186*	-0.175***	-0.242***	0.113***	-0.003	-0.186*	-0.029	-0.175***	-0.242***			
1999	0.097***	-0.090**	-0.013	-0.087***	-0.059**	0.056	0.079***	0.017	-0.104	-0.149***	-0.081	0.079***	0.017	-0.104	0.012	-0.149***	-0.081			

Notes: *, **, and *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

The reference age cohort is Young, -30 in 1985, -44 in 1999. Middle-aged is 31–40 in 1985, 45–54 in 1999,

Old is 41–50 in 1985, 55–64 in 1999 and Retired is 51– in 1985, 65– in 1999.

Table A.3: “Treatment” effects on unemployment, 1983–1999.

	Uddevalla					LKAB						
	interaction with:					interaction with:						
	Base	Woman	Born abroad	Middle-aged	Old	Retired	Base	Woman	Born abroad	Middle-aged	Old	Retired
1983	-0.163***	-0.006	0.003	-0.027*	0.021	0.014	0.492***	0.116***	-0.025	-0.050	-0.071*	-0.151***
1984	-0.177***	-0.013	-0.010	-0.008	0.027*	0.016	0.377***	0.106***	0.059	0.022	0.007	0.013
1985	0.262***	0.022	-0.043	-0.126***	-0.180***	-0.175***	0.122***	0.090*	0.054	0.136***	0.132***	0.208***
1986	0.302***	0.037	-0.039	0.001	-0.050	0.144***	-0.011	0.152***	0.028	0.084**	0.048	-0.105***
1987	0.163***	-0.010	0.035	-0.054	-0.126***	0.203***	-0.088***	0.136***	0.024	0.051	0.077*	-0.096***
1988	0.041*	-0.026	0.028	-0.042	-0.094***	0.048	-0.098***	0.081*	0.115	0.049	0.070	-0.080***
1989	-0.016	-0.010	0.029	0.019	-0.029	-0.033	-0.084***	0.074*	0.144	0.025	0.056	-0.039
1990	-0.046***	-0.023	-0.039***	0.055***	0.075***	0.070***	-0.043**	0.003	0.067	-0.002	0.008	-0.028
1991	-0.038*	0.051	-0.066**	0.015	-0.012	-0.008	-0.013	0.032	0.059	-0.006	-0.032	-0.053
1992	0.035	-0.039	-0.095**	-0.007	-0.090***	-0.119***	-0.050*	0.033	-0.026	0.030	-0.017	-0.087***
1993	0.068**	0.062	0.055	-0.024	-0.099***	-0.217***	-0.123***	-0.029	0.037	0.045	0.042	-0.036
1994	0.042	0.058	0.053	-0.004	-0.077**	-0.177***	-0.106***	-0.007	0.029	0.017	0.018	-0.036
1995	-0.028	0.083*	-0.003	0.019	-0.026	-0.094***	-0.109***	-0.035	0.040	0.025	-0.006	-0.019
1996	-0.016	0.082*	0.088	-0.004	-0.013	-0.043	-0.120***	-0.056	-0.003	0.032	0.013	-0.027
1997	-0.036	0.062	0.044	0.015	0.012	0.021	-0.095***	-0.077*	0.046	0.019	0.004	0.056
1998	-0.041*	0.073	0.043	0.026	0.050*	0.089*	-0.100***	-0.051	0.042	0.039	0.065	0.131
1999	-0.041*	0.061	-0.067	0.037	0.076***	0.109*	-0.107***	-0.066	0.005	0.032	0.061	0.183

Notes: *, **, and *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

The reference age cohort is Young, -30 in 1985, -44 in 1999. Middle-aged is 31–40 in 1985, 45–54 in 1999, Old is 41–50 in 1985, 55–64 in 1999 and Retired is 51– in 1985, 65– in 1999.

Table A.4: “Treatment” effects on log earnings, 1983–1999.

	Uddevalla					LKAB						
	interaction with:					interaction with:						
	Base	Woman	Born abroad	Middle-aged	Old	Retired	Base	Woman	Born abroad	Middle-aged	Old	Retired
1983	0.355***	-0.024	0.146***	-0.198***	-0.177***	-0.247***	0.106*	0.234***	0.346***	-0.058	0.119*	-0.587***
1984	0.259***	-0.015	0.059	-0.123***	-0.087**	-0.155***	-0.320***	0.243	0.436*	-0.258**	0.006	-1.284***
1985	0.149***	-0.099	0.047	-0.051	-0.064	-0.104**	0.004	0.090	0.412**	-0.246**	0.041	-1.693***
1986	-0.303***	0.104	-0.021	0.067	0.096	-0.086	0.085*	0.023	0.653***	-0.197**	-0.137*	-1.900***
1987	-0.578***	0.054	-0.008	0.184*	0.388***	-0.164	0.124**	-0.033	0.175	-0.154*	-0.130	-1.731***
1988	-0.077	-0.058	0.105	0.135**	0.042	-0.576***	0.142***	-0.082	0.131	-0.010	-0.247**	-1.785***
1989	0.016	0.026	0.024	0.077	-0.060	-0.539***	0.089	0.022	0.518***	0.119	-0.120	-1.748***
1990	0.125***	-0.112	0.129	0.015	-0.206***	-0.568***	0.174***	0.057	0.287	0.083	-0.229**	-1.679***
1991	0.116***	0.094	0.329***	-0.018	-0.190***	-0.407***	0.178***	0.073	0.247	0.105	-0.175**	-1.629***
1992	0.046	0.051	0.138	0.082	-0.078	-0.194**	0.256***	-0.051	0.316	0.030	-0.130	-1.346***
1993	0.164***	0.076	0.100	0.014	-0.208***	-0.060	0.368***	0.125	0.435**	0.080	-0.543***	-1.651***
1994	0.073	0.037	0.190	-0.017	-0.175**	0.090	0.356***	0.246***	0.518**	-0.020	-0.525***	-2.187***
1995	0.172***	-0.039	0.130	-0.016	-0.091	0.015	0.405***	0.027	-0.516	-0.099	-0.586***	-1.437***
1996	0.210***	-0.040	0.188	-0.092	-0.127*	-0.014	0.362***	0.103	-0.149	-0.081	-0.481***	-1.322**
1997	0.176***	-0.042	0.151	-0.076	-0.131	-0.001	0.347***	0.129	0.678***	-0.231**	-0.686***	-2.305***
1998	0.202***	-0.019	-0.072	-0.133**	-0.123	0.179	0.350***	0.127	-0.299	-0.204**	-0.745***	-1.574*
1999	0.201***	-0.272*	0.298*	-0.170***	-0.105	-0.307	0.210***	0.209	0.025	-0.038	-0.530***	-0.368

Notes: *, **, and *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

The reference age cohort is Young, -30 in 1985, -44 in 1999. Middle-aged is 31–40 in 1985, 45–54 in 1999,

Old is 41–50 in 1985, 55–64 in 1999 and Retired is 51– in 1985, 65– in 1999.

Appendix B: Is the LKAB sample representative?

No surveys were sent in the second and third survey waves to those who did not respond to the first survey wave. An attrition study was, however, done in connection to the third survey wave. A mini survey with only one question was sent to those who did not respond to the first wave. The question was about the individual's labour market situation in October 1986.

The LKAB sample (responded to the first wave) at this time consisted of 1,179 people. Of these 1,049 (88 percent) responded to the third survey wave. The LKAB attrition sample (did not respond to the first wave) consisted of 361 people. The response rate to the mini survey was 47 percent (171 people responded).

Figure B.1 reports the labour market situation for the LKAB sample and the LKAB attrition sample. There are no big differences between the two samples. It is, therefore, not possible to conclude that our LKAB sample is not representative for the all LKAB workers.

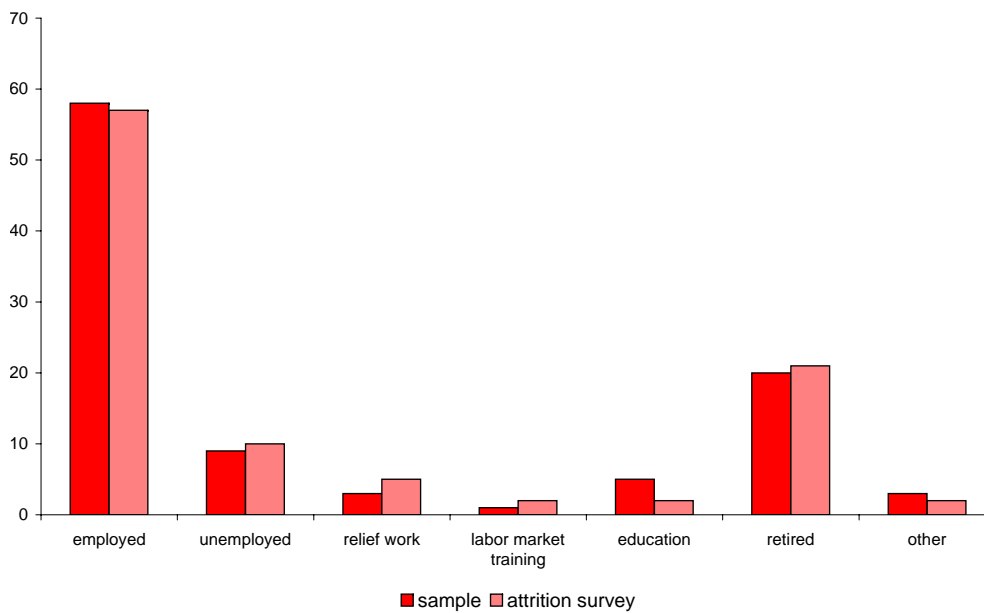


Figure B.1: The LKAB sample

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