



IFAU – INSTITUTE FOR
LABOUR MARKET POLICY
EVALUATION

Assistant and auxiliary nurses in crisis times

Marcus Eliason

WORKING PAPER 2011:1

The Institute for Labour Market Policy Evaluation (IFAU) is a research institute under the Swedish Ministry of Employment, situated in Uppsala. IFAU's objective is to promote, support and carry out scientific evaluations. The assignment includes: the effects of labour market policies, studies of the functioning of the labour market, the labour market effects of educational policies and the labour market effects of social insurance policies. IFAU shall also disseminate its results so that they become accessible to different interested parties in Sweden and abroad.

IFAU also provides funding for research projects within its areas of interest. The deadline for applications is October 1 each year. Since the researchers at IFAU are mainly economists, researchers from other disciplines are encouraged to apply for funding.

IFAU is run by a Director-General. The institute has a scientific council, consisting of a chairman, the Director-General and five other members. Among other things, the scientific council proposes a decision for the allocation of research grants. A reference group including representatives for employer organizations and trade unions, as well as the ministries and authorities concerned is also connected to the institute.

Postal address: P.O. Box 513, 751 20 Uppsala

Visiting address: Kyrkogårdsgatan 6, Uppsala

Phone: +46 18 471 70 70

Fax: +46 18 471 70 71

ifau@ifau.uu.se

www.ifau.se

Papers published in the Working Paper Series should, according to the IFAU policy, have been discussed at seminars held at IFAU and at least one other academic forum, and have been read by one external and one internal referee. They need not, however, have undergone the standard scrutiny for publication in a scientific journal. The purpose of the Working Paper Series is to provide a factual basis for public policy and the public policy discussion.

ISSN 1651-1166

Assistant and auxiliary nurses in crisis times[†]

Earnings and employment following public sector job loss in the 1990s

by

Marcus Eliason[‡]

January 19, 2011

Abstract

This paper studies the earnings and employment consequences of involuntary job loss in Sweden during the crisis years of the 1990s among assistant and auxiliary nurses. These two occupational groups were by far those in the public sector that experienced the largest number of job losses. While public service employment traditionally has been perceived as secure and permanent, Sweden witnessed far-reaching restructuring of the public sector and job loss truly became a reality for public sector employees during these years. The estimates show an immediate annual earnings loss of on average about SEK 12 000 and long-term losses of SEK 5 000 per year. An analysis of the distributional effect shows that the job losses did not affect the whole earnings distribution but mostly the lower part. This suggests that a few bore the whole loss from downsizing but most went on unaffected at least considering earnings and employment. From a policy perspective this points to the importance to early identify these redundant workers and to develop targeted policies improving their situation instead of general policies to all redundant workers.

Keywords: Job displacement, public sector, mass-layoff, earnings losses

JEL-codes: J45, J63, J65

[†] The author is grateful for comments and suggestions from Per-Anders Edin, Kristiina Huttunen, and seminar participants at IFAU and the Department of Economics, University of Gothenburg.

[‡] IFAU; E-mail: marcus.eliason@ifau.uu.se

Table of contents

1	Introduction	3
2	Background	4
2.1	The labour market and the unemployment crisis	4
2.2	Political reforms in the Swedish health care sector.....	6
3	Data and econometric method.....	8
3.1	The registers	8
3.2	Definition of mass-layoff and job displacement	8
3.3	The counterfactual case	10
3.4	The establishments	11
3.5	Estimation strategy	12
3.6	Estimation of the propensity score weights.....	14
3.7	Descriptive statistics and balancing test.....	15
4	Results	18
4.1	Pre-separation effects: An analogue to the Ashenfelter's Dip?	18
4.2	The temporal mean earnings and employment impact of A&A nurses' job loss.....	21
4.3	The mean impact of A&A nurses' job loss on unemployment, disability, and total income	24
4.4	The mean earnings impact of A&A nurses' job loss by choice of counterfactuals.....	25
4.5	Sensitivity to the definition of job displacement and the choice of conditioning variables	28
4.6	The distributional earnings and employment impact of A&A nurses' job loss	30
5	Summary and conclusions.....	32
	References	34

1 Introduction

Traditionally public service employment has been perceived as secure and permanent, but this has changed. During the past 20 or so years Sweden has witnessed far-reaching restructuring of the public sector. In what has usually been denoted the “New Public Management” (e.g., Hood, 1999) the Swedish public sector (as well as the public sector in many other countries) has undergone reforms such as output orientation, decentralization, and privatization. Although these reforms can be viewed as a starting-point for the weakening of the employment security among public sector employees, it was during the deep economic crisis in the 1990s that job loss truly became a reality for public sector employees. Instead of expanding to counteract the private sector unemployment the government, enforced large cutbacks in public spending leading to a dramatic employment downturn also in the public sector. Between 1993 and 1994 public sector employment decreased by more than 100 000 employees and then by another 100 000 during the following three years. The two occupational groups most severely affected by these cutbacks were assistant and auxiliary nurses (A&A nurses henceforth); between 1993 and 1999 the number of A&A nurses decreased by 34 and 38 percent, respectively (Federation of Swedish County Councils, 2002).

Although the causes of the unemployment crises of the early 1990s, as well as the impact of active labour market policy during this period, have been studied extensively the knowledge about how the redundant public sector employees actually fared is still limited. Moreover, although there is a substantial body of empirical research both in the United States (e.g., Ruhm, 1991; Jacobson et al., 1993; Farber, 2005) and in Europe (e.g., Kuhn, 2002; Eliason & Storrie, 2006; Carneiro & Portugal, 2006; Verho, 2008; Huttunen et al., 2011) suggesting the existence of considerable private costs of job loss in terms of foregone earnings and joblessness, almost all research has been concentrated to male private sector workers.¹ By investigating the labour market consequences of involuntary job loss among Swedish female A&A nurses, this paper aims to bridge this knowledge-gap. A&A nurses were the two occupational groups that by far were those in

¹ One exception is Eliason & Storrie (2006) that includes both men and women and both in the private and public sector in an investigation of the long-term effects of job displacement. However, no results are presented divided either by gender or by sectors.

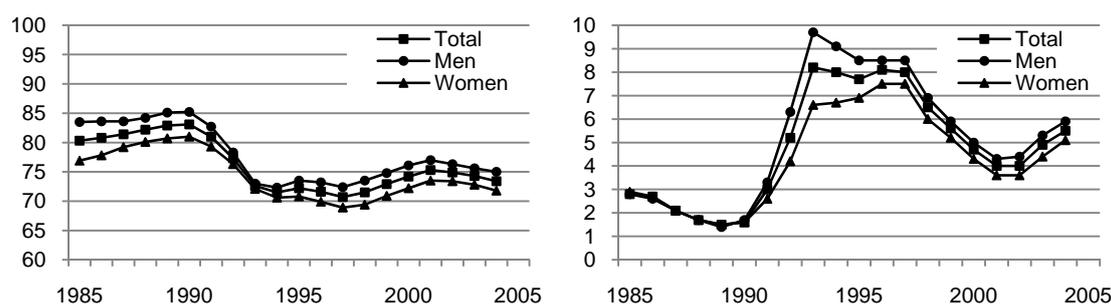
the public sector that experienced the largest number of job losses during this period and they were predominantly women. Limiting the analysis to A&A nurses only provides a more homogenous sample diminishing the risk of not “comparing comparable people.”² Still the samples are large enough for the effects to be estimated rather precisely. The A&A nurses employment and earnings history can be traced for 6 years before the crisis years (1985–1990), then during 7 crises years (1991–1997) when many of them lost their jobs, and finally during additional 8 years (1998–2005). Thus it is possible to estimate both the short and longer run effects and control for employment and earnings prior to job loss.

2 Background

2.1 The labour market and the unemployment crisis

While an investigation of the 1990s crisis per se, or of the underlying mechanism causing the very deep and prolonged recession, is beyond the scope of this paper, giving the broad picture is a necessary point of departure.³ The years preceding the crisis was characterized by an exceptionally low unemployment rate. Unemployment had been falling since 1983 and in 1989 it was down to a low of 1.5 percent, while employment rose continually up to a peak in 1990 (Figure 1, left). Indeed, by the end of the 1980s, these two measures indicated a more buoyant labour market than at any time since.

Figure 1. The Employment (left) and unemployment (right) rate during 1985–2004



Source: The Swedish labour force surveys.

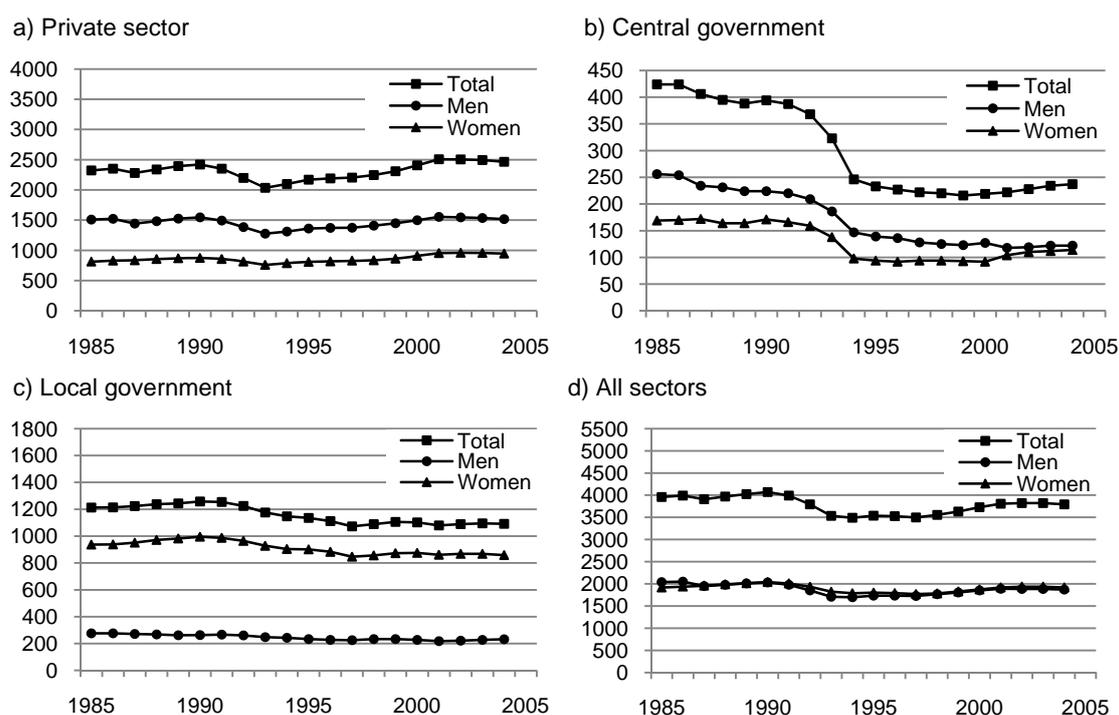
² See Heckman et al. (1999) for a discussion of the importance of comparing comparable people.

³ The causes of the unemployment crises have been discussed elsewhere. See, for example, Holmlund (2003).

During the macroeconomic downturn that followed, unparalleled in the post-war period, GDP fell by six percent from the cyclical peak in the first quarter of 1990 to the trough in the first quarter of 1993. By 1993 the open unemployment had also risen to over 8 percent, while total employment fell by 12 percent between 1990 and 1994 (Figure 1, right).

The crisis has previously been divided into three, somewhat overlapping, phases (see Lundborg, 2000) whereof the two first, the “international phase” (1990–1993) and the “real interest rate phase” (1992–1997) largely affected the private sector (see Figure 2a–c). The large decrease in employment in the private sector severely affected the public finances by increased expenditures for unemployment insurances and reduced tax revenues, which led to the third phase, the “budget consolidation phase” (1993–1997).

Figure 2. Number of employees (in 1 000) by sector during 1985–2004



Source: The Swedish labour force surveys.

To put a halt on an accelerating budget deficit the government enforced large cutbacks in public spending, leading not only to reduced generosity of social transfers but to a dramatic employment downturn also in the public sector. Thus, although the fall in employment in the private sector arrested in 1993, the public sector employment

decreased by more than 100 000 employees (77 000 in central government and 29 000 in local government) between 1993 and 1994 (Figure 2b-c) and then by another 100 000 between 1994 and 1997 mostly in the local government (75 000). The cutback in employment in central government was concentrated to 1993 and 1994 and more equally shared by men and women (Figure 2b), while the cutbacks in the local government employment were more extended over time and hit almost exclusively women (Figure 2c).⁴ However, the massive decrease in central government employment is to a considerable part explained by the incorporation of five of the previous eight public utilities (Gonäs, Johansson & Svärd, 1997).

After 1997 the employment rate in the private sector continued to rise until year 2000 when it halted, while it was rather stable in the public sector. Thus, the private sector employment returned to the levels prior to the crisis, even slightly higher, while the decrease in the public sector seems permanent.

2.2 Political reforms in the Swedish health care sector⁵

During the 1990s a series of reforms were introduced into the Swedish health care system. In short, the focus of the reforms was increased efficiency and decentralization was the common theme. At the beginning of the 1990s the county councils had the full responsibility, including financial responsibility and responsibility for resource allocation, for health care provision, health promotion, and disease prevention, while overall goals and policies were set at the national level. Between 1991 and 1997, however, three reforms came to further decentralize the organisational responsibility for health care to the municipalities.

The most important reform – the *ÄDEL Reform* by 1992 – transferred the responsibility for long-term care of the elderly from the county councils to the municipalities. The main aim was to accomplish a more unified responsibility for the care of the elderly, which previously had been divided between the county councils and the municipalities – a division of responsibility that came to be viewed as inefficient and the coordination unnecessarily complicated.

⁴ However, in relative terms the women did not fare worse, than the men, within the local government.

⁵ The description of the political reforms relies to a large extent on Petterson (2000).

The ÄDEL Reform was followed by the Disability Reform (*Handikappreformen*) in 1994, which increased both the county councils' and the municipalities' liabilities for people with disabilities through the Act Concerning Support and Service for Persons with Certain Functional Impairments (*Lag om stöd och service till vissa funktionshindrade – LSS*) and the Assistance Benefit Act (*Lagen om assistansersättning – LASS*). Nursing homes and specialist hospitals within the county councils for people with mental disabilities were phased out and replaced by various kinds of group living under the management of the municipalities.

As a complement to the ÄDEL and Disability Reform the Psychiatric Reform (*Psykiatrireformen*) in 1995 transferred the responsibility, in the same way as the former reforms, for psychiatric patients in no need of hospital treatment.

Parallel to the national government reforms above focusing on transferring responsibility between governmental levels many changes took place also at the county or municipality level. Especially in the late 1980s and the early 1990s several counties began reforming the health care system by implementing more market-oriented mechanisms.

The above description of the reforms of the Swedish health care system aimed to give a grasp of the many forces, at play at the same time, affecting the health care workers employment situation. These reforms had implications such as employer shifts from the county councils to the municipalities, but it was the recession of the early and mid 1990s that came to have the most impact. To some extent the crisis was a driving force behind the implementation of efficiency enhancing reforms, but these showed not to be sufficient. Due to the weakened finances considerable cutbacks in health care provision followed. Most noticeable there was a shift from costly inpatient treatment to different forms of outpatient treatment. During 1993 and 1998 the number of employees in Swedish health care was reduced from 379 000 to 310 000 and the average length of hospital stay was reduced from 18.0 days in 1990 to 6.6 days in 1998 (Lofgren, 2002). Partly, however, this shift from inpatient to outpatient treatment was facilitated also by technological advancements in health and medical care. Between 1990 and 1999 the number of hospitals also decreased from 94 to 70 partly because some have been closed

down, but mostly because of mergers of hospitals (National Board of Health and Social Welfare, 2002) aiming at increased efficiency and reduced administrative costs.

3 Data and econometric method

3.1 The registers

The data used to study the A&A nurses employed in the public sector is the Institute for Labour Market Policy Evaluation (IFAU) database covering the years 1985 to 2005. The database combines data from various population-wide administrative registers maintained by Statistics Sweden. Since every resident and every establishment in Sweden has a unique identity number (i.e., a civic registration number or an organization number) and the obligatory income statements, filed to the taxation authorities by the employer, contain both the numbers, one can merge these registers and link employees to their workplace. The possibility to link employees and employers is crucial for the identification of job losses as will be further explained below.

3.2 Definition of mass-layoff and job displacement

Although all separations between employees and employers can be traced in the data, one cannot explicitly distinguish between separations resulting from quits, discharges for cause, and displacements. The strategy to identify involuntary job losses applied here is to identify job separations during periods of mass-layoffs. This has been a common strategy in the displaced worker literature for identifying involuntary job losses in administrative data (e.g., Jacobson et al., 1993; Eliason & Storrie, 2006; Carneiro & Portugal, 2006, Morisette et al., 2009; Huttunen et al., 2011).

What exactly constitutes a mass-layoff is, however, somewhat arbitrary. In the displaced worker literature various definitions have been applied. Jacobson et al. (1993) defined their “mass-layoff sample” as those separating in 1980–1986 from firms that initially (i.e., in 1979) had at least 50 employees and had a workforce in the year following their departure that was 30 percent or more below its maximum levels during the

late 1970s.⁶ Morissette et al. (2009) defined mass layoffs as permanent layoffs that occurred in year t in firms that had at least 50 employees in year $t-4$ and experienced a drop in employment of 30 percent or more between year $t-4$ and year $t+1$. Other studies, such as Eliason and Storrie (2006), Eliason (2010), and Carneiro and Portugal (2006), have applied a stricter definition including only closures.⁷

Here, I will identify all mass-layoffs that occurred during the crisis years 1992 to 1996 within a sample of establishments consisting of all Swedish hospitals departments (SNI 85110), medical practices (SNI 85120), and other health care practices (SNI 85140) within the public sector which had at least 50 employees in 1990. A mass-layoff will be defined as a reduction of the workforce, from November of one year to November of the next, by at least 30 percent or 100 employees. This definition, obviously, includes also closures (i.e., a 100 percent reduction of the workforce). The alternative, but sufficient, condition of an absolute reduction of 100 ensures that downsizings large in numbers of employees, but at large hospital departments also are included. For example, a regional hospital in Sweden reduced its staff by 1000 person between 1995 and 1997, but that corresponded to only 20 percent (Hertting et al., 2004). For illustrative purpose also the separations in stable and expanding establishments will be identified. The latter will be defined symmetrically to downsizing establishments and the former is simply the complement.

Although some of the employees who separated, during a period of mass-layoffs, still may have quit their jobs, or been discharged for cause, the vast majority is likely to have separated from their workplace as a result of the cutbacks. A more important problem to address is the large-scale reorganisations that occurred at the same time implying that some A&A nurses who separated from their workplace may not have been displaced but relocated to other hospitals or medical practices. For example, 855 employees were in 1996 relocated between two hospitals in Stockholm County, i.e., Södersjukhuset and Huddinge sjukhus, whereof 785 employees from Södersjukhuset to Huddinge sjukhus and 70 employees in the other direction (Gustafsson, 2000). Such a

⁶ The same, or a very similar, definition has also been used in Schneider et al. (2010), Couch and Placzek (2010), and von Wachter et al. (2009).

⁷ Hijzen et al. (2010) applies two different definitions. One includes closures only and the other defines mass-layoff events as a more than 30 percent reduction of the workforce in a given year.

process of relocation of staff may very well occur simultaneous with a downsizing process where staff is also laid off. To be able to make a distinction between relocations and true displacement, employees who separated from an establishment were defined as either displaced or relocated based on worker flows. An employee who separated from an establishment between November year $t-1$ and November year t – a period of mass-layoff – is defined as displaced unless she was employed at a new establishment in year t together with at least 25 percent of those who at the same time separated from the old establishment; then she is instead defined as relocated.⁸

3.3 The counterfactual case

As is clear from the previous section, it is not unambiguous how to define job displacement in administrative data and although the question of how to define the counterfactual case seemingly may be more evident, it is not. For example, Jacobson et al. (1993) and von Wachter et al. (2009) contrasted displacement at time s with no separation between s and $s+4$. Schneider et al. (2010) constrained their controls to those who stayed at their employers throughout the whole period under study. Similarly, Morissette et al. (2009) required their comparison group to be workers with positive earnings in every year and who never experienced a permanent layoff during the full study period. In some other studies one have, on the other hand, chosen to put no restrictions at all on the comparison workers subsequent employment situation, i.e., workers displaced between year s and $s+1$ are contrasted with workers employed in year s , but who were not displaced between year s and $s+1$ (Hijzen et al., 2010; Eliason and Storrie, 2006; Carneiro and Portugal, 2003

Different comparison groups will not only produce different estimates of the costs of job displacement but also answer different research questions, which has to be kept in mind when comparing the results of various studies. In the main analysis I will contrast A&A nurses employed, at the same establishment, at least from 1990 until the first displacement between November in year $s-1$ and October in year s are contrasted with A&A nurses also employed at the same establishment up to at least year $s-1$, but not

⁸ Although the subsequent analysis is limited to A&A nurses, this definition of displaced and relocated employees, as well as the definition of mass-layoffs, is based on all employees at the particular establishment independent of occupation.

displaced between $s-1$ and s . In any subsequent year there are no restrictions either on the displaced A&A nurses or the comparisons. In other words, the comparisons may have become displaced at any year following year s and analogously the displaced A&A nurses may experience multiple displacements. In section 4.5, however, I will present estimates from a supplementary analysis applying various other choices of comparison A&A nurses.

3.4 The establishments

The sample of establishments consists of all Swedish hospitals (SNI 85110), medical practices (SNI 85120), and other health care practices (SNI 85140) within the public sector which had at least 50 employees in 1990. Establishments that disappeared and then reappeared during 1990 to 1996 were excluded. Using these sample criteria the remaining sample comprised 311 hospitals divisions employing on average almost 874 persons, 373 medical practices with on average 174 employees, and finally 19 other health care practices with on average 151 employees.

Table 1. Number of establishments and employees by sector

Sector	Establishments		Establishment size (# employees)		
	#	%	Mean	Min	Max
Hospitals	311	44.2	874	50	8 105
Medical practices	373	53.1	174	50	3 265
Other health care	19	2.7	151	50	583
Total	703	100.0	482	50	8 105

After applying the rules defining the establishments as downsizing, stable, or expanding, during 1992 to 1996, we can see in Table 2 that a considerable number of establishments were contracting and only a few expanding. This is most evident in 1992 when a whole 47 percent were contracting while only 4 percent were expanding. In the following five years the shares are quite stable; the shares of downsizing, stable, and expanding establishments are about 16, 78, and 5 percent respectively.

Table 2. The establishments divided by being closing/downsizing and stable/expanding

Year	Downsizing establishments		Stable establishments		Expanding establishments	
	#	%	#	%	#	%
1992	331	47.1	343	48.8	29	4.1
1993	121	17.6	534	77.7	32	4.7
1994	115	17.0	532	78.5	31	4.6
1995	101	15.2	530	79.7	34	5.1
1996	108	16.6	506	77.7	37	5.7

Table 3. The sample of A&A nurses by displacement status

Year	Downsizing establishments				Stable/expanding establishments		Continuously employed		Dead/abroad	
	Displacements		Relocations		Separations		#	%	#	%
1992	10 509	13.7	8 754	11.4	3 820	5.0	53 727	69.9	121	0.2
1993	3 213	6.0	774	1.4	2 898	5.4	46 825	87.2	79	0.1
1994	2 154	4.6	1 347	2.9	2 748	5.9	40 549	86.6	95	0.2
1995	1 469	3.6	490	1.2	1 791	4.4	36 778	90.7	73	0.2
1996	1 351	3.7	538	1.5	1 997	5.4	32 872	89.4	67	0.2

Within each of the 703 establishments above all employed A&A nurses who had it as their main workplace in November of 1990 were identified.⁹ When applying the criteria for being displaced or relocated only the first job separation was considered. Among the A&A nurses who separated in times of downsizing more than half were classified as displaced (see Table 3). As the number of contracting establishments goes down the number of separating A&A nurses also diminish. During 1993–1996 the total number of first job separations, being displacements from contracting establishments, was less than in year 1992 alone.

3.5 Estimation strategy

In the worker displacement literature a fixed effect estimator including both lagged and leaded indicators of incidence of job displacement has become standard when examining wage and earnings changes caused by job displacements (see Jacobson et al. 1993; Margolis, 1999; Schmieder et al., 2010; Huttunen et al., 2011). This method allows both the effect of the displacement to set in prior to the actual displacement and to be long-lasting. Although the fixed effect estimator has the advantage that it will produce unbiased estimates of the displacement effect even if there are unobservable factors, correlated with the displacement status, it requires that in absence of the displacement the average outcomes for the displaced and non-displaced A&A nurses would have followed parallel paths. This requirement may not be plausible if there are pre-displacement characteristics associated with the dynamics of the outcomes that differ between the displaced and non-displaced A&A nurses. As discussed in von Wachter (2010), displaced and non-displaced workers earnings profile may differ by more than just earn-

⁹ The main workplace is defined as a workplace where the A&A nurse were employed in November and from which she obtained her largest annual earnings.

ings levels, since displaced workers are more likely to be younger, have shorter tenure, and lower education. von Wachter (2010) also suggested to condition on a richer set of career characteristics within, for example, a matching framework. Balancing such observed pre-displacement characteristics between the displaced and non-displaced A&A nurses increases the plausibility of the requirement of parallel dynamics in the outcome(s) in absence of displacement.

A propensity score weighted version of the fixed effect estimator will therefore be applied here. By weighting one will ideally obtain a pseudo-sample where the distribution of observed characteristics is the same in the samples of displaced and non-displaced A&A nurses. The propensity score (p) is the probability of treatment (Rosenbaum & Rubin, 1983), i.e., job displacement, which is here estimated by a logit model: $p_{i,s} = \Pr[D_{i,s}=1|D_{i,s}=0, X_i, Z_{i,s-k}, 1992 \leq s' < s \leq 1996] = \{1 + \exp(-\alpha_0 - \alpha_1 X_i - \beta Z_{i,s-k})\}^{-1}$, where $D_{i,s}$ indicates displacement in year s , X_i is a vector of baseline or time-invariant covariates, and $Z_{i,s-k}$ a vector of time-variant variables with lags of k years ($k=2,3,\dots,7$). The propensity score is estimated for each year within the period 1992–1996 to construct five propensity score weighted comparison groups. The estimations are not conditional on any post-displacement measures. Hence, an A&A nurse who were displaced in, for example, year s will belong to the groups of comparisons for those displaced in any year $t < s$.

To obtain the effect of displacement on those actually displaced, A&A nurse i is assigned a weight $w_{i,s} = D_{i,s} + (1 - D_{i,s})p_{i,s} / (1 - p_{i,s})$.¹⁰ Hence, all displaced A&A nurses are assigned a weight equal to one, while each non-displaced A&A nurse j is assigned a weight equal to $p_{j,s} / (1 - p_{j,s})$. The samples constructed in each year were then pooled together and followed during the years $s-7$ to $s+9$. Using the pooled sample and the estimated weights a regression model with individual fixed effects was estimated: $y_{i,t} = \alpha_i + \gamma_t + \theta X_{i,t} + \sum_{k=-5}^8 \tau^{s+k} D_{i,t}^{s+k} + \varepsilon_{i,t}$, where $y_{i,t}$ is the particular outcome of interest for individual i in year t , $X_{i,t}$ is a vector of observed time-variant characteristics unaffected by the job separation. The $D_{i,t}^{s+k}$'s are a set of indicators for the number of years relative

¹⁰ See Hirano and Imbens (2001).

to displacement in year s , allowing us to estimate the temporal impact of the job separation, i.e., τ^{s+k} is the estimated impact k years after the displacement. The parameter α_i is the individual-specific fixed effect, γ_t is a time-specific effect, and $\varepsilon_{i,t}$ is the error term.

The model above only identifies the conditional mean effect and does not reveal any distributional effects. Therefore, I will in a supplementary analysis also estimate weighted quantile treatment effects, which will provide a more complete picture of the employment and earnings losses following job displacement. Let $Y(1)$ denote the potential outcome if displaced, and correspondingly $Y(0)$ if not displaced. Let also $F_{Y(1)}$ and $F_{Y(0)}$ be the cumulative density functions of $Y(1)$ and $Y(0)$, we can then define the quantile displacement effect at the q^{th} quantile as $\tau_q = F_{Y(1)}^{-1}(q) - F_{Y(0)}^{-1}(q)$, where $F_{Y(D)}^{-1}(q) = \inf\{y(D) | F_{Y(D)}(y(D)) \geq q\}$, $D=0,1$ and $q \in (0,1)$. Using the same weights as above we can obtain the empirical cumulative density function for $Y(D)$ by $F_{Y(D)}(y) = \sum_{i=1}^{N(D)} w_i I(Y(D) \leq y) / \sum_{i=1}^{N(D)} w_i$, where $I(\cdot)$ is an indicator function and N^D is the number of A&A nurses in group D .

3.6 Estimation of the propensity score weights

The estimation of the propensity scores was performed separately for each year during 1992–1996. The set of conditioning covariates includes both baseline covariates measured in 1990 and measured 2–7 years prior to separation. The baseline covariates measured in 1990 are: number of children aged 0–7 years and 7–17 years, respectively, number of employees at the establishment, and indicators for being foreign born, marital status (4 categories), attained education (3 categories), occupation (i.e., assistant or auxiliary nurse), tenure (6 categories), and sector (3 categories), and county of residence (24 counties). Age (in quartic form) is measured at the time of displacement. The covariates measured 2–7 years prior to separation are: labour market history (i.e., indicators of having non-zero earnings, number of annual months of employment, and annual earnings), and payments from the Swedish Social Insurance Agency such as sickness and rehabilitation insurance. Conditioning on labour market history two or more years prior to displacement is based on the assumption that job displacement had

no impact on earnings or employment more than one year prior to the actual displacement. This assumption will be discussed thoroughly in section 4.1.

Table 4. Summary statistics of the estimated propensity scores (i.e., the conditional probability of being displaced at baseline), the corresponding weights, and the number, and share, of observations discarded due to lack of common support

Cohort Status	Propensity score			Propensity score weights			Discarded observations	
	Mean	Min	Max	Mean	Min	Max	#	%
1992 <i>Displaced</i>	0.162	0.010	0.518	1	1	1	0	0.00
1992 <i>Non-displaced</i>	0.114	0.007	0.592	0.137	0.011	1.045	16	0.03
1993 <i>Displaced</i>	0.084	0.004	0.430	1	1	1	0	0.00
1993 <i>Non-displaced</i>	0.046	0.002	0.585	0.051	0.004	0.689	21	0.05
1994 <i>Displaced</i>	0.067	0.005	0.419	1	1	1	0	0.00
1994 <i>Non-displaced</i>	0.039	0.000	0.478	0.043	0.005	0.630	211	0.62
1995 <i>Displaced</i>	0.055	0.005	0.324	1	1	1	0	0.00
1995 <i>Non-displaced</i>	0.030	0.001	0.430	0.032	0.005	0.474	301	1.02
1996 <i>Displaced</i>	0.054	0.006	0.211	1	1	1	0	0.00
1996 <i>Non-displaced</i>	0.033	0.000	0.300	0.035	0.006	0.261	353	1.36

For brevity, no coefficient estimates are reported but instead the focus is on an assessment of the propensity scores and corresponding weights. From the summary statistics presented in Table 1, it is evident that no displaced A&A nurses were discarded due to lack of common support of the propensity score distribution, while some non-displaced nurses were found outside the overlapping range.¹¹ Moreover, as the propensity score in no case is close to one there are no corresponding weights that are unduly large for any comparison observation.

3.7 Descriptive statistics and balancing test

This section contains descriptive statistics for all baseline covariates, used in the estimation of the propensity score weights, for the unweighted and weighted samples, respectively (Table 5 and Table 6). To further investigate whether the samples of displaced and non-displaced A&A nurses were comparable, with respect to these baseline covariates, the standardized differences in means (in percent) were computed. The standardized difference in means is the difference in covariate means between the displaced and weighted non-displaced A&A nurses, in percent of the pooled standard deviation (before weighting) of that covariate (Rosenbaum & Rubin, 1985). Other balancing tests

¹¹ Whether including or excluding the many non-displaced A&A nurses outside the common support in the left tail of the propensity score distribution would have a negligible impact on the estimates as those A&A nurses would receive very small weights if included.

have been suggested,¹² but there is no consensus on which to apply or on what degree of balance is satisfactory. However, an absolute value of the standardized difference in means of 20 has been considered substantial (Rosenbaum & Rubin, 1985), while less than 10 has been considered small (Normand et al., 2001).

Table 5. Descriptive statistics for the baseline characteristics for the weighted and unweighted sample. SDM denotes the absolute value of the standardized difference in means between the displaced ($D=1$) and non-displaced ($D=0$) A&A nurses

Baseline variables	Unweighted sample			Weighted sample		
	$D=1$	$D=0$	SDM	$D=1$	$D=0$	SDM
Foreign born	8.6%	6.8%	7.38	8.6%	8.7%	-0.06
<i>Marital status</i>						
Never-married	38.4%	32.2%	13.33	38.4%	38.5%	-0.10
Married	51.7%	57.9%	-12.58	51.7%	51.7%	0.05
Divorced	9.0%	9.0%	0.13	9.0%	9.0%	0.09
Widowed	0.9%	0.9%	-0.68	0.9%	0.9%	-0.01
<i>Number of children</i>						
< 7 years of age	0.52	0.45	9.38	0.52	0.52	-0.11
7-17 years of age	0.77	0.86	-10.00	0.77	0.77	-0.03
<i>Education</i>						
Compulsory/unknown schooling	8.4%	5.7%	11.26	8.4%	8.5%	-0.35
Upper secondary schooling	88.9%	92.4%	-13.25	88.9%	88.8%	0.30
University studies	2.7%	1.9%	6.32	2.7%	2.8%	-0.12
<i>Occupation</i>						
Assistant nurse	60.1%	66.8%	-14.13	60.1%	60.0%	0.34
Auxiliary nurse	39.9%	33.2%	14.13	39.9%	40.1%	-0.34
<i>Tenure</i>						
1 year	21.0%	10.4%	33.83	21.0%	21.0%	0.03
2 years	15.3%	9.9%	17.94	15.3%	15.4%	-0.30
3 years	14.8%	11.7%	9.71	14.8%	14.9%	-0.30
4 years	13.1%	12.0%	3.14	13.1%	13.1%	0.04
5 years	6.6%	5.7%	3.94	6.6%	6.7%	-0.05
6+ year	29.2%	50.3%	-42.42	29.2%	29.0%	0.44
# of employees	2 033	2 335	-13.81	2 033	2 022	0.49
<i>Sector</i>						
Hospital	78.5%	81.1	-6.57	78.5	78.3	0.41
Medical practice	21.1%	18.1	7.78	21.1	21.3	-0.43
Other health care	0.5%	0.9%	-4.60	0.5%	0.4%	0.13
<i>Resident in metropolitan area</i>						
Stockholm	18.7%	12.6%	18.46	18.7%	18.7%	0.12
Gothenburg	3.2%	5.8%	-11.15	3.2%	3.2%	-0.13
Malmö	2.7%	2.8%	-0.72	2.7%	2.7%	-0.15

As layoff due to work shortages to some extent is constrained by employment protection laws stipulating a last-in-first-out order, one would expect the displaced A&A nurses to have shorter tenure and perhaps also being younger. As we can see in Table 5 and Table 6, the descriptive statistics are in accordance with this anticipation. The dis-

¹² See Smith & Todd (2005).

placed A&A nurses were on average about two years younger, much more had very short tenure (i.e., less than a year) while much less had long tenure (i.e., more than 6 years).¹³

Table 6. Descriptive statistics for the baseline characteristics for the weighted and unweighted sample. SDM denotes the absolute value of the standardized difference in means between the displaced ($D=1$) and non-displaced ($D=0$) A&A nurses

Baseline variables	Unweighted sample			Weighted sample		
	$D=1$	$D=0$	SDM	$D=1$	$D=0$	SDM
Age (years)	37.46	39.64	-26.45	37.46	37.45	0.13
<i>Employment history</i>						
Non-zero earning in s-2	100.0%	100.0%	0.00	100.0%	100.0%	0.00
Non-zero earning in s-3	99.2%	99.6%	-6.13	99.2%	99.2%	0.01
Non-zero earning in s-4	99.1%	99.6%	-7.00	99.1%	99.1%	0.24
Non-zero earning in s-5	98.6%	99.3%	-8.12	98.6%	98.6%	0.08
Non-zero earning in s-6	98.1%	99.0%	-9.10	98.1%	98.1%	0.15
Non-zero earning in s-7	97.4%	98.7%	-11.05	97.4%	97.4%	0.07
# months employed in s-2	11.94	11.97	-9.03	11.94	11.94	0.20
# months employed in s-3	11.78	11.89	-10.61	11.78	11.78	-0.18
# months employed in s-4	11.66	11.84	-15.54	11.66	11.66	0.03
# months employed in s-5	11.58	11.78	-14.68	11.58	11.57	0.14
# months employed in s-6	11.44	11.71	-17.02	11.44	11.44	0.13
# months employed in s-7	11.22	11.57	-18.47	11.22	11.22	0.11
Earnings (SEK) in s-2	129 277	139 317	-20.40	129 277	129 234	0.08
Earnings (SEK) in s-3	126 475	135 010	-17.00	126 475	126 407	0.13
Earnings (SEK) in s-4	122 812	131 666	-17.36	122 812	122 711	0.18
Earnings (SEK) in s-5	120 316	128 975	-16.97	120 316	120 199	0.21
Earnings (SEK) in s-6	116 166	125 338	-18.04	116 166	116 048	0.21
Earnings (SEK) in s-7	107 758	117 864	-19.91	107 758	107 624	0.24
Insurances (SEK) in s-2	20 721	15 593	18.34	20 721	20 754	-0.09
Insurances (SEK) in s-3	21 376	17 449	13.59	21 376	21 433	-0.17
Insurances (SEK) in s-4	22 646	18 933	12.77	22 646	22 697	-0.15
Insurances (SEK) in s-5	20 224	17 457	9.69	20 224	20 286	-0.20
Insurances (SEK) in s-6	18 581	16 465	7.61	18 581	18 630	-0.17
Insurances (SEK) in s-7	15 866	14 750	4.31	15 866	15 890	-0.09

The largest differences – supposedly driven by the differences in age and tenure – are found for pre-displacement earnings (Table 6). The displaced A&A nurses earned considerably less in each pre-displacement year. Another expected difference is that the comparison group comprises relatively more assistant than auxiliary nurses. This is in

¹³ Note that tenure is measured in 1990, hence those who were displaced in, say, 1995 had an additional five years of tenure.

line with the overall aim of increasing the educational level within the health care sector.¹⁴

After re-weighting the samples the above differences vanish almost completely. The largest remaining differences with respect to the SDM (in absolute terms) are found for the workplace's number of employees (SDM: 0.49), the two sectors comprising hospitals (SDM: 0.41) and medical practices (SDM: -0.44), and a tenure of 6 or more years (SDM: 0.44). All these differences are, however, negligible. Hence, we can conclude that the displaced and non-displaced A&A nurses in the weighted pseudo-sample are very much alike with respect to their baseline characteristics.

4 Results

In this section I will present the results from the econometric analyses of the mean impact of A&A nurses' job loss on earnings employment, unemployment, disability, and total income, followed by some sensitivity analyses, and finally the supplementary analysis of the distributional effects.

There are a number of aspects of the definition of job displacement and the sampling procedure that should be kept in mind when interpreting the results. First, there are by definition no A&A nurses with zero annual earnings in any of the years $s-7$, $s-2, \dots$, $s-1$ that correspond to the calendar year 1990 or later. Hence, in year $s-1$ and $s-2$ all A&A nurses, displaced as well as non-displaced, has non-zero earnings. Second, there are no restrictions on their employment situation in any year after year s . Third, the displacements occurred between November in year $s-1$ and October year s , which means that it is possible for a period of non-employment following displacement to start already in November of year $s-1$.

4.1 Pre-separation effects: an analogue to the Ashenfelter's Dip?

Most studies on the earnings losses following job displacement have found that the displaced workers suffer earnings losses already before the actual separations occur (e.g., Jacobson et al., 1993; de la Rica, 1995; Eliason & Storrie, 2006). The seminal study by

¹⁴ The number of 'registered' nurses, who are not covered in this paper and for which a university degree is required, actually increased during these years.

Jacobson et al. (1993), which methodology has been followed by many later studies, found that displaced worker started to experience earnings losses as long as three years before they separated from the firm. This finding has been referred to as an analogue to the Ashenfelter's dip, i.e., the dip in earnings prior to entering a labour market program (Ashenfelter & Card, 1985; Eliason & Storrie, 2006; Hijzen, Upward & Wright, 2010). Thus, it has in a similar way changed the way we compute earnings losses following job displacement. The crucial question is whether the dip is temporary or represents a permanent cost of job loss. It is not necessarily so that a pre-separation earnings dip without consideration should be inferred to be a consequence of the impending job loss and therefore included in a measure of total earnings loss. The explanation for an apparent pre-separation earnings dip has been that distressed firms not only reduce their workforce but also cut wages or hours of work (de la Rica, 1995; Jacobson et al., 1993). A competing explanation, however, would be that the firm when facing a situation where they have to reduce the workforce chose to layoff the least productive workers (e.g., workers with long or frequent absence spells due to sickness). Pre-separation effects found in studies using data on complete closures – where all workers are laid off – would, of course, not be susceptible to the same ambiguity.¹⁵

Whether a pre-separation earnings dip is a consequence of the downsizing process per se, or is a selection effect, has important methodological implications. Controlling (by regression, weighting, or in any other way) for these pre-separation earnings differences might in the former case produce underestimates of the true post-displacement effects, while not controlling for them in the latter case instead might produce overestimates.

It must be considered highly unlikely that job losses due to politically determined decisions of mass-layoffs in the Swedish public health care sector, with its highly centralized wage negotiation system, would be preceded by cuts in nominal wages. Although the assumption cannot be directly tested, I will before proceeding to the main analysis test two related hypotheses to provide some evidence regarding the explanation to a pre-separation earnings dip:

¹⁵ This is also evident in Bender et al. (2002) there separations other than from closure show a pre-separation dip that is both larger and set in earlier.

[H.1.] If the pre-separation earnings dip is due to reduced work hours or wages it should not be compensated by sickness insurance.

[H.2.] If the pre-separation earnings dip is due to a general reduction of work hours or wages it should not affect only those who later are laid off but all employees at the same establishment.

The two columns to the left in Table 7 presents weighted FE estimates conditioning on earnings history up to, but not including, the second year prior to the actual job loss (i.e., for year $s-7$ to $s-3$). There is quite a large pre-separation earnings dip. Already two years before separation the earnings loss is about 40 percent of the loss in the year of separation. However, as is evident from the next column, most (i.e., 80 percent) of this earnings dip is offset by an increase in income from social insurances (mostly sickness insurance). I interpret this as a first evidence against that the pre-separation earnings dip would be related to decreased wages or negotiated work hours.

Table 7. Estimated pre-displacement effects on annual earnings and social insurances

Time	Treated: Displaced during mass-layoff Controls: Not displaced during mass-layoff		Treated: Displaced during mass-layoff Controls: Non-displaced co-workers	
	Earnings	Insurances	Earnings	Insurances
	Est. (s.e.)	Est. (s.e.)	Est. (s.e.)	Est. (s.e.)
$s-5$	124 (491)	30 (324)	93 (549)	-13 (359)
$s-4$	103 (586)	39 (367)	-70 (652)	26 (411)
$s-3$	-1 763 (640)	1 805 (385)	-2 221 (708)	1 804 (424)
$s-2$	-4 848 (661)	3 327 (397)	-5 480 (728)	3 383 (428)
$s-1$	-8 635 (681)	3 930 (349)	-9 217 (749)	3 919 (376)
s	-13 951 (746)	2 977 (345)	-15 179 (811)	3 107 (373)

The columns to the right in Table 7 present the corresponding estimates when workers at the same establishments constitute the comparisons. These estimates are quite similar to the previous ones. This implies that if wages or negotiated work hours were reduced at the establishments executing mass-layoffs, even prior to the actual lay-offs, it was not a policy covering all employees but only those who subsequently were displaced. This is interpreted as evidence against that establishments forced to reduce the workforce first employ general cuts in wages and/or hours of work.

These findings suggest that the pre-separation earnings dip is likely not to be driven by reduced wages or negotiated work hours. Although increased sickness absence prior to the job loss might be explained by an “anticipation effect” – that the anticipation of job loss induces increased stress levels and worse health in general has been found in

epidemiological studies (e.g., Ferrie, et al., 1995) – one would then expect to see more sickness absence also among the other employees at the same establishment as it is unlikely that the employees would foresee both the impending event of mass-layoffs and who are the employees to go.

The findings in this section motivate the choice, made in the rest of the analyses, to condition on earnings and insurance history up to, but not including, the year immediately preceding the job loss.¹⁶ If the assumption that the pre-separation dip in earnings two years prior to job loss is not truly an analogue to the Ashenfelter's dip, then the estimates that follows might be underestimations of the true losses from job displacement; this will, however, be investigated in a sensitivity analysis in section 4.5.

4.2 The temporal mean earnings and employment impact of A&A nurses' job loss

This section will present the propensity score weighted FE estimates of A&A nurses' job loss on annual earnings and employment. To display the results, the coefficients τ^{s+k} , capturing the impact of job displacement k years after its occurrence in year s , are plotted in the right part of Figure 3–Figure 5. Together with each of these estimates the corresponding trajectories of the (propensity score weighted) mean earnings and employment for both the displaced and non-displaced A&A nurses has been plotted in the left part of the figures. The latter may help to give a deeper insight to the mechanism behind the estimates of the mean impact.

As the A&A nurses' labour market history, two to seven years prior to the separation, were included in the conditioning set of variables in the weighting scheme we should expect that for these years the trajectories of the means are much similar and the corresponding estimates of the impact of displacement to be zero or near zero. Starting with the estimates on earnings depicted in Figure 3 it is also clear that the difference between the displaced and non-displaced A&A nurses is practically zero during these first six years; for both groups annual earnings increases almost linearly from SEK 108 000 to SEK 129 000. In year $s-1$, however, earnings start to diverge. Although

¹⁶ One might at first argue that the conditioning variables then also should include the earnings and insurance in the year preceding the job loss. However, the argument against this is that the job loss actually can take place in the two last months of this year.

annual earnings drop for both groups in this year a gap of SEK 5 700 emerge. In the displacement year the earnings of those who become displaced drops further and the gap widens to SEK 12 000 and remains at about this level in the next year. Hereafter, the earnings for both the displaced and non-displaced A&A nurses again increases almost linearly to the end of the follow-up period. After the first years following displacement there is little recovery of the displaced A&A nurses' earnings relative to the earnings of the non-displaced A&A nurses and nine years after the displacement the gap is about SEK 5 000.

Figure 3. Propensity score weighted mean annual earnings in SEK for displaced and non-displaced A&A nurses, respectively (left), and the estimated temporal effect of job loss on earnings in SEK with 95 percent confidence intervals (right)

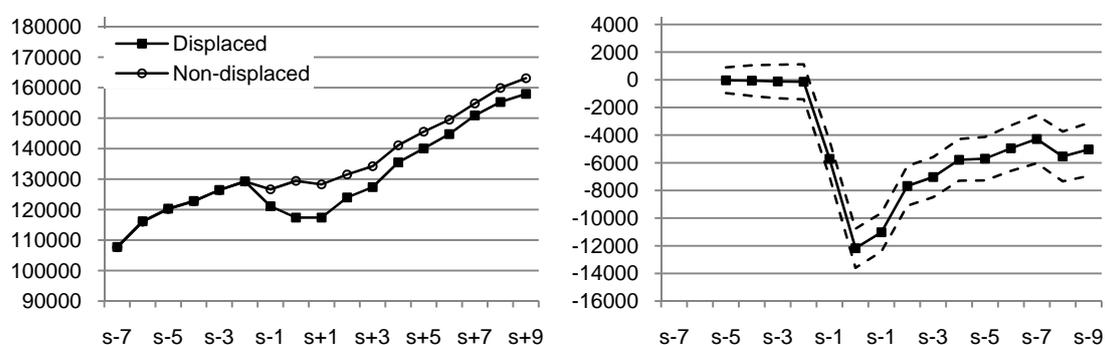
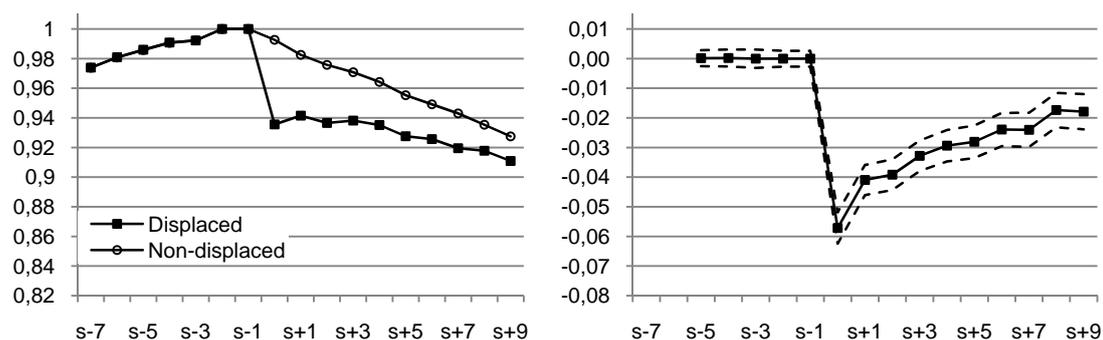


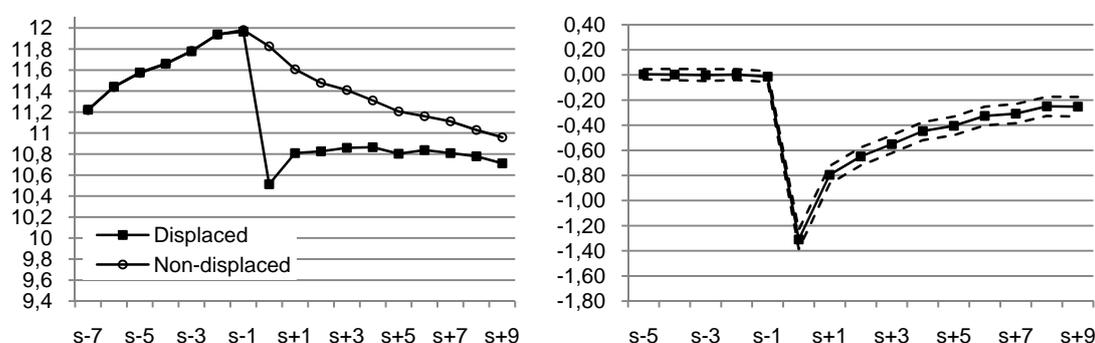
Figure 4. Propensity score weighted mean fraction with non-zero annual earnings among displaced and non-displaced A&A nurses, respectively (left), and the estimated temporal effect of job loss on the fraction with non-zero annual earnings with 95 percent confidence intervals (right)



Turning to the effects on employment, it is clear from Figure 4 that the fractions of displaced and non-displaced A&A nurses with non-zero earnings are almost exactly the same for all pre-displacement years; starting at 97.4 percent in year $s-7$ and then increasing to 100 percent in year $s-2$. The fraction then drops to 93.6 percent in year s

among those who were displaced, corresponding to an estimate of the gap of 5.7 percentage points. This gap then diminished almost linearly over time down to 1.8 percentage points nine years after the job loss. However, as can be seen in the left part of Figure 4 the diminishing gap was not the result of more and more displaced A&A nurses returning to paid employment but instead of an increasing fraction of the non-displaced A&A nurses leaving paid employment. In fact, the fraction of displaced A&A nurses with non-zero earnings is 2.5 percentage points lower in the end of the follow-up period than in the year of the displacement.

Figure 5. Propensity score weighted mean annual months of employment among displaced and non-displaced A&A nurses, respectively (left), and the estimated temporal effect of job loss on annual months of employment with 95 percent confidence intervals (right)



Finally, Figure 5 presents the mean annual months of employment among displaced and non-displaced A&A nurses (left), and the estimated temporal effect of job loss on annual months of employment (right). Again, there is a zero difference in all pre-displacement years. In the year of displacement the annual months of employment drops from 12 to 10.5 for those who became displaced. This corresponds to an estimated difference of 1.3 months. In the next year there is a slight increase in the annual months of employment among the displaced A&A nurses, but then the level remains at about 10.8 months during the whole follow-up period. Due to decreasing employment among the non-displaced A&A nurses the estimated gap continues to diminish to 0.25 months in the end of the follow-up period. This long-term differential in annual month of employment can almost entirely be explained by the larger share of displaced A&A nurses with no employment at all.

4.3 The mean impact of A&A nurses' job loss on unemployment, disability, and total income

In this section we will investigate to what extent the job losses lead to unemployment and disability retirement. That job loss in many cases results in subsequent unemployment is obvious but not necessary; many workers may also find new employment during a period of advance notice. Disability retirement could also be a possible consequence of job loss. A significant number of studies have found an association between job loss and ill-health. Not only may the loss of employment be stressful because of long-lasting earnings losses but it may also entail the loss of social networks and time structure, threatened self-esteem and self-confidence and possibly altered family relations and increased family tensions. However, an increased incidence of disability retirement cannot be viewed in terms of deterioration in health only but also in terms of sustained labour market difficulties, as it was possible until 1997 to be granted disability insurance partly for labour market reasons.

The incidence of unemployment and disability retirement is measured as receiving at least some payment of unemployment and disability insurance, respectively, during the year. Finally, to investigate to what extent the earnings losses found in the previous sections also were translated into income losses we repeat the estimations using an outcome measure including apart from earnings also social insurances and unemployment insurance.

The estimates are presented in Table 8. Data on unemployment and disability incidence is not available for the full sample more than two years prior to job loss; as before, however, the estimates are conditional on having no payments of either unemployment or disability insurance in the second year prior to job loss. From the left column of Table 8, we can see that the difference in unemployment incidence increased already in the year prior to job loss to 3.5 percentage points. In the year of job loss the gap has increased to 11.2 percentage points. Thus, somewhat surprisingly, it seems that despite the deep crises most of the displaced A&A nurses gained new employment without any intervening spell of insured unemployment. During the following years the gap decreased almost linearly to 1.3 percent nine years after the job loss.

Table 8. The estimated temporal mean impact on the probability of receiving unemployment and disability insurance, respectively, and on total income (i.e., the sum of earnings, unemployment insurance, and social insurances)

Time	Unemployment insurance receiver		Disability insurance receiver		Total income	
	Est.	(s.e.)	Est.	(s.e.)	Est.	(s.e.)
s-5	-	-	-	-	77	(390)
s-4	-	-	-	-	63	(478)
s-3	-	-	-	-	-10	(536)
s-2	0.000	-	0.000	-	-7	(551)
s-1	0.035	(0.002)	0.003	(0.001)	-2 020	(598)
s	0.112	(0.004)	0.006	(0.001)	-4 829	(649)
s+1	0.103	(0.004)	0.008	(0.002)	-3 776	(624)
s+2	0.083	(0.004)	0.008	(0.002)	-1 884	(616)
s+3	0.070	(0.004)	0.009	(0.002)	-1 507	(624)
s+4	0.053	(0.004)	0.009	(0.002)	-1 471	(657)
s+5	0.039	(0.004)	0.009	(0.002)	-2 107	(689)
s+6	0.029	(0.004)	0.008	(0.003)	-1 625	(730)
s+7	0.025	(0.003)	0.008	(0.003)	-1 623	(764)
s+8	0.018	(0.003)	0.009	(0.003)	-3 059	(785)
s+9	0.013	(0.003)	0.005	(0.003)	-2 323	(839)

The corresponding estimates on disability incidence presented in the middle columns of Table 8 show that among the displaced A&A nurses the incidence of receiving disability insurance was close to one percentage point higher and quite stable during follow-up period.

After having established that the displaced A&A nurses experienced somewhat higher subsequent unemployment and disability rates, I will now examine if insurance payments replaced any of the earning losses, or if the earnings losses also were translated into income losses. The right columns of Table 8 present these estimates on the sum of income from earnings, social insurance, and unemployment insurance. Comparing these estimates to the estimated earnings losses in Figure 1 reveal that in each post-displacement year between 45 and 79 percent of the losses were replaced by these insurances. Hence, the displaced A&A nurses were at least to a considerable part compensated by the social welfare system.

4.4 The mean earnings impact of A&A nurses' job loss by choice of counterfactuals

In section 3.3 several potential choices of the counterfactual case were discussed. Recall that in the main analysis I contrasted A&A nurses who were employed, at the same establishment, at least from 1990 until the first displacement in year s with A&A nurses,

also employed at the same establishment up to at least year s , but not displaced in year s . Here, I will contrast the displaced A&A nurses with four alternative counterfactual cases. The earnings estimates using these alternative cases are presented in Figure 6.

The estimates in Figure 6a are the results from an estimation using the same control group, but censoring the A&A nurses in the control group at the time of a job separation. We would then expect larger post-displacement earnings losses as the controls are always employed, while in the main analysis a large part of the recovery was driven by A&A nurses in the control group leaving employment. The estimates also support this hypothesis, instead of an annual earnings loss diminishing with time as found in the main analysis the annual earnings loss is increasing. In the year of job loss the estimated earnings loss is only somewhat larger, but in the final year of the follow-up it has increased to SEK 16 000, which is more than double the long-term loss found previously.

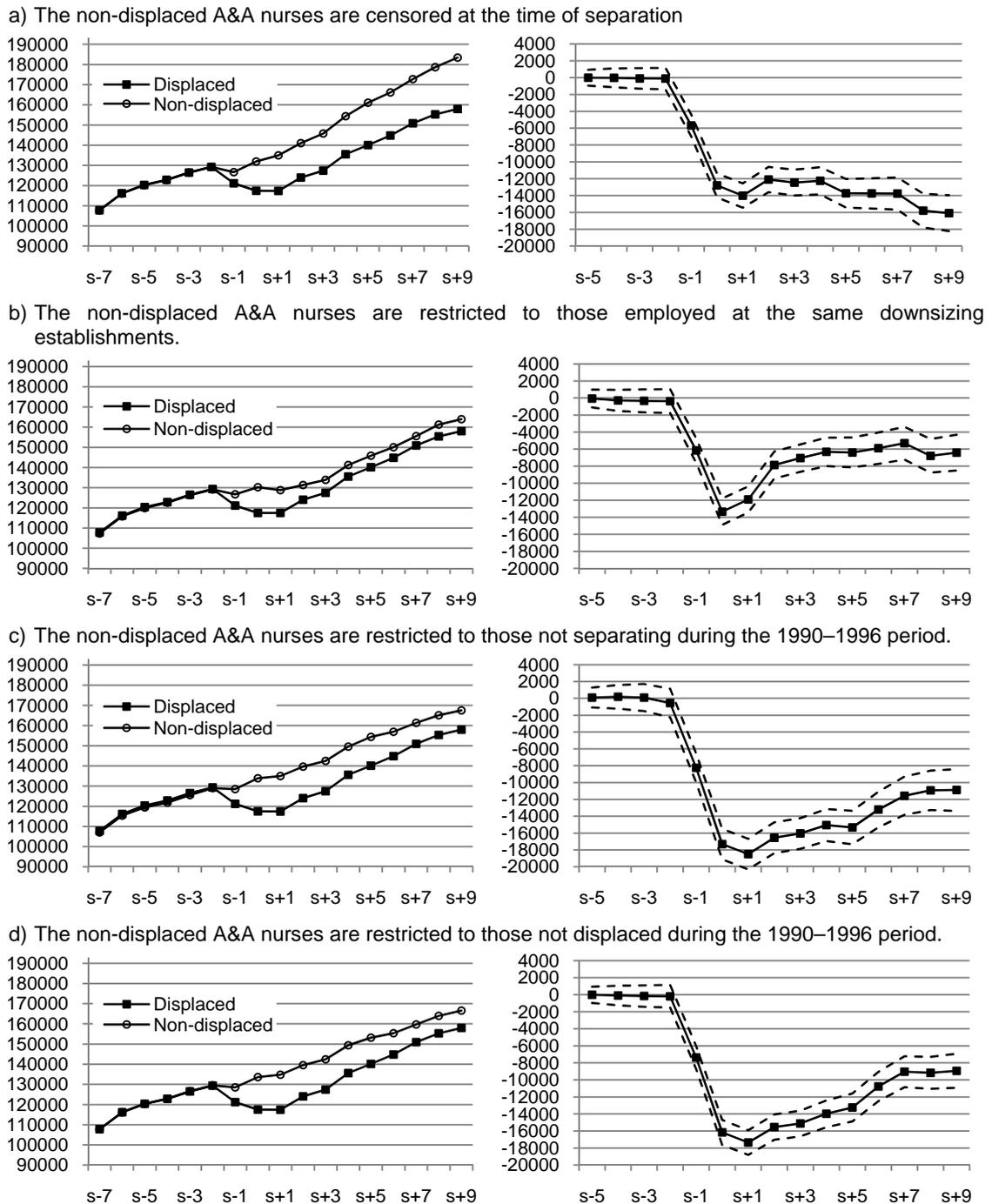
Figure 6b presents estimates where the counterfactual case is employment at the same downsizing establishments, but not displaced at the time (i.e., the co-workers of the displaced A&A nurses). These estimates are in each year very close to those in the main analysis.

The estimates in Figure 6c and Figure 6d correspond to estimations where the controls have been confined to A&A nurses who at no time during 1990–1996 period separated or were displaced, respectively. The estimates are very close to each other and suggest much larger immediate earnings losses than the previous estimations; in the year of the job loss the earnings loss is SEK 16 000 and SEK 18 000. Like the main estimates, but unlike the estimates where job separators were censored, the annual earnings losses then decreases each year; in the end of the follow-up the annual loss is SEK 11 000 and SEK 9 000. A&A nurses in the comparison group who are separating after 1996 explain the difference compared to the case when job separators were censored.

From these estimations we can conclude that the estimated earnings losses following job loss differ quite a lot depending on how the counterfactual case is defined and that the estimates presented in the main analysis showed to generate the most conservative

earnings losses. That various choices of counterfactual case affect the estimates has to be considered when comparing the findings from different studies.

Figure 6. Propensity score weighted mean annual earnings in SEK for displaced and non-displaced A&A nurses, respectively (left), and the estimated temporal effect of job loss on earnings in SEK with 95 percent confidence intervals (right), for various alternative counterfactual cases



4.5 Sensitivity to the definition of job displacement and the choice of conditioning variables

In this section the results from a number of sensitivity analyses are presented. So far I have applied a non-standard definition of job displacement aiming both at distinguishing real displacements from separations that are merely relocations and at identifying mass-layoffs large in absolute terms but not in relative terms. Although such a definition differ from previous definitions applied in the displaced worker literature, it is not claimed here that those definitions would be unsatisfactory, or that the suggested definition is superior, but it depends ultimately on the context. When investigating displacements in the private sector, the previous definition is probably most satisfactory. However, in the public sector and especially during these years when much reorganization occurred simultaneously with overall downsizing of the health care sector I believe the attempt to distinguish displacements from relocations is necessary. Nonetheless, the first two sensitivity analyses concern the definitions of mass-layoff and displacement. The other sensitivity analysis concerns the implications of the choice to condition on labour market history up to the year prior to displacement. As discussed in section 4.1 this choice depends on the assumption that any pre-displacement earnings losses, two or more years before the displacement, is driven by selection in the process of determining who has to leave and not by the downsizing process per se. Thus, in this analysis I will investigate the sensitivity to exclusion of variables on pre-displacement labour market history in the estimation of the propensity score weights. Hence, the results from three sensitivity analyses will be reported: (1) dropping the sufficient absolute condition defining mass-layoffs (i.e., applying a standard definition of mass-layoff); (2) no distinction is made between displacements and relocations (i.e., applying a standard definition of displacement); and (3) no labour market history at all is included in the estimation of the propensity score weights.

As is clear from Figure 7a, the immediate earnings loss, when relaxing the sufficient absolute condition defining mass-layoffs, is about half of that found in the main analysis. The difference in long-term losses between the two estimations is much less. The long-term losses were in the main analysis about SEK 5 000, while when relaxing the sufficient absolute condition defining mass-layoffs it is about SEK 4 000. Thus,

relaxing these requirements, with the consequence that we ignore downsizings that are large in absolute terms without fulfilling the relative requirement of a cutback of 30 percent, seems to largely affect at least the short-term estimates. As can be seen from the left part of Figure 7a this is driven by the lack of a drop in earnings between $s-1$ and s among those who were displaced in a mass-layoff using the more standard definition of a relative cutback of 30 percent only.

Figure 7. Propensity score weighted mean annual earnings in SEK for displaced and non-displaced A&A nurses, respectively (left), and the estimated temporal effect of job loss on earnings in SEK with 95 percent confidence intervals (right), for various alternative definition of job displacement and choices of conditioning set of variables

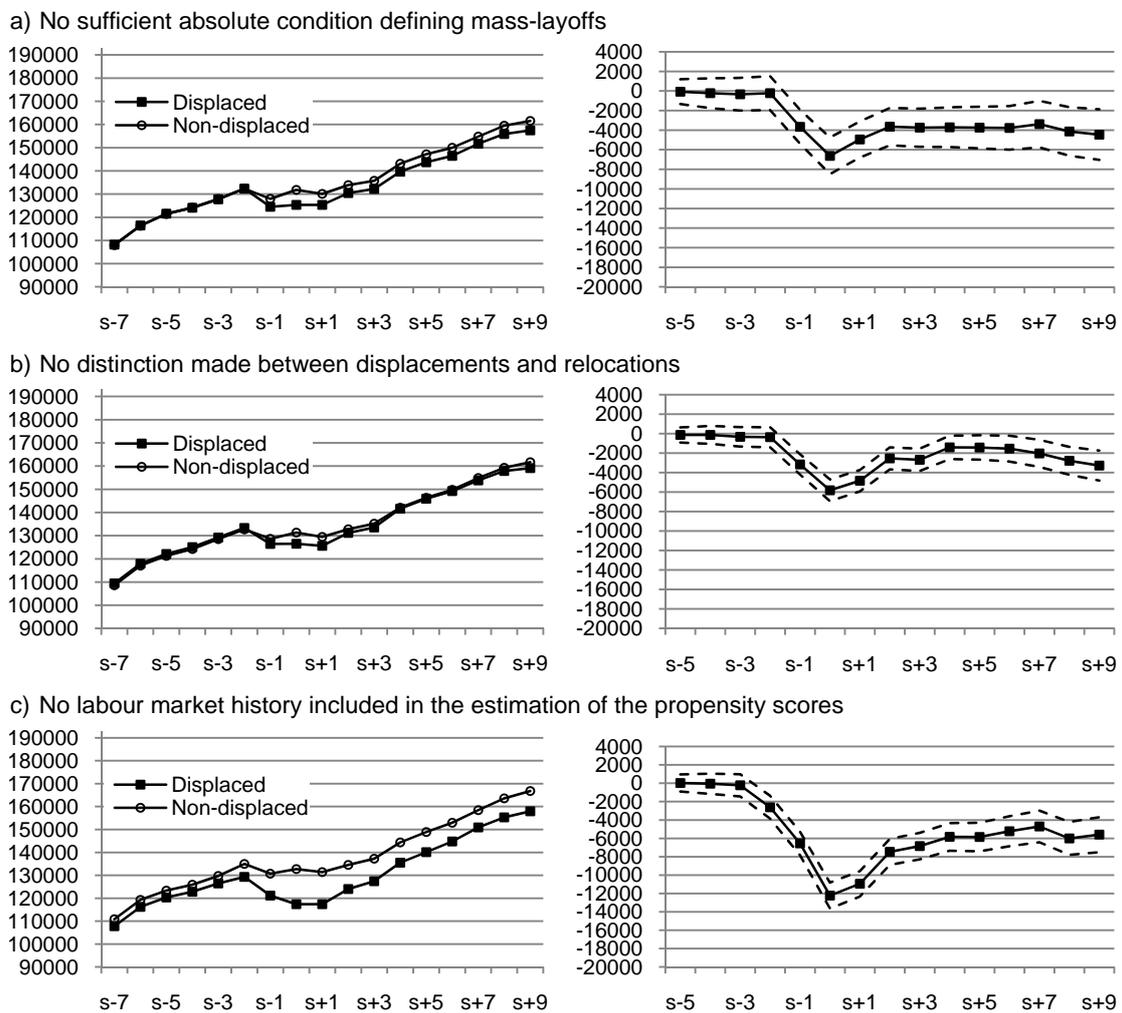


Figure 7b presents the results from estimations where the non-standard part of the definition of displacement (i.e., the attempt to distinguish real displacements from relocations) has been discarded. As those who were defined as relocated by definition had a

new employer in November following the separation including them would obviously decrease the estimated earnings losses. Especially the drop in earnings in the year of separation would be expected to be much less. Comparing the estimates in Figure 7b with those in Figure 3 reveals that the earnings losses, when not distinguishing relocations from real displacement, are 35–76 percent of those in the main analyses.

The final sensitivity test, concern the inclusion of variables on labour market history in the conditioning set of variables in the weighting procedure. Dropping the variables measuring labour market history from the set of conditioning variables does only have minor impact on the estimates. However, there is one noticeable difference: an apparent dip in earnings already two years prior to displacement. This dip was discussed to a great extent in section 4.1. However, the concern that the inclusion/exclusion of pre-displacement earnings in the conditioning set of variables would affect also the post-displacement estimates is not confirmed.

Thus, from these sensitivity analyses we can conclude that the definition of mass-layoffs and displacements is crucial. Not trying to distinguish between real displacements and relocations and not relying on also an absolute condition for defining mass-layoffs produce estimates of about half the size. How one deal with pre-displacement earnings losses seems to be of less importance.

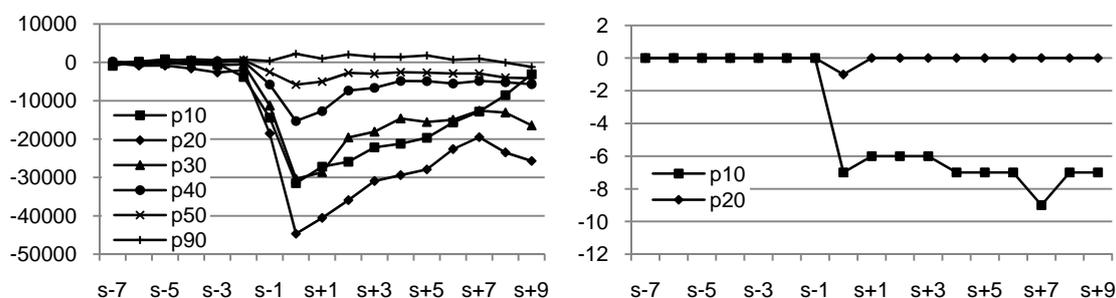
4.6 The distributional earnings and employment impact of A&A nurses' job loss

The estimates presented this far has revealed that job loss inflicts some costs – although rather minor in an international comparison – in form of lower subsequent earnings and employment. In this section we will further explore these findings by turning to the distributional effects. In Figure 8 (left) the quantile estimates on annual earnings are presented for the 1st, 2nd, 3rd, 4th, 5th, and 9th decile. From the graph it is clear that job loss does not seem to have had an impact over the full distribution of earnings. The top of the earnings distribution (i.e., the 9th decile) is not affected at all. The median estimates of the short-run earnings losses are less than half of the mean estimates presented in section 4.2, although the long-term estimates are about the same size.

In large, most of the impact is concentrated to the lower parts of the distribution. The estimate for both the 1st and 3rd decile, in the year of job loss is about SEK 30 000, and

for the 2nd decile it is SEK 45 000. The gap for the 1st decile is narrowed in each year during the rest of the observation period and nine years after the job loss it is only SEK 3 000. However, this is not the result of improved earnings in the bottom of the distribution among the displaced A&A nurses; the seeming recovery is completely driven by A&A nurses leaving employment also in the bottom of the distribution among the non-displaced A&A nurses. For the 2nd and 3rd decile, on the other hand, there are still considerable differences in earning among the displaced and non-displaced A&A nurses nine years after the job loss; for the 3rd decile the estimated earnings loss is SEK 16 000 while for the second it is an additional SEK 10 000.

Figure 8. The temporal propensity score weighted quantile earnings (SEK) and employment effects of job loss. p10-p90 denote the 10th to the 90th percentiles



When turning to the corresponding estimates for the annual number of months in employment (right part of Figure 8) it is clear that the large earnings gap for the lowest decile is mainly driven by non-employment as the difference is as large as 7 months in the year of job loss. This difference remains at about the same level during the rest of the follow-up period. For the 2nd decile, however, there is only a one-month gap in employment and only in the year of job loss. For all higher deciles there are no differences in any single year; all A&A nurses, displaced and non-displaced, have 12 months of annual employment (not shown here). This indicates that although some A&A nurses seem to have been pushed, more or less, completely out of the labour market most A&A nurses survived the job loss without any spells of non-employment; at least no spells longer than a calendar month.

5 Summary and conclusions

This study has investigated the labour market consequences of job displacements among assistant and auxiliary nurses in the public sector during the crisis years of the 1990s. Assistant and auxiliary nurses were the two occupational groups that by far were those in the public sector experiencing the largest number of job losses. Public service employment had traditionally been perceived as secure and even permanent. During these years, however, Sweden witnessed far-reaching restructuring of the public sector. When the government enforced large cutbacks in public spending leading to a dramatic employment downturn also in the public sector job loss truly became a reality for public sector employees.

Using administrative data, all assistant and auxiliary nurses employed in the public sector in 1990 were identified. The focal point here was their first job separation due to mass-layoff during the period 1992–1996. Their earnings trajectories were followed for seven years prior to the job loss and then for nine subsequent years. Only considering job separations related to mass-layoffs is likely to reduce any selection problems and has been the dominating strategy for identification in the displaced worker literature the past 15 years. However, as much reorganization, including relocation of employees between hospitals, occurred simultaneously during these years, the commonly used definition of a job displacement in the literature was modified to distinguish between real displacements and job separations that in fact were relocations.

The estimates show an immediate annual earnings loss of on average about SEK 12 000. It gradually decreased over the following years and in the end of the follow-up period, nine years after the job loss, it amounted to about SEK 5 000. The estimates on employment show a similar pattern. In the year of the job loss the share of A&A nurses with no employment at all in that year was 5.7 percentage points higher among the redundant A&A nurses. Thereafter, also the employment gap was decreasing linearly to the end of the follow-up period when there was a statistically significant difference of 1.8 percentage points. On average this corresponded to an annual estimate of 1.3 months of non-employment in the year of job loss; a gap that was down to 0.3 months nine years later.

The findings in this paper highlight several important aspects of involuntary job loss. First, earnings losses do not seem to be limited to male workers in the private sector but also job losses among female employees in the public sector as investigated here seem to have similar earnings and employment consequences.

Second, in an international context the adverse consequences are rather limited. The earnings loss nine years after job loss was only about 3 percent. Although, only somewhat less than previously found for men in Sweden (Eliason, 2010), this should be compared to 10–15 percent for Germany (Schmieder et al., 2010), 14–25 percent for the United Kingdom (Hijzen et al., 2010), and 13–15 percent for the U.S. (Couch and Placzek, 2010). It should be noted, however, that the comparison A&A nurses were not constrained to be employed during the follow-up. Hence, the diminishing gap in earnings over time was to large extent a result of job separations within the comparison group. A supplementary analysis using more stably employed A&A nurses as comparisons produced long-term effects twice as large.

Third, the social insurance system replaced the majority of the lost earnings. This is in line with earlier Swedish research (Eliason, 2010), but in stark contrast to findings for Germany in Schmieder et al., 2010.

Fourth, job loss did not affect the whole earnings distribution; the upper part of the distribution seems unaffected. This suggests that some bore the whole loss from downsizing, but many went on, more or less, unaffected; at least considering incomes and employment. From a policy perspective this points to the importance to early identify these displaced workers and to develop targeted policies improving their situation instead of general policies to all displaced workers.

References

- Abadie, A. (2005), “Semiparametric difference-in-difference estimators”, *Review of Economic Studies*, 72(1): 1–19.
- Ashenfelter, O., and D. Card. (1985), “Using the longitudinal structure of earnings to estimate the effect of training programs”, *The Review of Economics and Statistics*, 67(4): 648–60.
- Bender, S., C. Dustmann, D. Margolis, and C. Meghir. (2002), “Worker Displacement in France and Germany”, In: P.J. Kuhn, ed., *Losing Work, Moving on International Perspectives on Worker Displacement*. W. E. Upjohn Institute for Employment Research, Kalamazoo, MI.
- Bergmark, Å., and J. Palme. (2003), “Welfare and the unemployment crisis: Sweden in the 1990s”, *International Journal of Social Welfare*, 12(2): 108–22.
- Carneiro, A., and P. Portugal. (2006), “Earnings Losses of Displaced Workers: Evidence from a Matched Employer-employee Data Set”, CETE Discussion Papers 0607, Universidade do Porto, Faculdade de Economia do Porto.
- Couch, K.A. (2001), “Earnings Losses and Unemployment of Displaced Workers in Germany”, *Industrial and Labor Relations Review*, 54(3): 559–72.
- Couch, K., and D.W. Placzek. (2010), “Earnings losses of Displaced Workers Revisited”, *American Economic Review*, 100(1): 572–89.
- de la Rica, S. (1995), “Evidence of Preseparation Earnings Losses in the Displaced Worker Survey”, *Journal of Human Resources*, 30(3): 610–21.
- Eliason, M., and D. Storrie. (2006), “Lasting or Latent Scars? Swedish Evidence on the Long-Term Effects of Job Displacement”, *Journal of Labor Economics*, 24(4): 831–56.
- Eliason, M. (2010), “Income After Job Loss - The role of the family and the welfare state”, Forthcoming in: *Applied Economics*.
- Farber, H. (2005), “What do we know about job loss in the United States? Evidence from the displaced workers survey, 1984–2004”, *Federal Reserve Bank of Chicago Economic Perspectives*, 29(2): 13–28.

- Federation of Swedish County Councils. (2002), "Swedish health care in the 1990s," Report from the Department for Policy on Health Care at the Federation of Swedish County Councils. Stockholm, Sweden.
- Ferrie, J.E., M.J. Shipley, M.G. Marmot, S. Stansfeld, and G.D. Smith. (1995), "Health effects of anticipation of job change and nonemployment: Longitudinal data from the Whitehall II study", *British Medical Journal*, 331(7015): 1264–69.
- Gonäs L, Johansson S & Svärd I (1997) "Lokala utfall av den offentliga sektorns omvandling", i SOU 1997:83 *Om makt och kön i spåren av offentliga organisationers omvandling*. Fritzes, Stockholm.
- Gustafsson, R.A. (2000), "Vårdens och omsorgens förändrade karaktär i Stockholms län under 90-talet – omorganisering, nedskärning och entreprenadisering", In: *Vården under 90-talet. Den organisatoriska nivån*, Rapport 2000:4. Yrkesmedicinska enheten, Stockholm.
- Heckman, J., R. LaLonde, and J. Smith. (1999), "The economics and econometrics of active labor market programs", In: Ashenfelter, O., Card, D. (Eds.), *Handbook of Labor Economics*, Vol. 3A. North-Holland, Amsterdam.
- Hertting, A., K. Nilsson, T. Theorell, and U. Sätterlund Larsson. (2005), "Assistant Nurses in the Swedish Health Care Sector during the 1990s – A Hard-hit Occupational Group with a Tough Job", *Scandinavian Journal of Public Health*, 33(2): 107–14.
- Hijzen, A., R. Upward, and P.W. Wright. (2010), "The Income Losses of Displaced Workers", *Journal of Human Resources*, 45(1): 243–69.
- Hirano, K., and G.W. Imbens. (2001), "Estimation of causal effects using propensity score weighting: An application to data on right heart catheterization", *Health Services and Outcomes Research Methodology*, 2(3–4): 259–78.
- Holmlund, B. (2003), "The Rise and Fall of Swedish Unemployment", Working Paper 2003:13, University of Uppsala, Uppsala.
- Hood, C. (1991), "A Public Management for All Seasons", *Public Administration*, 69(1): 3–19.
- Huttunen, K., J. Møen, and K.G. Salvanes (2011), "How Destructive is Creative Destruction? Effects of displacement on labor force withdrawal, within-firm labor

- mobility and earnings”, forthcoming in *Journal of the European Economic Association*.
- Jacobson, L., R. LaLonde, and D. Sullivan (1993), “Earnings Losses of Displaced Workers” *American Economic Review*, 83(4): 685–709.
- Kuhn, P.J. (2002), “Summary and Synthesis”, In: P.J. Kuhn, ed., *Losing Work, Moving on International Perspectives on Worker Displacement*. W. E. Upjohn Institute for Employment Research, Kalamazoo, MI.
- Lofgren, R. (2002), “The Swedish Health Care System: Recent Reforms, Problems, and Opportunities”, *Public Policy Sources*, 59: The Fraser Institute.
- Lundborg, P. (2000), ”Vilka förlorade jobbet under 90-talet?”, In: Fritzell, ed., *Välfärdens förutsättningar: Arbetsmarknad, demografi och segregation*, SOU 2000:37, Fritzes, Stockholm.
- Margolis, D. (1999), “Part-Year Employment, Slow Reemployment and Earnings Losses: The Case of Worker Displacement in France”, In: J.C. Haltiwanger, J.I. Lane, J.R. Spletzer, J.J.M. Theeuwes, & K.R. Troske (eds.). *The Creation and Analysis of Employer-Employee Matched Data*. Amsterdam: North-Holland.
- Morissette, R., X. Zhang, M. Frenette. (2009), “Earnings Losses of Displaced Workers: Canadian Evidence from a Large Administrative Database on Firm Closers and Mass Layoffs”, Working Paper No. 42. CLSRN: Canada.
- National Board of Health and Social Welfare. (2002), “Yearbook of health and medical care 2002” (in Swedish). Stockholm: National Board of Health and Social Welfare.
- Normand, S-L.T., M.B. Landrum, E. Guadagnoli, J.Z. Ayanian, T.J. Ryan, P.D. Cleary, and B.J. McNeil. (2001), “Validating recommendations for coronary angiography following acute myocardial infarction in the elderly: A matched analysis using propensity scores”, *Journal of Clinical Epidemiology*, 54(4): 387–98.
- Petterson, I-L. (2000), ”Organisationsförändringar och nya styrformer i vård och omsorg”, In *Vården under 90-talet. Den organisatoriska nivån*. Yrkesmedicinsk rapportserie 2000:4. Stockholm, Sweden.
- Rosenbaum, P.R., and D.B. Rubin. (1983), “The central role of the propensity score in observational studies for causal effects”, *Biometrika*, 70(1): 41–55.

- Rosenbaum, P.R., and D.B. Rubin. (1985), “Constructing a Control Group Using Multivariate Matched Sampling Methods that Incorporate the Propensity Score”, *American Statistician*, 39(1): 33-8.
- Ruhm, C.J. (1991), “Are Workers Permanently Scarred by Job Displacements?”, *American Economic Review*, 81(1): 319–24.
- Schmieder, J.F., T. von Wachter, & S. Bender. (2010), “The Long-Term Impact of Job Displacement in Germany During the 1982 Recession on Earnings, Income, and Employment”, IAB Discussion paper 201001, Institute for Employment Research, Nuremberg, Germany.
- Smith, J.A., and P.E. Todd. (2005), “Does matching overcome LaLonde's critique of nonexperimental estimators?”, *Journal of Econometrics*, 125(1–2): 305–53.
- Stevens, A.H. (1997), “Persistent Effects of Job Displacement: The Importance of Multiple Job Losses”, *Journal of Labor Economics*, 15(1): 165–88.
- Verho, J. (2008), “Scars of recession: the long-term costs of the Finnish economic crisis”, Working Paper Series 2008:9, IFAU–Institute for Labour Market Policy Evaluation.
- von Wachter, T. (2010), “Summary of the Literature on Job Displacement in the US and EU: What we know and what we would like to know”, Forthcoming in: David Marsden and François Rycx (eds.), *Wage Structures, Employment Adjustments and Globalization: Evidence from Linked and Firm-level Panel Data*, Applied Econometrics Association Series, Palgrave Macmillan.
- von Wachter, T., J. Song, & J. Manchester. (2009), “Long-Term Earnings Losses due to Mass-Layoffs During the 1982 Recession: An Analysis Using Longitudinal Administrative Data from 1974 to 2004”, Mimeo, Columbia University.

Publication series published by the Institute for Labour Market Policy Evaluation (IFAU) – latest issues

Rapporter/Reports

- 2010:11** Engström Per, Hans Goine, Per Johansson, Edward Palmer and Pernilla Tollin "Underlättar tidiga insatser i sjukskrivningsprocessen återgången i arbete?"
- 2010:12** Hensvik Lena "Leder skolkonkurrens till högre lärarlöner? – En studie av den svenska friskolereformen"
- 2010:13** Björklund Anders, Peter Fredriksson, Jan-Eric Gustafsson and Björn Öckert "Den svenska utbildningspolitikens arbetsmarknadseffekter: vad säger forskningen?"
- 2010:14** Hensvik Lena and Peter Nilsson "Smittar benägenheten att skaffa barn mellan kollegor?"
- 2010:15** Martinson Sara and Kristina Sibbmark "Vad gör de i jobb- och utvecklingsgarantin?"
- 2010:16** Junestav Malin "Sjukskrivning som politiskt problem i välfärdsdebatten – det politiska språket och institutionell förändring"
- 2010:17** Hägglund Pathric and Peter Skogman Thoursie "Reformerna inom sjukförsäkringen under perioden 2006–2010: Vilka effekter kan vi förvänta oss?"
- 2010:18** Sibbmark Kristina "Arbetsmarknadspolitisk översikt 2009"
- 2010:19** Ulander-Wänman Carin "Flexicurity och utvecklingsavtalet"
- 2010:20** Johansson Per and Erica Lindahl "Informationsmöte – en väg till minskad sjukskrivning?"
- 2010:21** Grönqvist Erik, Jonas Vlachos and Björn Öckert "Hur överförs förmågor mellan generationer?"
- 2010:22** Martinson Sara och Kristina Sibbmark "Vad gör de i jobbgarantin för ungdomar?"
- 2010:23** Hinnerich Tyrefors Björn, Erik Höglin och Magnus Johannesson "Diskrimineras pojkar i skolan?"
- 2011:1** Hall Caroline and Linus Liljeberg "En jobbgaranti för ungdomar? Om Arbetsförmedlingens ungdomsinsatser"
- 2011:2** Angelov Nikolay, Per Johansson, Erika Lindahl and Elly-Ann Lindström "Kvinnors och mäns sjukskrivningar"
- 2011:3** Eliason Marcus "Undersköterskor och sjukvårdsbiträden i kristider: inkomst- och sysselsättningseffekter av friställningar inom den offentliga sektorn under 1990-talet"

Working papers

- 2010:5** Vikman Ulrika "Does providing childcare to unemployed affect unemployment duration?"
- 2010:6** Persson Anna and Ulrika Vikman "Dynamic effects of mandatory activation of welfare participants"

- 2010:7** Sjögren Anna “Graded children – evidence of longrun consequences of school grades from a nationwide reform”
- 2010:8** Hensvik Lena “Competition, wages and teacher sorting: four lessons learned from a voucher reform”
- 2010:9** Hensvik Lena and Peter Nilsson “Businesses, buddies and babies: social ties and fertility at work”
- 2010:10** van den Berg Gerard J., Dorly J.H. Deeg, Maarten Lindeboom and France Portrait “The role of early-life conditions in the cognitive decline due to adverse events later in life”
- 2010:11** Johansson Per and Erica Lindahl “Can sickness absence be affected by information meetings? Evidence from a social experiment”
- 2010:12** Grönqvist Erik, Björn Öckert and Jonas Vlachos “The intergenerational transmission of cognitive and non-cognitive abilities”
- 2010:13** de Luna Xavier, Per Johansson and Sara Sjöstedt-de Luna “Bootstrap inference for K -nearest neighbour matching estimators”
- 2010:14** Hinnerich Tyrefors Björn, Erik Höglin och Magnus Johannesson “Are boys discriminated in Swedish high schools?”
- 2011:1** Eliason Marcus “Assistant and auxiliary nurses in crisis times: earnings and employment following public sector job loss in the 1990s”

Dissertation series

- 2010:1** Johansson Elly-Ann “Essays on schooling, gender, and parental leave”
- 2010:2** Hall Caroline “Empirical essays on education and social insurance policies”