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DISTRIBUTIONAL EFFECTS OF WAGE LEADERSHIP: EVIDENCE FROM SWEDEN

by

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ABSTRACT

This paper represents the first analysis of the consequences of a formal wage leadership, the Swedish Industry Agreement. We show that leadership in general has implied a lowered wage level for occupational groups having signed the agreement compared to groups that have not signed it. This is as expected as wage leadership should stabilize wage increases. However, the effects differ widely across occupations and skilled groups that signed the agreement have raised their wage level compared to otherwise similar workers outside the agreement. The agreement seems to have had a less binding effect on skilled workers. A possible explanation is that local wage formation is more common among the skilled groups. The agreement has increased the wage level among high educated compared to low educated and thus raised the education premium. Difference-in-differences models are applied using register data 1990-2005.

Keywords: Wage leadership, Differences-in-differences.

JEL-codes: J31, J51, J41

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1 Introduction

Excessive wage increases were considered the major cause behind the Swedish economic problems in the 1980.s and 1990.s. During the severe slump of the early 1990.s the government therefore interfered temporarily in the wage formation process, traditionally controlled by the social partners. The result was the so called "Rehnberg agreement" in 1991-1992, which stabilized wage increases for some years. However, in 1995 and 1996 wage increases were again considered to be inconsistent with lowered unemployment and with the inflation target that had come into effect in 1995. In an attempt to contain wage increases, and to avoid further needs for income policies by the government that threatened the social partners' hegemony over the wage setting process, white and blue collar trade unions in the Swedish manufacturing sectors and their counterparts on the employers side coordinated wage bargaining. The agreement, known as the "Industry agreement" (Industriavtalet[1]), was concluded in 1997 and was launched in 1998 and has been in operation ever since.[2]

The main purpose of the agreement is to obtain higher real wages through nominal wage stabilization that would raise employment in the manufacturing sector. The industrial relations between white and blue collar workers had also changed over the years stressing the need for more cooperation across unions and to reduce the ideological barriers. Though the manufacturing sector was the main target of the agreement, by acting as a wage leader and setting a wage norm compatible with the inflation target, it was also expected to benefit employment in the whole economy.

Wage leadership of the manufacturing sector is well in line with the so called Scandinavian model for which a cornerstone is that the competitive sector should lead wage setting in the

[1] Formally known as "samarbetsavtalet om industriell utveckling och lönebildning" (Co-Operation Agreement on Industrial Development and Pay Determination). It covers private manufacturing industry and was signed by twelve employers' organizations and eight unions. The Agreement represents the first modern-day bargaining agreement and includes a good twenty percent of all employees. It is directed at creating the conditions enabling constructive negotiations aiming at concluding sector agreements with a balanced outcome and without conflicts. It lays down a set of rules on the timing of pay negotiations and guidelines on their implementation. Impartial negotiations leaders are appointed jointly by the parties and some of the responsibility for pay bargaining is relinquished to them. The Agreement makes state mediation essentially unnecessary, but the impartial negotiations leaders, together with an Industrial Committee composed of representatives of the parties, are given powers far more extensive than those of state mediators. While industrial action is not prohibited, the impartial negotiations leaders are authorized to impose a cooling-off period of up to two weeks. Moreover, the joint Industrial Committee can order the temporary cessation of actions already in progress. The Agreement stipulates that a union having initiated industrial action during negotiations forfeits all claim to retroactive effect.

[2] For a discussion of this and other changes in Swedish wage formation institutions, see Vartiainen (2007).

sense that wage increases should be transmitted from the competitive to the protected sector rather than the other way around. A formalisation of the manufacturing sectors' wage leadership also implies that wage changes could be directed at adding up to the sum of productivity changes and changes in world prices, another leading principle of the Scandinavian model.

To the best of our knowledge, there are so far no quantitative studies of the effects of any active wage leadership in the literature. As the agreement by now has been in operation for ten years and with our data it is possible to evaluate the effects thereof. Its existence raises several interesting questions in particular related to its distributional effects and its implementation. Two questions are in focus of the present paper. First, if wage leadership is to stabilize wage formation one might expect that the average wage of wage leaders to fall relative to the average wage outside the wage leading sectors. We thus test for the effects on relative wages. A second interesting issue is if the wage formation institutions, particularly the degree of individual wage setting, affect the outcome of wage leadership. For instance, if wages and salaries are determined at the firm level rather than at the industry level, compliance with the agreement may be hard to obtain. This would, in turn, imply that wage stabilization may be hard to achieve. The paper therefore sets out to test to what extent wage leadership contains wages across different sectors of the economy. We are also interested in the effects on wage gaps, particularly across skill groups, and on the university premium.

The previous literature on wage leadership has focused on the question *if* some sector, like private manufacturing, actually acts as an informal wage leader. In general, the studies find that this has been the case in Sweden.[3] Due to the Industry agreement this question is hardly relevant today since there is no reason to question the wage leadership role of the manufacturing sectors. Considering that parts of the manufacturing sector may have acted as wage leaders already before the Industry agreement, the agreement should be considered as a formalisation, strengthening and possibly extension of wage leadership. Because of the formal agreement it is also possible to identify the sectors that act as leaders. It should also be seen as

[3] See Holmlund and Ohlsson (1992), Jacobson and Ohlsson (1994), Andersson and Isaksson (1997). Later studies (Tägtström (2000) and Friberg (2003)) indicated that the federal governmental sector had overtaken the role as wage leader at least for parts of the private sector. A recent study, (see Lindquist and Vilhelmsson (2006)) showed though that this was not the case, adding further support to the claim that the private manufacturing sector leads the wage setting process. The existence of wage leadership has also been investigated for Canada (Bemmels and Zaidi (1990)), the UK (Latreille and Manning (2000)) and Chile (Mizala and Romaguera (1995)).

a way of setting a norm for wage formation not only in manufacturing but in the whole economy.

It is noteworthy that the concept of "wage leadership" has been used in the literature to identify leadership and not as in the present case where some sectors explicitly take on the wage leading role. In identifying leadership, the concept of "wage spillovers" often occurs in the international literature (Addison and Burton (1979), Breitung and Meyer (1994)), and is related also to "pattern bargaining" (Budd (1997)) and "key bargaining" (McGuire and Rapping (1968)).[4]

The paper starts by analyzing if the Industry agreement has affected wages in the wage leading sectors differently from wages outside the wage leading sectors. Signing the agreement implies a social responsibility as it should be expected to lead to a lowered relative wage. We then proceed to analysing how different occupational groups have been affected by the agreement.

An interesting aspect of the agreement is that it covers blue collar as well as white collar workers including engineers of different education. As wage formation differs across white and blue collar workers, it becomes of interest to see if the effects of the agreement differ across the categories of workers. One should note that the agreement, on the one hand, implies a strong tendency towards centralization. On the other hand, wages of white collar workers, unlike those of blue collar workers, are increasingly determined at the local level which could have a bearing on the implementation of the agreement. During the period, local wage formation has been more common in the private than in the public sector which implies that it is more common among white collar workers that are under the Industry agreement. It is not clear to which extent the Industry agreement can be implemented at the firm level.

We may analyse the distributional effects of the agreement and to see which group or groups have born the burden of the agreement. We may also analyze the effects on the university premium.

[4] See discussion in Lindquist and Vilhelmsson (2006).

II *An Econometric Analysis of the Industry Agreement*

Identifying workers under the Industry agreement.

We use Swedish register data for the period 1990 through 2005 covering workers between 18 and 65 years old. We have a random sample of around 1.1 million individuals and 3.2 million observations. In the panel data set, wages are determined as full time equivalent monthly wages. The wage is not only the bargained wage but is also affected by wage drift and includes bonuses, performance pay, the value of fringe benefits etc.[5]

The basis for identifying the individuals covered by the agreement is the industry code of the individuals' workplace along with the individuals' occupational code. The industry and occupational codes of these are listed in Appendix 1. The agreement is signed by employers and unions in the manufacturing sectors, extractive industries and parts of the forestry industry. However, not all trade unions representing individuals in these sectors have signed the Industry agreement. The trade unions that signed the agreement are all blue collar workers' unions plus Swedish private sector white collar workers and the Civil engineers' union.[6]

We have no information about the union membership of individuals. Instead we use the individuals' occupational code, together with the industry sector requirement, to indicate whether the individual is covered by the agreement or not. Whether a worker is a member of the union or not is not really crucial since the agreement holds for workers who are not members but have identical or similar work tasks as members. A non-organised metal worker will thus be treated as being covered by the agreement irrespective of membership or not in a union that has signed the agreement. The corresponding employers' organisations have signed the agreement.[7]

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[5] Fixed extra wages, performance wages, bonuses, per diem pay, extra pay for night shift work and supplementary pay for unsocial hours, pay for stand by and other benefits and cash replacements. The included performance wages correspond to those during the hours worked in the period of measurement and if the firms have been unable to measure these they have calculated an average "performance pay" over a longer period, e.g. a year.

[6] The unions that signed the agreement were IF Metall, "Unionen" organising Swedish white collar workers, the Swedish Association of Graduate Engineers, the Swedish Food Workers union, Swedish Forestry workers, and Swedish Paper Workers Union.

[7] These include employers federation of construction materials (Byggnadsämnesförbundet), Swedish Association of Mines, Mineral and Metal Producers, the Swedish Industrial and Chemical Employers Association, the Swedish Food Federation, Swedish Forest Industries Federation, Swedish federation of employers in forestry and agriculture, Swedish federation of steel and metal industry employers (Svemek), the Association of Swedish Engineering Industries, Swedish employers in textile and fashion industries (TEKO) and Swedish Federation of Wood and Furniture Industry (TMF).

A special circumstance is that a union's representatives at the firm level, i.e. in the union local, may bargain for employees who are members of other unions. A civil engineers' union local, that has signed the agreement, may bargain not only for civil engineers but also for e.g. business economists or legal advisers in the same firm but who are members in unions that have not signed the agreement. Formally, the union local should then consider that these workers are not covered by the agreement. It is not clear, however, if in these cases workers that are covered are being treated differently than workers who are not covered by the agreement.

For an individual to be classified as covered by the agreement it is thus necessary to work in a firm in a sector covered by the agreement (according to sector code) and to be active in an occupation for which union and employer have signed the agreement. We have thus classified individuals as covered or not covered by the agreement based on the industry codes and occupational codes.

The occupational codes are available from 1996 and onwards implying that we have access to the codes only for two years before the agreement came into operation. We may, however, base the analysis also on type of education which is available from 1990 implying that a considerably longer pre agreement period is represented in data.

Table 1 shows the means of some variables in the sectors covered by the agreement, in sectors not covered and in all sectors. Since the agreement is signed by representatives of the manufacturing sector, we find that the sectors covered by the agreement are dominated by men and that the average education level is low. We also note that the average age is higher and that the average real wage is higher.

Table 1 here

Figure 1 shows the changes in real monthly wages of workers in the sectors covered by the agreement (IA-sectors) and workers in sectors not covered (Non-IA-sectors). The only major difference in wage increases took place in 1992 when the manufacturing sectors were hit more badly than non-manufacturing sectors by the economic crisis causing a relative wage

constraint. As shown by the figure, the general trends of the two groups of sectors have been similar over the period.

Figure 1 here

The Regression Model.

We first explore the effects of wage leadership on wages of the individuals that have signed the agreement compared to wages of those that have not signed. With the agreement follows a leading role in wage setting and a responsibility for the economy's wage formation. This responsibility is not formally shared by those not signing. Thus, we expect the agreement to dampen wage increases among groups that signed it compared to those that have not signed it. This does not rule out the possibility that the agreement has had a normative effect on both groups.

To analyze the wage effects we shall specify a difference-in-differences model. Much of the debate around the DD estimates concerns the issue of a potential endogeneity of the intervention. The agreement itself came much as a surprise partly because it covered both white and blue collar workers and because the manufacturing sectors, as indicated in Figure 1, had experienced more modest wage increases than other sectors. However, in line with the Scandinavian model, it was natural that, if there was to be a formal wage leader, the manufacturing sectors should take on this role.

The model is estimated with two-way fixed effects across individuals and time and is specified as:[8]

$$\ln w_{it} = \alpha X_{it} + \gamma TIME_t + \delta REGION_{it} + \beta_1 IASECTOR_i + \beta_2 IA_{it} + \mu_{it} + \varepsilon_{it} \qquad (1)$$

where index *i* represents individual and *t* represents observational time period and where

w_{it} = real wage

X_{it} = vector of individual specific properties,

TIME=indicator variable for individual years,

[8]We have performed a Hausman test to determine how the heterogeneity across individuals should be considered. The test showed that μ_i in (1) is correlated with other regressors implying that the model should be estimated using fixed effects rather than random effects.

$REGION_{it}$= region (län) where individual *i* is active,

IA= indicator variable for period and sector covered by the agreement,

IASECTOR = indicator variable for sector covered by the agreement,

μ_i = parameter capturing fixed effects for individuals,

ε_{it} = error term.

The vector X_{it} includes age, seniority, education (if applicable) and quadratic variables of age and seniority. Equation (1) will be estimated for the whole sample or for single occupations. The parameter β_2 is intended to capture the effect of the intervention (*IA*) on relative wages of groups having signed the agreement compared to those that have not. *IA* takes on a unit value for workers in covered sectors when the agreement applies. *IASECTOR* captures the effect that may occur for individuals within the agreement compared to those outside, irrespective of period.

The identifying assumption is that the introduction of the Industry agreement is the only measure that has been taken and has affected the wages differently between workers covered and not covered by the agreement. However, other factors, if any, that affected wage earners in the manufacturing sectors from 1998 to 2005 will also be captured by the estimated β_2. To capture the influence of the individual years, like business cycle effects, we include indicator variables for the individual years 1990 through 2005, as represented by *Time*. This also captures possible trend effects on changes in wages between individuals covered and not covered by the agreement.

III ***Results***

III.1 Wage effects

We start by estimating the effects of the agreement on the wages using the full sample. The results are presented in Table 2, Column 1, and show a β_2 estimate of -0.0083 (see bolded figures). This implies that the agreement has lowered the wage level of workers that have signed the agreement by .83 percent compared to workers outside the sectors and occupations covered by agreement. A negative wage premium is actually to be expected for workers under the agreement as the agreement implies a responsibility to act as a wage leader to stabilize wage formation. Unless the agreement has increased wages outside the sectors covered, for

which it is difficult to offer theoretical support, the estimate suggests that it has had a dampening impact on wage formation.

Table 2 here

Bertrand, Duflo and Mullianathan (2004) shows that the conventional difference-in-differences standard errors due to serial correlation may seriously understate the standard deviation of the estimators. Serial correlation may be a particularly severe problem if the time series is long. Here it is 16 period. Moreover, individuals wages are typically positively serially correlated. Bertrand et.al. (2004) argue that one of the remedies against inconsistent standard errors is to collapse the data set into a "pre" and "post"-intervention period. Collapsing our data yields a t-statistic of 19.89 for the relevant estimate which is only slightly lower than the one obtained in Column 1, (21.53). (See Appendix 2, Table A1.)

A placebo experiment has been conducted to investigate whether the estimated effects are indeed results of the agreement. We randomly select sectors and periods for the agreement and if no effect is found of the placebo reform, we can be more confident that we actually have captured a treatment effect and not just a sector and time specific shock. The resulting estimate is not significant and the estimates yielded a zero value. (See Appendix 2, Table A2.)

The regressions presented in Column 1 include civil engineers as the only major group with a long formal education. Their salaries are to a large extent determined at the firm level. To explore the effect of these institutional differences, it is of interest to see the results as civil engineers and other engineers are excluded from data. Performing a similar regression excluding all engineers shows the effects of the agreement covering only traditional blue collar workers and low skilled white collar workers. The results are shown in Column 2. The estimated effect of the agreement is now considerably higher, -0.0145 implying a drop of 1.4 percent relative to workers outside the sectors covered by the agreement.[9]

Taken together, these estimates suggest that the agreement has affected the groups that signed it quite differently. The results in Columns 1 and 2 imply that the effect could be qualitatively different for the groups that were excluded in the regressions in Column 2, i.e. the engineers.

[9] If only civil engineers are excluded, the estimate is -0.0123.

Wages of blue collar and low skilled white collar workers are to a high degree determined at the industry level. At this level it is easily perceived that the agreement has a normative effect on the workers' final wages. For other groups wages and salaries are determined at the firm level and an implementation of the agreement may be difficult to achieve.

To further explore the distributional effects of the agreement, we therefore regress the effects on salaries of civil engineers. Columns 3 and 4 show the results of two different regressions. The first is based on identifying civil engineers from their stated occupation. This variable is, however, only available from 1996 and onwards. The second regression, in Column 4, is based on workers having stated that they have completed a civil engineer education. This latter group, however, contains workers that do not necessarily work as civil engineers. The advantage is that the time series on which we may perform the estimations are longer, dating back to 1990.

In both regressions we find a *positive* effect of the agreement on civil engineers covered by the agreement. The regressions in Column 3 suggest an increase by 2.33 and in Column 4 by 1.86 percent. While this may come as a surprise, one should remember that the salaries of civil engineers, particularly in the private sector, are determined in local wage bargaining at the firm level to a much higher extent than wages of blue collar workers. The results suggest that it is difficult to implement the Industry agreement when wages are set at the local level.

This fact cannot by itself explain that groups under the agreement receive a positive wage premium. The degree of local wage setting is more common in the private manufacturing sector covered by the agreement than outside the manufacturing sector. Granqvist and Regnér (2004) reports that in 2002, salaries of 66.1 percent of members of the academics' union[10] in the private sector were determined in "talks" between the employee and the employer. For the federal government the figure was 47.7 percent and 53.3 percent for academics in the local government sector. It should be recognized though that there may be differences in the extent to which the wage talks really are binding for the employers.

The sectors not covered by the agreement are public and private service sectors and local

[10] SACO.

wage setting is also common in the latter sectors. To obtain further evidence of the influence of local wage setting we regress the effects of the agreement on salaries including only civil engineers employed in the public sector among those outside the agreement. The results are presented in Column 5.

The estimate is now considerably higher, 0.0395 as compared to 0.0233 (Column 3). Thus, the agreement has raised the average salary level of civil engineers in the sectors covered by the agreement by almost 4 percent compared to salaries of engineers in the public sector.

Another possible explanation for the result that the Industry agreement does not lower salaries in the private manufacturing sector could be that other sources of income than salaries are more frequently applied. As noted, our dependent variable include bonuses, profit sharing etc. that easily can be used to circumvent the agreement if this is considered limiting for the wage setting process in the private manufacturing sector. Another possibility could be that wage drift is more common in the sectors covered by the agreement, implying large difficulties in implementing the agreement.

The estimates presented above have yielded a fairly clear picture. The agreement seems to have had a restraining effect on wage increases that should have benefited employment. The effects vary, quantitatively as well as qualitatively, across occupations. Our results show that civil engineers under the agreement have gained from the agreement compared to peers in sectors not covered by the agreement. Also for engineers less educated than the civil engineers we obtain a positive wage premium from the agreement. For other wage earners, dominated by blue collar workers, we have obtained a negative wage premium from the agreement. Notable is that the civil engineers is the only occupation in the high skilled category.

The structural differences in current wage formation practices may explain some of our results. The wages of the blue collar workers are generally determined at the sector level suggesting a higher degree of compliance to the norm of the agreement than is the case for blue collar workers outside the agreement. This may explain why blue collar workers under the agreement have constrained their real wage increases more than peers outside the agreement.

There is no reason to assume that salaries of white collar workers are constrained at the sector level by the agreement. A major difference as compared to the blue collar workers is, however, that wages to a large extent are determined at the workplace level in a bargain between the individual worker (or her union representative) and a representative of the firm. The propensity to take on the social responsibility falls as the wage is determined locally and we should then expect white collar workers to comply less with the agreement than blue collar workers.

III.II The Industry Agreement and Wage Gaps

The results that engineers having signed the agreement have gained relative to engineers having not signed, while the contrary is the case for blue collar workers and low skilled white collar workers, does not *per se* imply that the agreement has increased the wage gap between the skilled and the unskilled under the agreement. However, an extended version of equation (1) may be estimated that may illuminate the wage gap effects. We therefore specify a differences-in-differences-in differences model as:

$$\ln w_{it} = \alpha X_{it} + \gamma TIME + \delta REGION + \beta_1 IASECTOR + \beta_2 IA + \beta_3 CIVENG + \beta_4 IASECTOR * CIVENG + \beta_5 IATIME * CIVENG + \beta_6 IA * CIVENG + \mu_i + \varepsilon_{it} \quad (2)$$

where *CIVENG* is an indicator variable representing the civil engineers and *IATIME* is the agreement period. Controlling for *CIVENG* and its interactions with *IASECTOR* and *IATIME*, β_6 will capture effect of the agreement on the relative wage of civil engineers and other workers under the agreement. Identifying civil engineers by the occupation variable, we are limited to data covering the 1996-2005 period.

The results are presented in Column 6. The estimate 0.028 implies that the agreement has raised the average salary of the civil engineers by 2.8 percent relative wages of other workers, i.e. blue collar workers and low skilled white collar workers. For comparison we make the corresponding estimation based on education enabling us to utilize the longer time period. In Column 7 we see that this estimation generates a lower value, 0.0106 implying an effect on the relative wage of a modest one percent. In both cases the agreement seems to have increased wage differences in the economy.

III.III The Industry Agreement and the University Premium.

This section investigates the effect of the agreement on the returns to education, i.e. the salaries of the high skilled relative the low skilled. We shall first investigate the effects of the agreement on salaries of university educated engineers compared to those of lower educated engineers and see if this difference is larger for workers covered by the agreement than for those not covered.

To estimate the university premium we apply a DDD model similar to the one in equation (2). We denote the high educated by an indicator variable *HIGH* and in this group we include individuals with a university degree. While equation (2) captured the differences between civil engineers and other wage earners, we now capture the differences between high- and low educated of being under the agreement. We write equation (3) as:

$$\ln w_{it} = \alpha X_{it} + \gamma TIME + \delta REGION + \beta_0 IATIME + \beta_1 IASECTOR + \beta_2 IA + \beta_3 HIGH + \beta_4 IASECTOR * HIGH + \beta_5 IATIME * HIGH + \beta_6 IA * HIGH + \mu_i + \varepsilon_{it} \quad (3)$$

The parameter β_6 captures the effect of the agreement on the salaries of the high educated relative wages of the low educated. The underlying assumption is that the agreement is the only factor that affects the relative wage of the high educated relative the low educated in the sectors where the agreement is in operation between 1998 and 2005.

We first estimate the effect limited to engineers, i.e. civil engineers and lower educated engineers. The high educated have at least 2 years college education. The results, presented in Column 8, show that the agreement has had a positive effect on the wage relations of 2.39 percent.

Based on the full sample, but now for the full period 1990-2005, Column 9 shows that an estimate of 0.0171 is obtained, implying a positive effect of 1.71 percent. Thus, the agreement seems to have affected the university premium among the group of engineers more than among all wage earners in the full sample.

The extent of local wage setting is again a prime suspect behind these results. Individual wage setting is considerably more common among the high educated. At the local level workers are

unlikely to comply with the norm of the agreement while it is harder for the low educated whose wages are commonly determined at the industry level to escape the norm.

IV Conclusions

This study is the first quantitative evaluation of a formal wage leadership and is based on the Swedish Industry agreement covering most employees in the manufacturing sector since 1998. While the previous empirical literature has tested for the existence of wage leadership, this agreement opens up for a unique analysis since wage leadership can be taken as given and we may assess the consequences of the agreement. Using detailed data on a representative sample for the period 1990 and 2005, we have implemented a difference-in differences approach to evaluate the wage effects.

A basic purpose of the agreement is to stabilize wage setting to comply with the inflation target without intervention in the form of a governmental income policy. In this paper we have estimated the effects of the agreement on wages and wage gaps across different groups of wage earners. Several conclusions stand out:

First, the agreement appears to have had a dampening effect on real wages. This is indicated by the fact that the real wage increases of wage earners whose union has signed the agreement are lower than the wage increases of those whose union did not sign. This result obtains after we have controlled for structural factors and considered a wage concept that includes not only a traditional monthly wage but also bonuses, performance pay, the value of fringe benefits etc.

Secondly, the wage effects vary considerably across occupations. The group of blue collar workers and low skilled white collar workers under the agreement appear to have restrained their wage increases compared to peers having not signed. The situation is the contrary for engineers. The engineers in sectors where the agreement has been signed have had more favourable wage increases than those outside the agreement sectors. A possible explanation for these deviating effects and for which we also have obtained some supporting evidence, is the differences in wage setting practices. Implementation of the agreement might have been rendered more difficult as wages are set at the firm level since the macroeconomic arguments may not bite in bargaining at this level.

In line with this reasoning, we have also found that the agreement has contributed to increasing wage gaps between civil engineers and low skilled workers. It also appears to have had a positive impact on the university premium. The university premium has increased more for the group of engineers than for the whole sample.

Another possible explanation could be that wage drift and other forms of pay than the basic wage plays a more prominent role for the high skilled like the civil engineers than for the low skilled. Wage drift, bonuses, and any form of performance pay, are likely to be unaffected by an agreement like the Industry agreement and hence be an underlying explanation for the structure of our results. This formalisation implied a coordination of the efforts to lead the wage formation.

We have noted that some studies suggest that the manufacturing sectors had a wage leading role already before the agreement was launched. Against this background, the interpretation of the results is that the agreement implied a formalisation of the wage leadership that has had a clear effect on wage relations.

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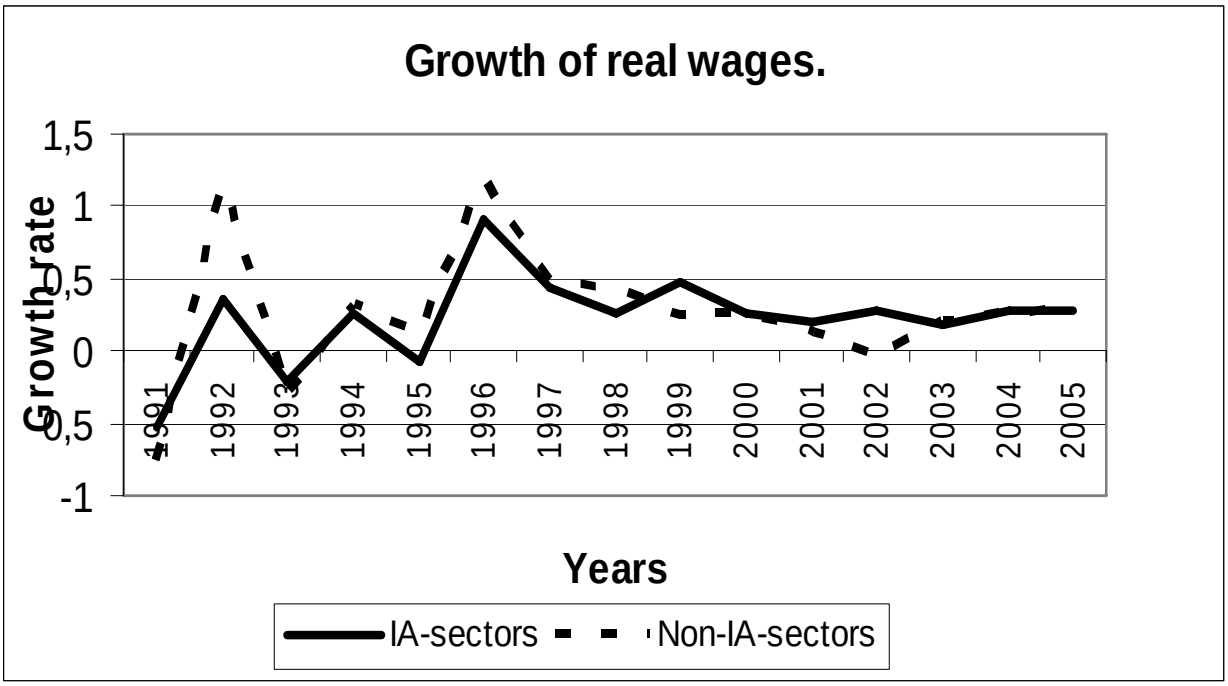

Figure 1. Real wage growth in sectors covered and not covered by the agreement.

	Covered sectors	***Not covered sectors***	***All sectors***
Share men %	74	44	55
Age	52	49	50
Seniority (years)	5.9	5.7	5.8
Education level 1 %	21.1	12.2	15.5
Education level 2 %	14.5	8.9	10.9
Education level 3 %	45.7	41.9	43.3
Education level 4 %	6.2	3.5	4.5
Education level 5 %	11.4	29.0	22.4
Education level 6 %	0.8	1.4	1.2
Average real wage	22 946	19 291	20 656

Table 1. Mean values of some variables, separated by sector.

	All workers, 1990-2005	*All workers except engineers 1990-2005*	*Civil engineers occupat. 1990-2005*	*Civil engineers education 1996-2005*	*Civil engineersPublic sectors outside IA 1996-2005*	*Civil engineers vs low skilled workers. Occup. 1996-2005*	*Civil engineers vs low skilled workers. Education 1990-2005*	*Education premium, Engineers, 1996-2005*	*Education premium, All workers 1990-2005*
Age	0,01372	0,0112	0,10672	0,07821	0,10571	-0,01718	0,01351	-0,01811	0,0132
	(14,80)**	(12,03)**	(62,32)**	(6,61)**	(61,29)**	-0,65	(14,61)**	-0,67	(14,44)**
Age sq	-0,00032	-0,00029	-0,00076	-0,00085	-0,00077	-0,00028	-0,00032	-0,00027	-0,00032
	(149,29)**	(128,08)**	(47,81)**	(50,37)**	(48,86)**	(94,94)**	(149,01)**	(93,81)**	(150,77)**
Seniority	0,00088	0,00098	-0,00039	0,00044	-0,00031	0,00125	0,00089	0,00119	0,00084
	(15,12)**	(15,65)**	-1,18	-1,25	-0,94	(20,78)**	(15,41)**	(19,92)**	(14,51)**
Seniority Sq	-0,00007	-0,00007	-0,00001	-0,00006	-0,00001	-0,00008	-0,00007	-0,00008	-0,00007
	(18,74)**	(18,06)**	-0,37	(2,48)*	-0,53	(20,88)**	(18,73)**	(19,76)**	(17,96)**
Educ 2	0,00889	0,00628	0,03251	0,0203	0,03501	0,01112	0,00809	0,01135	0,00905
	(6,64)**	(4,65)**	-0,8	-0,84	-0,88	(3,65)**	(6,06)**	(3,71)**	(6,81)**
Educ 3	A94	0,00734	-0,0398	0,0648	-0,03752	0,00231	0,00796	0,00447	0,01019
	(9,93)**	(8,40)**	-1,79	-1,29	-1,69	-0,97	(9,31)**	-1,87	(11,91)**
Educ 4	0,02353	0,0234	-0,05779	0	-0,05237	-0,00803	0,0245	-0,00224	0,03221
	(12,86)**	(12,00)**	(2,56)*	(,)	(2,33)*	(2,25)*	(13,49)**	-0,62	(17,80)**
Educ 5	0,07421	0,06628	0,00629	0,02278	0,00861	0,07293	0,06701	0,04439	0,04152
	(50,61)**	(43,98)**	-0,31	-1,25	-0,43	(17,85)**	(46,75)**	(10,37)**	(27,41)**
Educ 6	0,21986	0,21178	0,01222	0,10211	0,01461	0,18781	0,22151	0,15042	0,16639
	(48,31)**	(42,44)**	-0,57	(3,86)**	-0,7	(27,91)**	(48,76)**	(22,10)**	(37,67)**
Regions incl	YES	YES	YES	YES	YES	YES	YES	YES	YES
Years incl	YES	YES	YES	YES	YES	YES	YES	YES	YES
IAsector	0,04423	0,04801	-0,02626	-0,00436	0,05649	0,0467	0,04598	0,03884	0,02775
	(41,39)**	(41,25)**	(5,19)**	-0,72	(2,12)*	(38,68)**	(42,98)**	(30,39)**	(25,18)**
IA	***-0,00827***	***-0,01453***	***0,02335***	***0,0186***	***0,0395***	-0,02148	-0,01111	-0,01393	0,00136
	(21,53)*	***(35,67)****	***(6,22)****	***(4,23)****	***(8,24)****	(57,34)**	(28,91)**	(32,36)**	(3,05)**
CivEng.						-0,00916	0,05211	-0,00682	
						(6,61)**	(8,63)**	(4,94)**	
IAtime*CivEng						0,02883	0,05799		
						(15,29)**	(12,63)**		
IAtime*High								0,03349	0,0462
								(58,37)**	(76,83)**
IAsector*CivEng						-0,03787	-0,02117		
						(26,46)**	(3,46)**		
IA*CivEng						***0,02839***	***0,01063***		
						(11,80)*	***(2,20)****		
Iasector*High								-0,01301	0,03864
								(4,47)**	(17,67)**
IA*High								***0,02388***	***0,01706***
								(24,25)*	***(17,38)****
Constant	10,21207	10,24099	6,85396	8,97332	6,96233	11,82845	10,21912	11,86025	10,23423
	(185,02)**	(184,07)**	(119,39)**	(13,88)**	(109,59)**	(7,82)**	(185,21)**	(7,72)**	(187,02)**
R2	0,47	0,45	0,62	0,51	0,62	0,41	0,47	0,41	0,48

Table 2. Results of Differences-in-Differences and Differences-in-Differences-in-Differences estimations.

Notes: *=significant a 5% level, **significant at 1 % level.

APPENDIX 1

Sectors covered by the Industrial agreement as classified by SNI 2000.

02011-02029 (Parts of forestry.)

10100-1400 (Mining and quarrying)

15111-16000 (Food product, beverage and tobacco industry.)

17110-18300 (Textiles, textile products)

19100-19300 (leather products))

20101-20520 (Industry for wood and woodproducts)

21111-22330 (Industry for pulp and paper; publishers and printers.)

23100-23300 (Industry for coke and petroleum products)

24110-24700 (Industry for chemicals)

25110-25240 (Industry for rubber and plastic products)

26110-26829 (Industry for other non-metallic mineral products)

27100-28759 (Industry for basic metals and fabricated metal products Industry for fabricated metal products, except machinery and equipment)

29110-29720 (Industry for machinery and equipment n.e.c.)

30010-33500 (Industry for electrical and optical equipment)

34100-37200 (Industry for transport equipment)

The relevant occupations and codes (according to SSYK-96) are:

Civil engineers, architects etc. (214),

physical and engineering science technicians (311),

computer associate professionals (312),

office secretaries and data entry operators (411),

numerical clerks (412),

stores and transport clerks (413),

other office clerks (419),

forestry and related workers (614),

miners, shotfirers and quarry workers (711),

metal moulders, welders, sheet metal workers, structural metal preparers and related trades workers (721),

stationary-plant and related operators (81),

machine operators and assemblers (82).

APPENDIX 2

	Collapsed data (two periods)
Age	0.052
	(147.74)**
Age Sq	-0.000
	(87.46)**
Seniority	0.001
	(3.76)**
Seniority SQ	-0.000
	(8.55)**
Educ	0.007
	(7.45)**
Educ	0.006
	(9.85)**
Educ	0.013
	(8.37)**
Educ	0.049
	(42.73)**
Educ	0.150
	(28.51)**
Regions incl	Yes
Before IA	-0.043
	(62.58)**
IAsector	0.028
	(27.93)**
IA	-0.010
	(19.89)**
Constant	8.069
	(802.73)**
R-squared	0.66

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Table A1. Results from collapsing data into two periods.

	Randomised data
Age	0.01541
	(16.55)**
Age Sq	-0.00033
	(150.25)**
Seniority	0.00081
	(13.97)**
Seniority Sq	-0.00007
	(17.45)**
Educ 2	0.00850
	(6.32)**
Educ 3	0.00805
	(9.37)**
Educ 4	0.02302
	(12.56)**
Educ 5	0.07430
	(50.53)**
Educ 6	0.22482
	(48.43)**
Regions incl	Yes
Years incl	Yes
Random IA	-0.00010
	(0.75)
Constant	10.14661
	(182.96)**
R-squared	0.47

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Table A2. Results from a placebo experiment.