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What are the wage effects of extending collective labour agreements?

Evidence from the Netherlands

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Summary (English)

This paper estimates the effect of mandatory extensions of industry-level collective labour agreements (CLA's) on wages using a large linked employer-employee database. Our analysis is an improvement over previous Dutch empirical research as we are able to distinguish between employees under industry-level CLA's that either *were* or *were not* extended to all firms in a sector. We find that on average, similar employees in firms with an extended CLA earn around 1 to 2% more per hour worked than employees under an industry-level CLA that was not extended. The size of the impact is about 4% in 2006 and 2007 and declines to 0% in 2010 and 2011. The timing of the decline coincides with the Great Recession.

Our results are partly consistent with market power theory of unionization as wages are higher in economic good times and partly with coordination theory as wages are not higher in economic bad times (Villaneuva, 2015, Teulings and Hartog, 1998). The decline over time may furthermore be explained partly by economic trends such as globalization, technological progress and a decline in union membership, possibly leading to more flexible labour markets and lower negotiation power by unions. It is an open question whether our results may be interpreted as causal as the incidence of an extension may be non-random. An interesting direction for future research would be to use the timing of extensions for identification. An additional interesting direction of research is on the effect of extensions on employment.

Summary (Dutch)

In dit achtergronddocument schatten we het effect van algemeen verbindend verklaren (avv) van bedrijfstakcao's op lonen. Het onderzoek is een verbetering tegenover eerder Nederlands onderzoek omdat we weten welke werknemers onder een cao vallen die algemeen verbindend is verklaard. We vinden dat werknemers die onder een cao met avv vallen, tussen de 1 tot 2% meer verdienen dan vergelijkbare werknemers die onder een cao zonder avv vallen. Het verschil in beloning is ongeveer 4% in 2006 en 2007 en daalt naar 0% in 2010 en 2011. De daling van het verschil valt samen met de grote recessie.

De resultaten zijn deels in lijn met de theorie over marktmacht van vakbonden omdat lonen hoger zijn tijdens hoogconjunctuur en deels met de theorie over coördinatie omdat lonen niet hoger zijn tijdens laagconjunctuur (Villaneuva, 2015, Teulings en Hartog, 1998). De daling van het verschil kan ook deels verklaard worden door economische trends zoals globalisering, technologische vooruitgang en de afname van het vakbondslidmaatschap, waardoor arbeidsmarkten flexibeler worden en de onderhandelingsmacht van vakbonden in sommige sectoren afneemt. Het is een open vraag of onze resultaten als oorzakelijk geïnterpreteerd kunnen worden. Toekomstig onderzoek kan de timing van avv gebruiken om een oorzakelijk effect van avv vast te stellen. Daarnaast is onderzoek naar het effect van avv op de werkgelegenheid interessant.

1 Introduction

In a number of countries around the world, collective labour agreements (CLA's) are subject to mandatory extensions. Agreements between a limited number of employees and employers, often represented through unions and employer organizations, are extended to all employees in a sector. This assures that everyone is covered by the CLA, implying that job-specific minimum wages and wage increases are homogeneous across jobs in those sectors. What impact do these extensions have on labour market outcomes? Will unions monopolize the supply of labour and claim higher wages, which is usually assumed in the international literature? Or do they facilitate the coordination of wage growth across firms and stimulate wage moderation in times of recession, thereby increasing wage flexibility, as is claimed by an influential Dutch literature (e.g. Teulings and Hartog, 1998)?

This paper considers the effect of mandatory extensions on wages in the Netherlands. Using an extensive linked employer-employee micro data set covering all Dutch employees, we compare wages of employees under various collective bargaining regimes between 2006 and 2011. This period offers a unique opportunity to study the effect of extending CLA's, as it contains both a peak and a through in economic growth. We can therefore assess whether a) labour unions use their market power to negotiate higher wages and b) whether this effect varies over the business cycle. If labour unions facilitate coordination, for instance, we would expect to see a greater effect of mandatory extensions in 2006 and 2007 then in 2010 and 2011, when the Netherlands were in a deep recession. Our source of identification is the fact that not all industry-level CLA's are extended. When CLA's are not extended, they only apply to firms that are members of employer organizations that signed the agreement. Firms that are not covered by an industry agreement could be covered by firm-level CLA's, or not be subject to collective bargaining. The former usually applies to large firms.

We quantify the effect of extension on wages by comparing wages of employees that were covered directly by an industry-level CLA that *was* and *was not* extended. Our research sample will include about 1.5 and 0.4 million observations per year respectively for the former and latter group, which is more than half of all employees covered directly by an industry-level CLA. We exclude employees that were added to the agreement through the extension as they may be incomparable to employees that were covered directly. We also exclude (semi-)public sector employees. We find that on average, similar employees in firms with an extended CLA earn around 1 to 2% more per hour worked than employees under an industry-level CLA that was not extended. The size of the impact differs across years. In 2006 and 2007, the effect of extensions is estimated to average around 4%. After 2007, the effect declines to a minimum of 0% by 2010 where it remains in our final year, 2011. The timing of this decline coincides with the Great Recession. In support of this idea, we find that the effect of extensions is correlated with growth rates in some large industries.[1] We furthermore find that the difference in wages is slightly larger for older employees, while employees under the

[1] The decline over time may also partly be explained by general trends like globalization, technological progress and a decline in union membership, possibly leading to a more flexible labour market and less negotiation power by unions.

age of 35 barely benefit. The size of this effect, too, fades when the general effect of extensions diminishes after 2007. The results are based on estimations that adjust for a rich set of employer and employee characteristics (including industry fixed effects, contract type, hours worked, age, tenure, ethnic background and firm size), and is robust to estimations in various specifications.

Although the extension of CLA's is common in several European countries (OECD, 2012), the international literature has picked up the issue only recently. Martins (2014) concludes that employment in Portuguese industries declines by around 2% following mandatory extensions. South African research on firms that are just inside areas covered by extended agreements pay over 10% higher wages than those just outside these areas (Magruder 2012).[2] Research on the effect of mandatory extensions in the Netherlands has yielded mixed results. SZW (1993) concludes on the bases of a sample on 16.000 employees that those covered by extended CLA's on average earn about 3% more than those who are not covered. Hartog et al. (2002) explicitly assesses the effect of extensions by comparing salaries of those covered directly by bargaining agreements and those who were added through an extension. They conclude that extensions do not increase wages, because employees who were covered by the CLA through the extension earned around 4% less than those who were covered directly. The most recent works for the Netherlands (Rojer 2002, Venema et al. 2005) conclude on similar grounds that extensions do not increase wages between 1995 and 2004. The empirical papers on the Netherlands suffer however from the limitation that no distinction could be drawn between employees who were covered by an industry-level CLA that was extended and those who were not. Their source of identification is therefore limited to comparing employees who were covered directly and those who were added through the extension. That strategy does not quantify the difference in market power to labour unions that is generated by mandatory extensions.

Although our analysis is a clear improvement over the existing empirical literature for the Netherlands, it too suffers from the limitation that whether or not a CLA is extended to all employees in the industry is not random. It depends on a number of factors, the most important of which is that at least 55% of employees must work for employers who are members of employer organizations. If a firm's membership status to these organizations is correlated with wages even after correction for a rich set of background characteristics, our results may not have a causal interpretation. An interesting direction for future research would be to use the timing of the extension for identification. This approach would imply a focus on a limited number of industries using a time event approach. An additional interesting direction of research is to study the effect of extensions on employment.

The remainder of this paper is organized as follows. Section 2 provides a brief outline of the institutional framework of collective bargaining in the Netherlands. Section 3 explains the empirical strategy used to relate wages to mandatory extensions. Section 4 outlines the data and provides summary statistics. Section 5 provides results while Section 6 concludes.

[2] Other examples of recent research are found in Villanueva (2015).

2 Institutional setting

In the Netherlands, employers and employees negotiate collectively about wages and other terms of employment at the firm or industry level. The resulting CLA's are binding by law for all workers in a firm that signed the agreement, irrespective of whether they are members of the union signing the agreement. Also by law, the Minister of Employment and Social Affairs can extend an agreement at the industry level to all firms in that particular industry. Firms that are not members of an employer organization and hence did not sign the CLA are then required to obey the agreement's terms of employment.

Table 2.1 Numbers of employees by collective labour agreement (CLA) regime, in millions

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total employees (a)	6,78	6,74	6,76	6,85	7,02	7,16	7,13	7,04	7,03	7,06	6,95	6,86	6,91
Industry agreement (b)	5,12	5,34	5,31	3,92	5,22	5,32	5,56	5,80	5,60	5,45	5,42	5,34	4,96
o.w. directly under agreement(b)	3,34	3,66	3,66	2,50	3,45	3,63	3,67	3,91	3,84	3,93	3,71	3,70	3,31
o.w. industry with extension (c)									2,61	1,66	2,78	2,81	2,24
o.w.industry without extension (b,d)									1,23	2,27	0,93	0,89	1,07
o.w. indirect under agreement (b)	0,78	0,69	0,66	0,43	0,77	0,68	0,86	0,84	0,73	0,50	0,70	0,63	0,64
o.w. civil servants (a,e)	0,99	1,00	0,99	0,98	1,00	1,01	1,03	1,05	1,03	1,02	1,02	1,01	1,02
Firm agreement (b)	0,65	0,72	0,86	0,90	0,59	0,54	0,59	0,57	0,53	0,55	0,53	0,55	0,52
No agreement (c)	1,02	0,69	0,60	2,03	1,21	1,30	0,98	0,66	0,90	1,05	0,99	0,97	1,43

(a) Statistics Netherlands, National Accounts (2015 forecast CPB).
(b) Ministry of Employment and Social Affairs, collective labour agreements, various years.
(c) own calculations..
(d) for most industry level agreements extension takes place, but this may take time. The number of employees in industries without extension concerns employees who are covered by a collective agreement which is not yet extended by January 1. Employers which are not bound by a collective agreement may wait until extension until they adjust their wages.
(e) civil servants do not have a collective labour agreement formally.

The rules for extension of a CLA are described in the Law on Mandatory Extensions.[3] Unions and employer organizations that are part of the industry-level CLA may ask the Minister to extend the agreement to all workers in the particular industry. Extension requires that at least one party that signed the agreement requests it. According to the law, only specific terms of the agreement are extended (and not the complete agreement). The law describes the procedure and conditions for the extension of a specific term of the agreement. An important condition is a majority requirement stipulating that at least 55% of employees covered by a CLA are employed by firms that are members of employer organizations that signed the agreement.[4] Involved parties may object to an extension. In practice this mostly leads to a delay of the extension (and hardly to non-extension). The negotiating parties and the Minister can grant dispensation, which is acknowledged in exceptional situations only.

[3] In Dutch: 'Wet op het algemeen verbindend en het onverbindend verklaren van bepalingen van collectieve arbeidsovereenkomsten'.
[4] The Minister has the freedom to also extend an agreement in case of a majority of 50 to 55%.

About six out of all seven million employees in the Netherlands are covered by a collective agreement at the industry or firm level that is including civil servants (Table 2.1).[5] About half a million employees are covered by a firm-level agreement while the other employees are covered by an industry-level agreement. About three to four million of these workers are covered *directly* by this agreement.[6] And slightly more than half a million workers are covered *indirectly* through an extension. The employers of these so-called 'added' or 'extended' workers are not member of an employer organization that signed the agreement. The one million civil servants do not have a CLA officially and so mandatory extensions do not play a role. Wages are negotiated between unions and public employers and the latter are bound to pay according to the agreement without the need of a mandatory extension.

Most CLA's are usually extended in the Netherlands. In 2013 and 2014 almost one million workers are covered by an industry-level agreement that is not extended. In most cases these agreements are *not yet* extended as most industry level agreements will be extended at some point in time. The number of workers covered by CLA's that are not yet extended varies over time as in some years large agreements were signed with a retroactive effect and some extensions were delayed because of objections. From the official statistics of the Ministry of Social Affairs used for Table 2.1 it is not possible to distinguish between agreements that are not yet extended and agreements that are generally not extended at all.

Despite the fact that most CLA's are usually extended, also a reasonable number of CLA's are usually not extended. The CLA database of the Ministry of Social Affairs, underlying the official statistics in Table 2.1, contains information on about forty of such CLA's. The sectors include temporary work agencies, information and communication technology, publishing, large chain stores, health care insurance, sports and recreation (see Appendix A). These sectors cover roughly 0.4 million private sector employees.

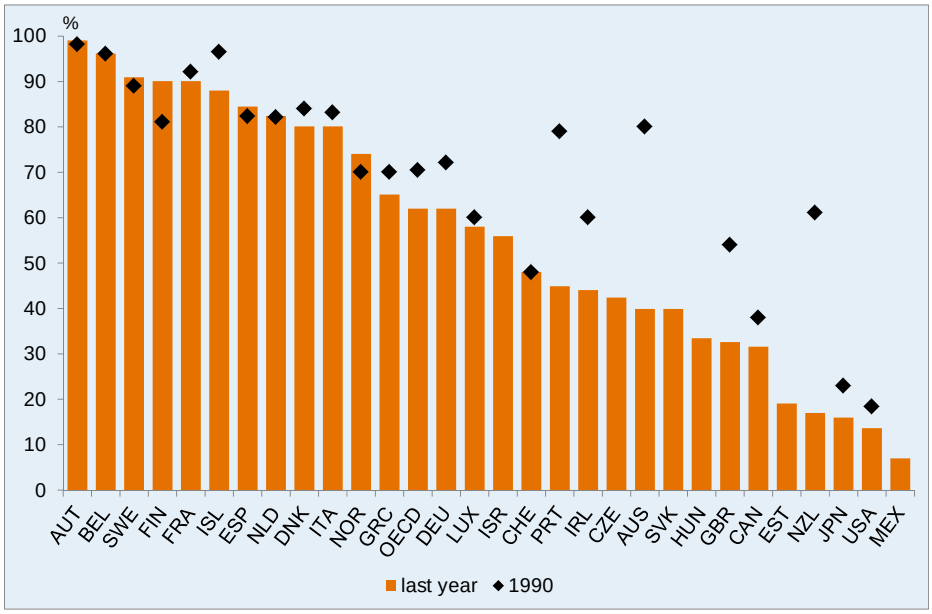
The purpose of the law on the mandatory extension of CLA's to prevent a race to the bottom on wages and other terms of employment induced by employers who are not member of an employer organization that signed the contract and their employees (SER, 2013, Regioplan 2015). An effective functioning of the law should therefore lead to higher wages. The bargaining regimes in the Netherlands are however also embedded in a corporatist system. Corporatism is a structure of well-organized interaction and consultation between union federations, employer federations, and the national government on all issues of social economic policies, including labour legislation and social protection (Teulings and Hartog, 1998). In such a system, unions may be inclined to take the impact of high wage claims on employment into account and the coordination between unions and employers may mitigate the impact of the extensions on wages. Most unions belong to one of three federations that have a seat in the Dutch Foundation of Labour, a private institution where trade union and employer federations meet and consult and give joint recommendations to their member organizations on wage setting, training, and employment policies. Although there is no strong legal basis for the system of labour relations, for example no union representation

[5] Civil servants do not have a CLA formally and so their agreements are not officially extended. Nevertheless we include them as public employers are bound to the agreements with unions.
[6] Their employers are members of employers' organizations that signed the agreement.

rules and no compulsory collective bargaining, unions have become key players in a system with formal and informal coordination. Relative to surrounding countries like Germany and France, union wage claims in the Netherlands are generally moderate.[7]

Collective bargaining is an important labour market institution in many countries and the Netherlands is no exception, whereby level of bargaining is changing in the direction of decentralization in several countries. Figure 2.1 shows that collective bargaining coverage is high in Austria, Belgium, Sweden, Finland and France. Belgium has however become one of the few countries with a completely centralized bargaining system (Table 2.5, OECD, 2012). Scandinavian countries like Sweden and Denmark traditionally had a highly centralized system, but in recent years bargaining more often takes place at the industry or regional level (OECD, 2012). The collective bargaining coverage is furthermore determined by union membership coverage and the possibilities of extensions. In Scandinavian countries there are almost no legal possibilities for extensions, but collective bargaining coverage is high because of the high union density. In the Netherlands, union density is low but the collective bargaining coverage is high because of the high coverage of the employer organizations in combination with the possibilities to extend bargaining agreements.

Figure 2.1 Collective bargaining coverage 1990 and 2008/9



Source: Figure 3.12 from OECD (2012).
Note: For the Netherlands the figure covers civil servants.

[7] The Netherlands has a tradition of wage moderation since the Wassenaar Agreement of 1982, see for example Broer and Huizinga (2004).

3 Method

To determine the effect of extensions of CLA's on wages, we compare salaries of employees that were covered *directly* by industry-level agreements that either were, or were not extended to all employees in an industry. Under the former regime, all firms in the industry are covered yielding limited differences in wages. Under the latter regime, such homogeneity only applies to firms that are member of employer organizations involved in negotiations. This limits the ability of unions to demand high wages as firms could, in the long run, 'opt-out' by terminating their membership. Note that our strategy to measure the impact of extensions differs from Hartog et al. (2002), who compare salaries of those covered directly by a CLA and those that were added through the extension ('added' or 'extended' workers).

The analysis is executed by estimating wage equations, containing variables that represent the collective bargaining regime for an individual worker. The dependent variable is the natural logarithm of pre-tax wages earned in the month October, standardized to full time equivalent, including incidental payments and compensation for overtime work. To facilitate a causal interpretation, our analysis takes into account differences in characteristics between employees who are covered by CLA's that were or were not extended usually during our observation period. Due to the explicit extension rules, unions are able to anticipate an extension. Nevertheless this is problematic in some sectors due to coverage of around 55% or due to economic circumstances leading to objections. This is the reason why we compare CLA's that are extended or not extended during the complete period. The equation reads:

$$\ln(wage_{i,j}) = \varphi * Extension_{i,j} + \vartheta(\%Added_{i,j}) * Extension_{i,j} + \beta * FirmLevel_{i,j} + \gamma * X_i + \delta * Z_j + \varepsilon_{i,j}$$

Where *wage* is the wage of employee *i* at firm *j*. *Extension* is a binary variable that equals one for employee *i* with an industry-level collective bargaining agreement that was subject to mandatory extension, $\%Added$ denotes the percentage of employees subject of the bargaining agreement that was added in the total number of employees who are subject to the collective bargaining agreement, *FirmLevel* equals one for employees with a firm level bargaining agreement, *X* is a vector of personal characteristic, *Z* is a vector of firm characteristics including broad sector dummies. The regression does not contain a dummy variable for those under an industry-level bargaining agreement without extension, which thus serves as control group.

The following groups are of primary interest in our identification strategy: a) a control group which is defined as all employees who are covered by an industry-level agreement that has not been extended in the last decade, and b) a treatment group which is defined as all employees who are covered by an industry-level agreement that has either been extended continuously throughout our sample period or has been extended in some years, but is not part of bargaining agreements that are not extended in the last decade. In Section 4, we discuss how the groups are observed in our dataset.

At the individual level our data does not allow a distinction between employees who are covered by a CLA directly and those who are added through the mandatory extension. We do know which percentage of employees was added through the extension for each bargaining agreement. By adding this percentage to the equation above ($\%Added$), the treatment effect covered by the parameter φ captures the effect of extensions on wages for those covered directly.[8] By adding this percentage to the estimation, we also control for selection effects. This is because when the percentage added is high, employers can influence whether or not a collective bargaining agreement is extended. As at least 55% of employees must be covered directly, firms could threaten to cancel their membership of employer organization and prevent mandatory extension. This limits the bargaining power of labour unions if the percentage added approaches this figure.

We estimate the equation above for separate samples in each year of our analysis. By estimating this 'repeated cross-section', we are able to analyse both the size of the effect of mandatory extensions as well as changes of its size over the business cycle. Next, we repeat the strategy above for various subsets of employees. Specifically, we assess whether there are differences in the effect of mandatory extensions for employees of various income levels, ages and sectors. The first two analyses are added in order to assess whether there are differences in the extent to which groups benefit from increases in the labour unions' bargaining power due to mandatory extensions. The third is added to determine the extent to which the parameter φ is homogeneous across industries. The latter will help in the assessment of whether our results are causal.

4 Data

We use linked employer-employee data (LEED) to analyse the effect of extension of CLA's on wages. The data are administrative and combine a wide variety of demographic, economic and employer characteristics such that a broad set of variables may be included in our analysis. Data on whether CLA's have been extended to the entire industry are obtained from a database administrated by the Ministry of Social Affairs.

The LEED dataset is constructed from the Social Statistical Database (SSB) of Statistics Netherlands. Data on wages and hours worked are based on administrative records kept by the Employee Insurances Implementing Agency (UWV). Personal characteristics such as age, gender and level of education are obtained from Municipal Personal Records Databases (GBA), while employer data is taken from administrative data stored at in the General Firm Records (ABR) and Production Statistics (PS). In principle the data contain all legal employees in the Netherlands. The LEED database also contains two variables relating to the type of CLA. First, it contains a variable that identifies the type of CLA that an employee is subject to. Based on this variable, we are able to distinguish whether individual had *no collective agreement*, a *firm-level agreement* or an *industry level-agreement*. Note that we delete employees without CLA from our analysis. Second, the database contains a three to

[8] Appendix B provides a derivation.

four digit CLA registration number assigned by the government agency responsible for the agreements' administration for all employees with industry-level agreements.

The CLA database administrated by the Ministry of Social Affairs is linked to our LEED data on the bases of the CLA register number. From this database we derive two important additional pieces of information. First, we determine which CLA's were extended and in which years. This is possible for a sample that consists of the larger CLA's, which cover about 90% of employees under industry-arrangements. For these agreements, we also have the number of employees covered by the CLA's as well as the percentage of which were added through extension. Second, we determine which CLA's were or were not extended for at least the last decade to define the control and treatment group.

Figure 4.1 Treatment and control group in our data

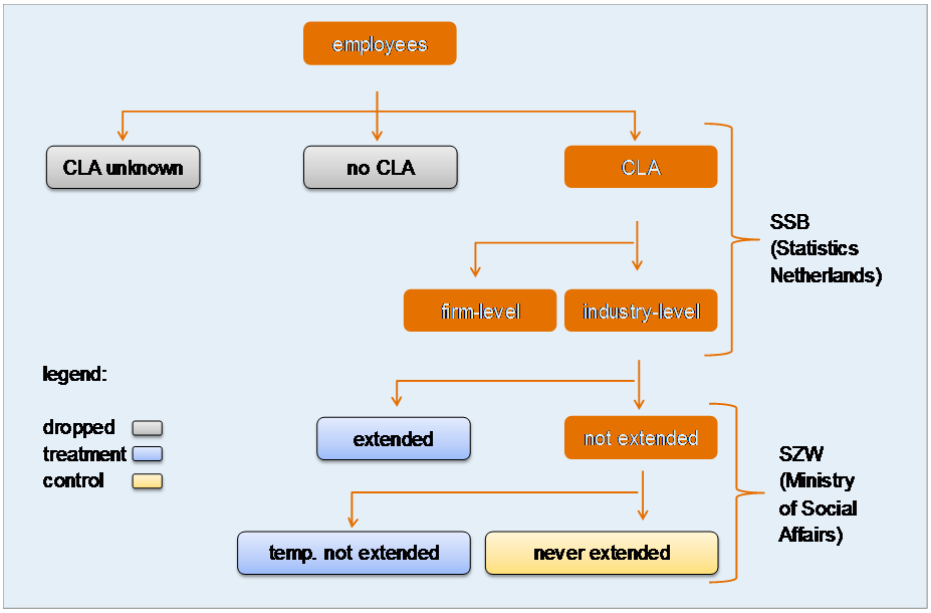


Figure 4.1 provides a schematic overview of how the control and treatment group discussed in Section 3 are derived from the data. Employees in the treatment group, for whom the variable *Extension* equals one, are either covered directly by the collective bargaining agreement or were added through the mandatory extension. The identification of the effect of being added through a mandatory extension is discussed in Section 3 and Appendix B. Including bargaining agreements that have been extended in some years assures that bargaining agreements that were temporarily not extended are classified as extended agreements. This adjustment assures that when an agreement is temporarily not extended, for instance due to delays in the administrative process, it is not counted as an agreement without extension.[9]

[9] Collective labour agreements that were extended in the first years of our sample, yet not in the latter were dropped from the sample. Including these agreements has little effect on our estimates.

As we are interested in the effect of different forms of CLA's, we drop observations that were not covered by an industry- or firm-level agreement (Figure 3.1). Observations for which no information on the type of CLA is available (1%) are dropped. If two CLA registration numbers are known for an employee (2%), the second is used. We also limit our analysis to the private sector by removing civil servants and employees in non-profit sectors (primarily education and healthcare). Finally, employees with a salary greater than €100.000 or below minimum wage, majority shareholders and employees on re-integration are excluded.

Table 4.2 presents summary statistics for our treatment and control group. The groups share a number of similarities: age, wage, education, immigrant status and tenure are similar across both groups. A number of other variables is different however. Women are for instance overrepresented in our control group (those without extensions). This is also reflected by the average number of working hours in that group. While employees with mandatory extensions work an average of around 32 hours a week, employees without extensions work closer to 26 hours a week. Similarly, there are differences in the sectorial composition of both groups. Employees with extended bargaining agreements work in each of the listed sectors. The sector 'Trade and Food Services' accounts for a large fraction of employees, followed by 'Manufacturing' and 'Construction'. The last two contain historically 'male' professions, and therefore fit with our findings regarding the gender distribution. A large share of employees without mandatory extensions is employed in the sector 'Other Services', as sector in which traditionally many women work (whereby one should note our sample does not contain the public sector, as well as education and health care). 'Commercial Services' and 'Trade and Food Services' are other large sectors, while 'Construction' and 'Transport and Communication' barely contain employees without extended agreements. These differences in group composition are not necessarily a problem as in our estimation strategy we correct for composition effects through control variables like gender, working hours and sector of employment.

Table 4.1 also shows that the size of our extended (treatment) and non-extended (control) group varies over time. In most years, the number of employees with extensions is around 1.8 million, while the number of employees without extensions is slightly over 0.4 million. The numbers vary as in some years the number of extensions deviates. In 2011, a number of CLA's were either not continued or not extended. As a result, the group of non-extended (control) is substantially larger. As we assess the effect of mandatory extensions on wages for each year separately, such sample differences may affect our results due to non-random selection.[10] Compared to 2010, the group of non-extended are on average younger with lower tenure, are more often male and earn higher wages. The industrial composition, especially the percentage employed in commercial services, also differs. We correct for this compositional change by applying each employee's collective bargaining regime from 2010 to 2011. This normalizes the size of both groups and results in more similar characteristics and sample sizes. The new sample contains 1.868.959 observations with extensions and 411.518 observations without extensions. The number of observations by group also varies in 2008, but for this year the composition of the groups is hardly affected.

[10] If high paid CLA's were not extended in 2011 for instance, the effect of mandatory extensions would be underestimated as the remaining bargaining agreements with extensions would pay relatively little.

Table 4.2 Selected characteristics of employees under bargaining agreement with and without mandatory extension

	2006		2007		2008		2009		2010		2011	
	Extended	Not Extend.	Extended	Not Extend.	Extended	Not Extend.	Extended	Not Extend.	Extended	Not Extend.	Extended	Not Extend.
Observations	1,779,853	428,965	1,872,292	424,727	1,883,442	344,826	1,872,738	427,495	1,869,325	411,451	1,322,519	715,595
Wage (fte) in log	7.787	7.752	7.809	7.772	7.851	7.814	7.873	7.830	7.881	7.850	7.918	7.938
Demographic												
Age	40.61	41.44	40.88	41.71	41.18	41.81	41.44	42.49	41.58	42.93	42.00	40.77
Female, %	35.36	66.84	35.92	67.62	36.63	66.92	37.22	71.56	37.90	71.47	40.80	60.41
Immigrant, %:												
1st generation	10.13	8.53	10.60	8.94	11.07	9.61	10.94	9.70	10.84	9.94	9.83	10.92
2nd generation	5.72	6.00	5.85	6.24	5.89	6.54	5.94	6.35	6.04	6.40	6.36	7.65
Work-related												
Education, %:												
Low	23.55	19.362	23.29	19.81	22.94	19.23	21.56	20.50	21.03	20.56	17.81	14.78
Middle	44.51	45.93	45.31	46.44	46.18	45.99	46.71	49.85	47.46	52.30	47.26	46.35
Higher	31.94	34.75	31.40	33.75	30.88	34.78	31.73	29.65	31.51	27.14	34.93	38.87
Hours paid (month)	138.9	113.5	140.6	115.1	140.3	116.8	137.8	112.1	135.9	110.1	136.8	116.8
Tenure, years	4.15	4.11	3.72	3.53	3.65	3.12	4.02	3.78	4.22	4.21	5.13	2.19
Company car, %	18.34	8.68	18.27	8.36	17.47	6.46	16.00	6.72	16.57	5.42	14.75	6.57
Industry, %												
Manufacturing	19.14	5.18	19.31	4.76	19.69	6.81	18.53	4.35	17.57	4.41	20.76	6.71
Construction	13.51	1.25	13.51	1.03	14.17	1.00	14.05	0.85	13.04	0.80	7.98	1.78
Trade, Food Serv.	26.33	11.75	26.40	12.60	27.07	11.94	27.10	13.03	26.42	13.75	29.39	12.95
Transp. & Commun.	7.64	2.81	7.72	3.15	7.70	3.06	7.65	2.37	7.19	3.27	6.60	4.85
Commercial Services	12.64	13.00	13.28	10.95	12.53	11.66	12.83	8.52	12.33	7.38	10.36	16.55
Other services	11.93	54.27	12.47	55.75	13.89	54.28	14.60	61.23	14.82	59.42	18.99	54.97
Remainder	8.72	8.91	7.30	7.78	4.94	9.61	4.61	8.63	7.91	9.8	4.86	4.36

5 Results

This section presents estimation results on the effect of the extension of CLA's on wages. Section 5.1 presents results for the full sample, while results in Section 5.2 assess whether the effect is different across subgroups by age, income and industry.

5.1 Main estimations

Results for the main estimations are presented in Table 5.1. The upper panel contains results from our preferred specification. The variables control for a broad set of characteristics that are available for almost all employees in our sample. The variables included in this specification include the number of employees per firm, age in three polynomials, migration status (first or second generation), gender, tenure, average hours worked, company financed car (dummy), contract type (temporary, permanent, zero-hours, outsourced) and dummies for over sixty industries (on the basis of two digit codes). The industries are classified by the Dutch Tax Administration for the purpose of calculating employer premiums. This does not overlap the industry level CLA's.[11]

The effect of CLA extensions on wages changes over time from significantly positive in years 2006 and 2007 to insignificantly different from zero in later years. Results in the first two columns of Table 5.1 show that in 2006 and 2007 an average employee directly covered by an extended CLA earns 3.8% and 4.4% more than a similar employee with a non-extended CLA. In 2008, extensions were associated with a 1.4% higher wage, followed by percentages around zero between 2009 and 2011. The estimated coefficients suggest that the percentage of employees added through the extension has a strongly negative effect on wages. A causal interpretation of the coefficient suggests that added employees earn significantly less, which is consistent with previous empirical results by Hartog et al. (2002). The size of this effect diminishes over time, but remains different from zero. The coefficients suggest that added workers seem to earn less than workers covered directly by a CLA, even in the absence of an effect of an extension. Employees under firm level agreements earn around 5% more, which is consistent with Hartog et al. (2002), Rojer (2002) and Venema et al. (2005). The estimated coefficients are stable over time between 5.5% and 6.5%, and so do not diminish over time like for the impact of an extension.

The impact of demographic characteristics is consistent with previous results. Signs for age polynomials are in line with results in Hartog et al. (2002), while our gender wage gap is around 16%, which is slightly larger than characteristic-adjusted estimates by Statistics Netherlands (2014). First generation immigrants also significantly less than natives while the difference for second generation is relatively small but still significant.

[11] The estimated effect of mandatory extensions is larger when using industry dummies at the broader one-digit SBI level. Estimates presented in this paper do not use that level as differences in payment levels in sub-sectors of the one-digit industries may drive wage differences and be correlated with mandatory extensions.

Table 5.1 Effect of extension of collective labour agreements (CLA's) on wages by year

Variable	2006	2007	2008	2009	2010	2011
Base specification						
Industry with extension	0.038*	0.044*	0.014	0.008	-0.002	0.004
	(0.011)	(0.012)	(0.016)	(0.018)	(0.017)	(0.016)
Firm Level	0.052*	0.055*	0.057*	0.059*	0.065*	0.065*
	(0.007)	(0.008)	(0.008)	(0.014)	(0.014)	(0.012)
% Added	-0.273*	-0.330*	-0.166*	-0.131*	-0.112*	-0.114*
	(0.038)	(0.041)	(0.053)	(0.014)	(0.047)	(0.047)
Demographics						
Age	0.113*	0.108*	0.105*	0.098*	0.094*	0.113*
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.005)*
Age^2	-2.237*	-2.115*	-2.060*	-1.869*	-1.769*	-2.173*
	(0.094)	(0.090)	(0.072)	(0.086)	(1.087)	(0.119)
Age^3	1.459*	1.366*	1.322*	1.171*	1.087*	1.363*
	(0.074)	(0.069)	(0.057)	(0.067)	(0.071)	(0.092)
Female	-0.160*	-0.163*	-0.162*	-0.157*	-0.152*	-0.150*
Immigrant status:	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
First Generation	-0.104*	-0.105*	-0.104*	-0.105*	-0.103*	-0.108*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Second Generation	-0.012*	-0.015*	-0.015*	-0.016*	-0.016*	-0.017*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
R^2	0.410	0.420	0.420	0.411	0.422	0.430
Observations	2.4 mil	2.5 mil	2.4 mil	2.4 mil	2.3 mil	2.0 mil
Hartog et al. '02 specification						
Industry with extension	0.036*	0.042*	0.015	0.007	0.002	0.007
	(0.010)	(0.012)	(0.012)	(0.015)	(0.014)	(0.013)
R^2	0.450	0.470	0.467	0.477	0.481	0.506
Observations	0.8 mil	0.9 mil	0.9 mil	0.9 mil	1.0 mil	0.8 mil

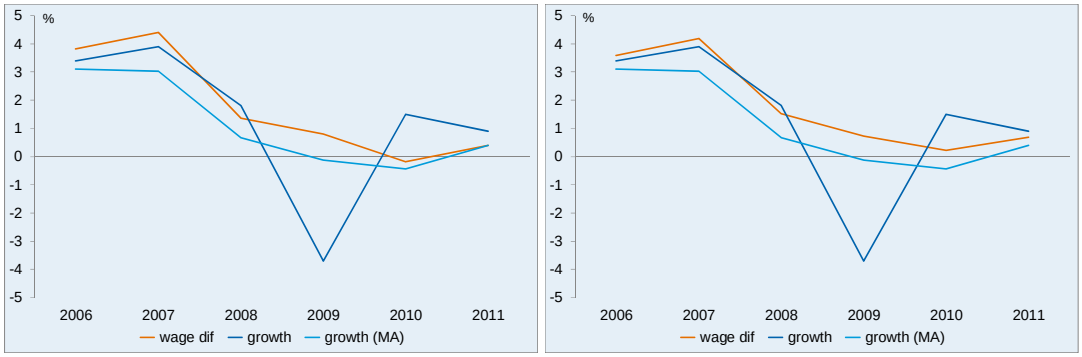
Note: * denotes significance at the 1% level. Standard errors are clustered by firm and given in parentheses. Unlisted control variables in the upper panel: tenure, contract type, hours paid for, usual hours worked, company car, industry dummies and firm size. The lower panel contains fewer variables but does include education, which leads to fewer observations. Full results for covariates available on request.

The bottom panel of Table 5.1 repeats the estimations taking covariates from Hartog et al. (2002) and the results do not change significantly. The estimations include sixty industry dummies, the number of employees per firm, age in three polynomials, gender, a dummy for employees with less than one year of experience, average hours worked (log) and education (low, mid, high). Because education is only available for a non-representative subset of employees, the sample size is substantially lower and young employers are overrepresented.

The decline in the impact of extensions on wages over time, from about 4% in 2006 and 2007 to about zero in 2009 and 2011 is correlated with economic growth. In 2006 and 2007, economic growth was well over 2%. In the years that followed economic growth declined to 1.7% in 2008 to a through at -3.8% in 2009. The timing of this decline coincides with the decline in the estimated effect of mandatory extensions. To show this, Figure 5.1 plots the estimated coefficients from Table 5.1 along with GDP growth. Although growth is more volatile than our estimates, a simple three period moving average (MA) fits well.

The mechanism leading to the coinciding patterns in the effect of extensions and economic growth is by no means obvious. Still the result is consistent with Teulings and Hartog (1998) which suggests that mandatory extensions facilitate coordination. As economic growth declines or is expected to decline or remain low, relative wages of employees under mandatory extensions fall or remain low. This may be due to unions agreeing to adjust wage growth under extensions. An open questions is how such coordination works however, as one may expect a delay in the reaction of wages. Furthermore, the decline in the effect of extensions may be also (partly) be the result of a long-term trend in the decline of union power, due to globalization, technological progress and union membership decline.

Figure 5.1 Percentage difference wages under extended/non extended collective labour agreements



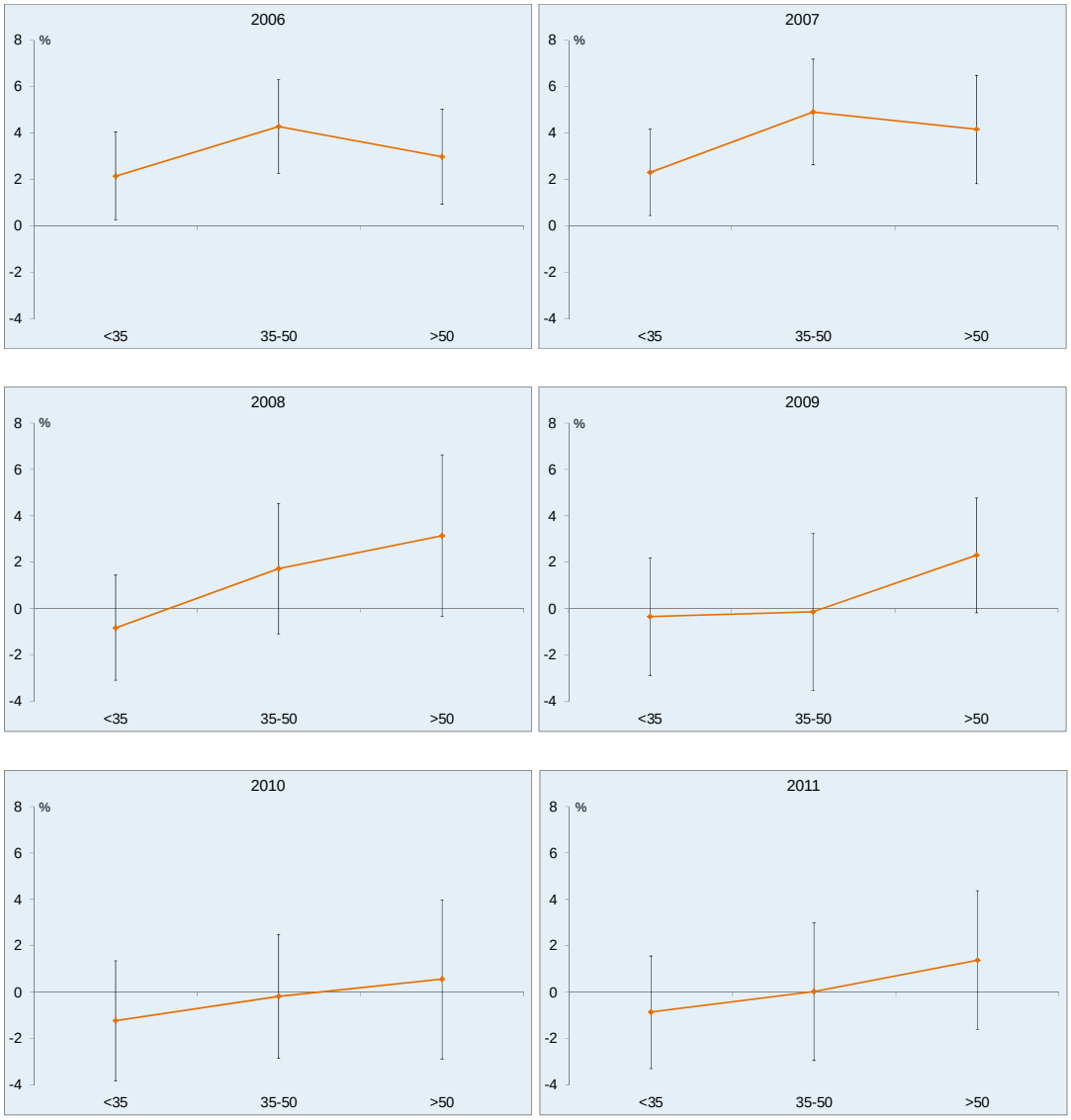
Note: left panel presents the estimation results for standard control variables; right panel presents estimation results for control variables from Hartog et al. (2002). .

5.2 Estimations by Age and Industry

Are similar patterns present amongst subgroups within our sample? The impact of an extension may vary across individual characteristics. In this section we explore the impact by age, income and industry.

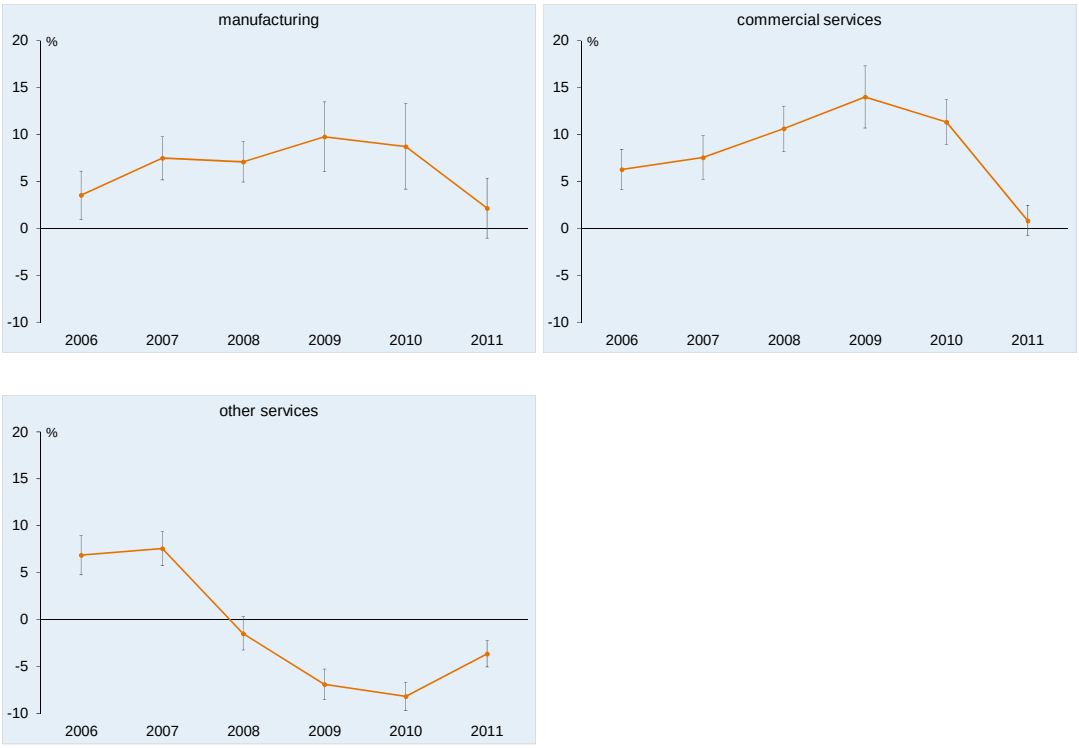
The results across age groups indicate that the decline in the effect of extensions is shared across age groups, but that overall younger workers benefit less from extensions. Figure 5.2 plots the estimated effects from our base specification when restricting the sample to various age cohorts. Each graph contains estimation results from a single year. Compared to 2006, the 2011 estimate of the effect is around 3% lower for all groups. This decline is similar to that presented for the complete sample in Table 5.1 Furthermore, observations in the younger cohort benefit less from higher wages under mandatory extensions than observations older than 35. This trend is observable in all years considered, and is largest in 2008. This is in line with the view that older employees may hold greater bargaining power (Euwals et al., 2009). Though persistent, the difference between age groups is not statistically significant.

Figure 5.2 Percentage difference wages under extended/non extended CLA's by age group



Differences across industries are informative, as one would expect the effect of extensions on wages to be fairly homogenous across industries. If sectors would display the pattern unveiled in Table 5.1 the effect of mandatory extensions applies universally to workers and is unlikely to be driven by third factors. We separate industries along the one-digit SBI codes in order to preserve a sufficient number of employees and collective bargaining agreement observations. In some sectors the number of observations without mandatory extensions becomes limited however, in particular in 'Construction' and 'Transport and Communication'. In 2009, barely 3000 construction workers were covered by a CLA without mandatory extension. The results vary between industries whereby the impact over time seems at least reasonably in line with the overall impact over time in large industries like 'Manufacturing', 'Commercial Services' and 'Other Services'.

Figure 5.3 Industries with initial positive effect and a decline over time



Note: 10% confidence margins using clustered standard errors. From left to right: manufacturing, commercial services, other services.

Results in Figure 5.3 are from sectors in which a similar pattern to that of all sectors combined; an initial positive effect of mandatory extensions followed by a decline. These sectors represent over half the employees with mandatory extensions and around 70% of employees with industry agreements that were not covered. The difference in wages seems largest in the 'Commercial Services' sector, where it equals nearly 15% by 2009, followed by a rapid decline. Similar patterns but with smaller magnitudes are observed in manufacturing and other services.

The results for sectors like 'Construction', 'Trade and Food Services' and 'Transportation and Communication' vary over time and patterns over time are generally not in line with the pattern for all sectors combined. These industries contain almost 50% of employees with mandatory extensions but only around 15 to 20% of those without extensions. Employees covered by an extension in 'Trade and Food Services' earn even less than those without an extension. The relatively small numbers of observations are a likely explanation for the mixed results. The results are nevertheless also in line with specific situations in these sectors. The collective labour agreements in 'Construction' are under pressure of the strong increase in self-employment, while terms of employment in the sector 'Transportation and Communication' may be affected by globalization and international competition.

6 Conclusion

This paper estimates the effect of extensions of industry-level CLA's on wages using a large linked employer-employee database. The relationship is studied to unveil whether labour unions use additional bargaining power generated by extensions to increase wages, or whether it facilitates coordination. Previous empirical research presents mixed results, whereby for the Netherlands no evidence was found that extension of CLA's increases wages.

We extend the existing literature by providing an extensive micro-data analysis of wages for employees under industry-level CLA's that either *were* or *were not* extended to all firms in a sector. Using data on a large number of Dutch employees, our estimated coefficients suggest that wages of similar employees in 2006 and 2007 were on average 4% higher for employees covered by extended CLA's. This result is significant and robust to the inclusion of control variables for differences in age, gender, migrant status, contract and employment type, tenure, firm size, part time status, education and sector of employment. From 2008 onwards however, the estimated coefficients suggest that the difference in earnings is declining. By 2009, the difference in earnings between both groups is close to zero where it remains until the final year of our sample, 2011. The decline coincides with a slowdown of economic growth from 2008 onwards. This suggests that, although wages of extended CLA's are on average slightly higher, extensions do not create a time-constant 'markup' over market wages. Instead, they seem to facilitate both higher wages in times of relatively fast growth followed by a wage adjustment in times of economic decline.

Our results are partly consistent with market power theory of unionization as wages are higher in economic good times and partly with coordination theory as wages are not higher in economic bad times (Villaneuva, 2015, Teulings and Hartog, 1998). The decline over time may furthermore be explained partly by economic trends such as globalization, technological progress and a decline in union membership, possibly leading to more flexible labour markets and lower negotiation power by unions. The implied effect of extensions on wages is slightly smaller for young than old employees, although this not statistically significant. The overall results are replicated reasonably well for large industries such as 'Manufacturing', 'Commercial Services' and 'Other services'. Other industries however yield different patterns and less clear-cut results, indicating that the role of extensions varies over industries.

Although our results are consistent with both the theory of union power in the international literature and coordination in the Dutch literature, our results are subject to a number of limitations. The main limitation is that the assignment of mandatory bargaining scheme extensions is not random. This implies that even though our dataset allows us to correct for important differences across groups, it is not possible to conclude with certainty that our results represent a causal effect of a mandatory extension. An interesting direction for future research would be to use the timing of extensions for identification. This approach would imply a focus on a limited number of industries using a time event approach. An additional interesting direction of research is to analyse the effect of extensions on employment.

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Appendix A

This appendix presents a list containing industry-level CLA's that were not extended during our period of observation in the empirical analysis. The information is subtracted from the CLA database of the Ministry of Social Affairs (which is also the bases of the numbers in Table A.1).

Table A.1 Collective labour agreements (CLA's) that were not extended during the years 2006-2012

CLA number	CLA name (in Dutch)
152	BAKSTEENINDUSTRIE, NEDERLANDSE
475	SPORT
533	LEVENSMIDDELENGROOTWINKELBEDRIJF
563	ZUIVELINDUSTRIE II
615	ZORGVERZEKERAARS
634	BEDRIJFSVERZORGINGSDIENSTEN
776	PAPIERINDUSTRIE
819	BEREIDE VERF- EN DRUKINKTINDUSTRIE
932	BIOSCOOPBEDRIJF
1060	NBBU UITZENDKRACHTEN
1094	NBBU VASTE MEDEWERKERS
1264	BEVEILIGING
1296	INFORMATIE- COMMUNICATIE- EN KANTOORTECHNOLOGIEBRANCHE
2143	NEDERLANDSE PODIA
2165	SIGNBEDRIJVEN
2266	VISDETAILHANDEL
2451	DAGRECREATIE
2493	GOLFBRANCHE
2674	DIERENARTSPRAKTIJKEN
2742	UITZENDKRACHTEN NVUB
2746	DAGATTRACTIEBEDRIJF
2994	NEDERLANDSE POPPODIA EN FESTIVALS
3041	GROOTWINKELBEDRIJVEN IN SCHOENEN
3313	NETWERKBEDRIJVEN
3557	CONTINUFLEX
3697	SPORTVERENIGINGEN
3798	UITGEVERIJBEDRIJF

Note: the list contains CLA's which cover at least a thousand workers per year; the complete list is available upon request.

Appendix B

Our wage regressions estimate the effect of mandatory extensions of collective bargaining agreements for employees that were covered directly by collective bargaining agreements. This assures that employees that were added to collective bargaining agreements through the extension (and whose employer is not associated with the employer-organizations involved in the formation of the collective bargaining agreement) are not included in the estimated effect. We are able to make this distinction by adding the percentage of employees added to an agreement to the estimation equation. The derivation below shows the reasoning behind this solution.

When not adjusting the estimation for the percentage of employees added through the extension, the estimation equation reads:

$$\ln(wage_{i,j}) = \theta * Extension_{i\,j} + \beta * FirmLevel_{i,j} + \gamma * X_i + \delta * Z_j + \varepsilon_{i,j}$$

for employee *i* at firm *j*. Vectors *X* and *Z* contain individual and firm-level control variables (including industry dummies). *FirmLevel* equals one for employees with a firm level bargaining agreement while *Extension* equals one for employees that are covered by industry-level collective bargaining agreements that have been extended. Because our dataset only consists of employees that were subject to a collective bargaining agreement, the control group consists of employees that were subject to an industry-level collective bargaining agreement that was not extended. A positive value for γ indicates that wages under the agreement are higher.

Employees for whom *Extension* equals one are either directly covered by the industry-level agreement or were added through the mandatory extension. The latter group may differ sharply from the firmer. Descriptive statistics in Hartog et al. (2002) show that this group on average is less educated, work fewer hours, are more often women and are employed by smaller firms than those covered directly. More importantly, Hartog et al. (2002) shows that earnings in this group are substantially lower than those by employees that are covered directly. This limits the ability to compare groups directly. If the added group indeed earns less than those directly covered given our control variables, their presence may suppress the effect of mandatory extensions on wages. The group of interest is those that are covered directly, as their salaries are negotiated at when the collective bargaining agreement is signed. During that negotiation unions are able to use their bargaining power.

Based on the percentage of added employees, it is still possible to calculate the effect of collective bargaining agreements solely for those covered directly. To do so, an interaction effect is used, as expressed in the following equation:

$$\ln(wage_{i,j,}) = \varphi * Extension_{i\,j} + \vartheta(\%Added_{i,j}) * Extension_{i\,j} + \beta * FirmLevel_{i,j} + \gamma * X_i + \delta * Z_j + \varepsilon_{i,j}$$

Where $\%Added_{i,j}$ denotes the percentage of employees that were added to the covered employees through the mandatory extension of the CLA. In the original equation this percentage is not included, which means that φ captured the effect of mandatory including the low-paying added employees. This is because when omiting the percentage, the equation captures the effect of mandatory extensions when the percentage of added employees is at the sample mean:

$$\left.\frac{\partial \ln(wage_{i,j,})}{\partial Extension_{i,j}}\right|_{\%Added_{i,j}=\overline{\%Added_{i,j}}} = \theta = \varphi + \vartheta * \overline{\overline{\%Added_{i,j}}}$$

where $\overline{\overline{\%Added_{i,j}}}$ denotes the mean value of the percentage of employees added through the extension. The effect of mandatory extensions on those covered directly can be derived in similar fashion. As ϑ captures the presence of those not covered directly, the effect of the remaining group is given by parameter φ:

$$\left.\frac{\partial \ln(wage_{i,j})}{\partial Avv_{i,j}}\right|_{\%Added_{i,j}=0} = \varphi + \vartheta * 0 = \varphi$$

This equation estimates the effect of mandatory extensions, represented by the variable $Avv_{i,j}$ on wages if the group added through the extension would not exist, and hence captures the effect on the directly covered group. If the hypothesis above is correct, ϑ should be smaller than 0 as is found by Hartog et al. (2002), such that φ exceeds θ.

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