Minimum wage systems and earnings inequalities: Does institutional diversity matter?

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Abstract
This article explores how the diversity of minimum wage systems affects earnings inequalities within European countries. It relies on the combination of harmonized microdata from household surveys, data on national statutory minimum wages and coverage rates and information on minimum rates compiled from more than 1100 sectoral-level agreements across Europe. The analysis covers 18 countries over the period 2007–2009. Empirical results confirm the intuition of many practitioners that the combination of sectoral minima and high collective bargaining coverage can be regarded as a functional equivalent of a binding statutory minimum wage, at least for earnings inequalities. Regression results suggest indeed that both a national statutory minimum and, in countries with sectoral minima, higher collective bargaining coverage is significantly associated with lower levels of (overall and inter-industry) wage inequalities and a smaller fraction of workers paid below prevailing minima. Several robustness checks confirm these findings.

Keywords
Collective bargaining, Europe, minimum wage systems, wage inequality

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Introduction

Few economic issues have sparked academic debates as long-lasting and as passionate as minimum wage policies. Evidence and counter-evidence have been used to assess whether a statutory wage floor is harmful for employment. The controversy continues but it seems that any employment effects (whether positive or negative) are probably very small (Dolado et al., 1996; Dube et al., 2010; ILO, 2010) and mostly related to low-skilled and young workers.

However, since the mid-2000s a new minimum wage debate has stirred much controversy in Europe (Schulten, 2012). The question has not been the employment effect, but whether there is a case for a harmonized minimum wage policy at European level. While prominent policy-makers, leading scholars and some trade unionists support the idea of European concertation on wage floors – including some form of harmonized minimum rate for all countries – there is also strong resistance from those advocating national autonomy and the preservation of institutional diversity.

The chief aim of a minimum wage is to set a floor at the bottom of the wage distribution which protects the most vulnerable workers. Put differently, the primary goal is to curb wage inequalities. Yet, 'there is very limited research explicitly focused' on this issue (Grimshaw, 2013: 3). This article contributes to a better understanding of how European diversity in terms of minimum wage regulations affects wage inequalities. We explore how far statutory minimum wages and sectorally bargained minima affect wage inequality, and how the two modes of regulating the labour market are interrelated. Given data limitations, the vast majority of empirical studies has overlooked countries where minimum wages are set through collective agreements at sectoral level, so that our article is one of the first to link this type of institutional diversity of minimum wage systems to outcomes in terms of inequality.

To do so, we combine harmonized micro-data from household surveys, data on national statutory minimum wages and coverage rates and information on minimum rates compiled from more than 1100 sectoral agreements across Europe. This effort notably enables us to assess the distributive outcomes of the minimum wage systems in Austria, Belgium, Cyprus, Denmark, Finland, Germany and Italy, all countries that are both absent from other empirical studies and among the main protagonists of the minimum wage debate at the European level. Overall, our dataset covers 18 European countries over the period 2007–2009; in addition to those noted above, these are Bulgaria, Estonia, France, Greece, Hungary, Ireland, Latvia, Poland, Portugal, Romania and the UK.[1]

We start our analysis with a brief review of the literature regarding the relation between wage floors and distributive outcomes. Then we present the key features of minimum wage systems in Europe as well as our analytical framework. Our dataset, benchmark regression results and robustness tests are described in the ensuing section. We end with conclusions.

Review of the literature

Minimum wages are typically designed to protect the most vulnerable workers. They can have a role in sustaining income, reducing in-work poverty and curbing wage inequalities. A rise in minimum wages can have conflicting effects on income inequality. On the one

hand, some people at the bottom of the distribution receive higher wages; on the other, it can lead to individuals being excluded from employment. Freeman (1996) reviews the distributional consequences of minimum wages and concludes that if not too high, they can improve the well-being of low-wage earners and limit earnings inequality. Butcher et al. (2012) develop a model of wage-posting by employers where the labour supply to an individual employer is not perfectly elastic. Their model predicts that wage inequality will be affected by the minimum wage, as it defines the level of the wage floor and generates spillover effects associated with job losses and 'wave effects' on earnings above the prevailing minimum. These spillovers, however, would dissipate as one moves up the wage distribution, since higher up the distribution the minimum wage has little impact.

Empirical results usually show that minimum wages reduce wage inequality (Brown, 1999; Manning, 2003; OECD, 1998; Rubery, 2003). For the USA, Di Nardo et al. (1996) and Lee (1999) find that the fall in the real value of minimum wages explains a big share of the increase of the lower tail wage inequality in the USA during the 1980s, and Autor et al. (2010) confirm the overall conclusion of previous estimates. Keese (1998) and Lucifora et al. (2005) show that minimum wages reduce wage inequalities in Europe. In contrast, the European Commission (2008) analyses the effects of a range of wage-setting variables on wage dispersion in EU countries and finds no significant effect of minimum wages. At the more micro-level, Butcher et al. (2012) estimate a structural model taking both direct and spillover effects into account, and find that the introduction of the UK National Minimum Wage explains more than 50 percent of the decline in wage inequality in the bottom half of the wage distribution between 1998 and 2010. Their results also confirm that spillovers are larger in low-wage segments.

Another issue at the core of the present article is whether the diversity in minimum wage systems may lead to a diversity of outcomes. Among the few studies that address this question empirically is Boeri (2012), who compares different institutional settings in 66 countries by looking at the process of determination of statutory minimum wages and its effects on minimum wage levels. He finds that a minimum imposed by legislation without consultation with the social partners is significantly lower than a wage floor set after formal consultations. According to the European Commission (2008), EU member states that have not introduced a statutory minimum wage possess particularly strong bargaining institutions and actors; while in countries with statutory minima, strong bargaining institutions would drive up the level of minimum wages.

Previous research has devoted great attention to minimum wages and their effects on earnings inequalities. The current consensus suggests that minimum wages help reduce wage inequalities and, if not too high, improve the well-being of low-paid workers. It should be noted, however, that because of data limitations the vast majority of empirical studies has overlooked countries where minima are set by sectoral collective agreements. The potentially divergent outcomes of different minimum wage systems are thereby largely ignored.

Analytical framework

This article analyses minimum wages not only in countries with statutory national minima, but also where wage floors are determined at sectoral level through collective bargaining. Even though collectively agreed minimum wages are sometimes considered

'functional equivalents' of statutory wage floors (Schulten et al., 2006), we are interested in whether the two types of systems lead to different outcomes in terms of earnings inequalities. As far as we know, this question has not been addressed elsewhere.

Given the importance and interactions between collective bargaining coverage and the type of minimum wage that prevails in a given system (Grimshaw, 2013; Grimshaw et al., 2013), we propose to distinguish European countries with the help of a typology with two main components. The first is *collective bargaining coverage*, since this has been shown to influence both the relative level of minimum wages and also earnings inequalities. The second is *the mechanism of minimum wage setting*: whether minimum wages are determined nationally as statutory floors or through collective bargaining at sectoral level is likely to affect earnings inequalities.[2]

It should be noted that these two features of minimum wage systems are not entirely independent, and act in a complementary fashion (Grimshaw and Rubery, 2013). Indeed, a range of studies underline that the centralization and coverage of collective bargaining tends to be higher in countries without statutory minima (Eldring and Alsos, 2012; OECD, 2012; Schulten et al., 2006; Vaughan-Whitehead, 2010). One reason is that statutory minima are thought to protect workers against low wages in the absence of effective protection through collective bargaining. In other words, statutory minimum wages can be the consequence of low levels of collective bargaining if policy-makers see them as an instrument to protect otherwise vulnerable workers. This explanation seems to account for minimum wage policies adopted in Central and Eastern Europe, where collective bargaining institutions were so weak during the transition to capitalist labour markets that almost all countries installed statutory wage floors in order to protect workers against excessive wage dumping.

A central objective of minimum wage systems is to reduce wage inequality (Grimshaw and Rubery, 2013). Yet it is not straightforward to define precisely what is meant by 'inequality'. Therefore, three complementary aspects are examined in this article: overall wage inequality, measured by the Gini index; wage inequality between industries, assessed through a Theil decomposition;[3] and effective coverage measured by the share of people paid below the minimum wage.

How are the different features of minimum wage systems related to these outcomes? In general, one might expect that more inclusive collective bargaining systems will be associated with lower levels of inequality: the compression of the overall wage structure is thus likely to be related to the share of employment covered by collective agreements. However, if union representatives only address the interests of workers covered by collective bargaining and achieve higher wage rates for 'insiders' (those covered) at the expense of lower rates for 'outsiders', the overall effect might be higher inequality. In particular, low levels of coverage might encourage union leaders to ignore outsider interests, which could lead to higher levels of wage inequality in the lower tail of the wage distribution. Even relatively stable and effective systems like the Austrian model, where obligatory membership in the *Kammer* system obliges all employers to adhere to collective bargaining agreements, leave more and more groups in the labour force uncovered, in particular new kinds of self-employed individuals (Hermann, 2006). If many workers are not covered, then negotiated minimum wages can increase inequality and strengthen the divide between 'insiders' and 'outsiders'. It should be noted, however, that the lower

Table 1. Countries grouped by minimum wage systems and collective bargaining coverage rates.

Bargaining coverage[a]	Low	Medium	High
Sectoral minima		CY, DE	AT, DK, FI, IT
Statutory minima	BG, EE, HU, IE, LV, PL, UK	GR, PT, RO	BE, FR

[a]Low: <50%; medium: 50–75%; high: >75%.

wages of 'outsiders' are not necessarily a consequence of the bargaining behaviour of insiders, but could also directly reflect the low pay offered by employers.

As regards the mechanism of minimum wage setting, it appears reasonable to assume that inequalities will be smaller in the presence of a national minimum wage than when wage floors are bargained at sectoral level (Grimshaw and Rubery, 2013). Indeed, the former mechanism is more likely to reduce wage dispersion in the lower tail of the distribution provided that non-compliance is limited. This idea is largely supported by the empirical literature on statutory minimum wages (Autor et al., 2010; Brown, 1999; Di Nardo et al., 1996; Lee, 1999).[4] Since a national minimum wage is by definition the same for all workers regardless of sector, inter-industry wage inequality is also expected to be lower. This idea is supported by Hermann (2005: 12), who argues that the Austrian system of sectoral agreements leads to considerable inequality between sectors, an outcome that is qualified as a 'grave disadvantage of the existing system'. Finally, one might assume that the share of workers paid below prevailing minima will be lower in countries with statutory minimum wages, as wage floors are set by law and information on their levels is probably more easily available to both employers and workers. In addition, it appears reasonable to hypothesize that higher collective bargaining coverage will lead to fewer workers paid below existing floors, especially in systems where the latter are bargained at sectoral level (Grimshaw et al., 2013).

Table 1 summarizes the diversity of European countries in our sample with respect to collective bargaining coverage and minimum wage-setting arrangements. The empty cell in the upper left corner suggests that all countries provide at least some level of protection against low pay (through the existence of a statutory minimum wage or at least a medium level of bargaining coverage). Eleven of the 18 countries are classified into one of the two cells associated with potentially equivalent levels of protection: Bulgaria, Estonia, Hungary, Ireland, Latvia, Poland and the UK have a statutory minimum wage but low collective bargaining coverage; Austria, Denmark, Finland and Italy have no statutory minima but high coverage. Belgium and France appear to be associated with dual protection, although in practice the French system probably provides no more protection than the other two groups, given that sectoral-level agreements often contain minima that are actually below statutory minimum wages (Eldring and Alsos, 2012; Gautié, 2010). The three remaining countries occupy intermediate positions: Greece, Portugal and Romania arguably may provide somewhat stronger protection than the majority of countries with statutory minimum wages, given their relatively high bargaining coverage. Conversely, the relatively low coverage rates in Cyprus and Germany could mean that their systems

provide lower levels of protection than the other countries without statutory minimum wages. The weak position of the German minimum wage system in our table underlies the lively debate on the introduction of a national minimum wage in this country.

Data

Our representative micro-level data stem from the harmonized survey of European Statistics on Income and Living Conditions (EU-SILC). For the 18 countries in our sample, we used the available waves collected in 2008, 2009 and 2010 containing information on income variables for the years 2007–2009. EU-SILC contains detailed information on job characteristics such as earnings, employment type and employer characteristics.[5] On average, the micro-level information in our sample is based on 6792 individual observations per country and year (see online Appendix A3).

The earnings variable used in the regression analysis is the gross hourly wage, calculated at the individual level by dividing gross monthly earnings (before the deduction of taxes and including social contributions paid by the employee) by the working hours the individual declared for the corresponding income period. We calculated this variable for all workers in EU-SILC except for individuals who stated to be self-employed; our analysis therefore includes individuals working part-time and salaried employment. This is slightly different from other studies of minimum wages which focus exclusively on full-time workers or on individuals paid hourly wages as opposed to monthly salaries (Bureau of Labor Statistics, 2012; Schulten, 2006; Vaughan-Whitehead, 2010).

For all 11 countries in our sample with statutory minimum wages, information on their level and changes was collected from the March 2012 edition of the *WSI Mindestlohndatenbank*.[6] The minimum rates were converted into euro equivalents for all years with available EU-SILC microdata.

Given the institutional characteristics of the seven countries without a statutory national minimum wage, access to minimum wage data for these countries is considerably more problematic.[7] Indeed, this information had to be hand-collected from sectoral-level collective agreements in each country. More precisely, we extracted from each agreement the wage assigned to the lowest category in collectively negotiated pay scales. While this definition of a sectoral minimum is straightforward, it should be noted that the elaborate categorizations that are found in many collective agreements render the identification of a given sectoral minimum relatively cumbersome. Indeed, in most agreements different pay scales co-exist: separate scales are often defined for blue- and white-collar workers; specific scales are included for apprentices or young entrants to the labour market; and even where a unique pay scale exists it is often differentiated by several variables such as occupational groups, work-post nomenclatures and seniority levels. In order to come closest to the conception of sectoral minimum wages as 'the pay rate defined for the lowest wage category', our database contains information on the pay rate of the lowest of any category that figures in all of the pay scales in a sectoral collective agreement, with the exception of scales for apprentices and young workers. In practice, in the vast majority of agreements this boils down to the rate that applies to workers with no seniority and classified in low-status occupations at the bottom of organizational hierarchies (*manœuvre ordinaire, Hilfsarbeiter* and so on).

It should be noted that in most countries, numerous collective agreements are signed. We therefore decided to collect minimum rates from a representative sample of sectoral agreements in each country and used them to compute sectoral average minima at the NACE one-digit level. Notably, we extracted minima from around 325 sectoral agreements from Austria (referring to wages in 2009); 150 from Belgium (wages in 2007); 105 from Denmark (wages in 2007, 2008 and 2009); 210 from Finland (wages in 2007, 2008 and 2009); 80 from Germany (wages in 2007); and 240 from Italy (wages in 2007, 2008 and 2009). In order to ensure the representativeness of the sectoral minima in the final dataset, the calculation of average minimum rates at the NACE one-digit level takes into account the relative employment shares of the sectors sampled. A more detailed description of the country specificities regarding the collection of sectoral-level data on minimum wage rates is provided in the first section of online Appendix A4.

The information on bargaining coverage has been taken from Visser's ICTWSS database (2011), a standard reference in the literature on labour market institutions.[8] We have used ICTWSS data corresponding to all 44 country-year observations in our sample, although it should be noted that the relative stability of coverage rates (or data on coverage rates) means that the temporal variability of this variable is low in most countries. Bargaining coverage is 29 percentage points higher in the sample of countries in which minimum wages are determined through collective bargaining at sectoral level, reflecting a well-known relationship already mentioned above (see online Appendix A3).[9]

In all, our database contains 44 country-year observations (31 for countries with a statutory minimum wage and 13 for those without) covering the period 2007–2009. Detailed descriptive statistics by country can be found in online Appendix A3.

Results

Using all country-year observations in our sample, Tables 2 to 4 show results for different variants of the following model:

$$
\begin{aligned}
Y_{c,t} = \alpha &+ \beta_1\, NMW_{c,t} + \beta_2\, CBC_{c,t} + \beta_3 \left(NMW_{c,t} * CBC_{c,t} \right) + \beta_4\, Kaitz\_index_{c,t} \\
&+ \beta_5 \left(Kaitz\_index_{c,t} \right)^2 + X_{c,t}\delta + \tau_t + \varepsilon_{c,t}
\end{aligned}
\tag{1}
$$

where the dependent variable denotes respectively the Gini index (overall wage inequality), the between-group Theil index (inter-industry wage inequality), and the proportion of people earning less than 75 percent of the corresponding minimum wage (at the national or NACE one-digit level) in country c at year t. NMW is a dummy variable equal to 1 if the country has a statutory minimum wage and 0 otherwise (no country changed systems during the period under investigation). CBC measures collective bargaining coverage. The interaction between NMW and CBC enables us to test whether, as hypothesized, bargaining coverage has a stronger negative impact on wage inequality in countries with sectoral wage floors. The Kaitz index is defined as the ratio of the minimum wage to the median wage of the working population.[10] It reflects the 'bite' of the minimum wage: small values indicate that the floor is a long way from the centre of the

Table 2. Overall wage inequality (Gini index).

	Model 1	Model 2	Model 3	Model 4	Model 5
NMW	0.03**	0.03**	−0.09**	−0.10***	−0.11***
	(0.01)	(0.01)	(0.04)	(0.03)	(0.03)
CBC	−0.10***	−0.12***	−0.24***	−0.24***	−0.23***
	(0.03)	(0.02)	(0.05)	(0.03)	(0.03)
NMW*CBC			0.16***	0.17***	0.19***
			(0.05)	(0.04)	(0.04)
Kaitz index				−0.13***	−0.47**
				(0.03)	(0.19)
Kaitz index squared					0.26*
					(0.14)
Sex ratio	No	Yes	Yes	Yes	Yes
Occupational controls	No	Yes	Yes	Yes	Yes
Educational controls	No	Yes	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes	Yes
Constant	0.35***	0.18	0.13	0.48**	0.52**
	(0.02)	(0.20)	(0.17)	(0.19)	(0.19)
R-squared	0.57	0.72	0.76	0.80	0.81
Observations	44	44	44	44	44
F-test	26.43	15.38	16.10	23.71	24.74
p-value	0.00	0.00	0.00	0.00	0.00

Significance levels: $*p < 0.1$; $**p < 0.05$; $***p < 0.01$. Robust standard errors are reported in parentheses.

earnings distribution and its impact therefore potentially low; conversely, a high Kaitz index reveals that the minimum wage is close to the centre of the distribution and that it potentially affects a larger number of employees. *Ceteris paribus*, we thus expect wage inequality indicators to depend negatively on the Kaitz index. Equation 1 also includes the square of the Kaitz index as an additional explanatory variable. This allows us to detect any non-linear relationship between the relative level of the minimum wage and the dependent variables and to increase the precision of our estimates. A quadratic relationship could appear if, for instance, the effect of a change in the minimum wage has a stronger incidence on our inequality measures when the initial minimum rate is further away from the median wage; conversely, the closer the initial minimum wage is to the centre of the wage distribution, the smaller the impact on inequality could become. X is a vector of control variables, comprising time-varying country-specific characteristics. The latter include information (taken from EU-SILC data) on shares of workers by occupation (three categories), education (three categories) and sex. τ denotes year dummies that control for business cycle effects. ε is the usual error term.

Overall wage inequality

Table 2 shows pooled OLS results of the estimation of equation (1) with the Gini index (overall wage inequality) as dependent variable. Models 1 to 5 report regression

coefficients for our main variables of interest when moving progressively from a parsimonious to a more complete specification. Standard errors are robust to heteroscedasticity and autocorrelation.

The national minimum wage (NMW) and collective bargaining coverage (CBC) variables are systematically significant. The interaction effect between the two, reported in Models 3–5, is also highly significant. In the most complete specifications (the last three models), the coefficient on NMW stands at -0.10, which means that overall wage inequality is approximately 10 percentage points smaller in countries with a statutory minimum wage. Moreover, estimates suggest that the Gini index decreases on average by 2.3 percentage points following a 10 percentage point increase in CBC. However, in countries with statutory minima the impact of CBC on wage inequality is found to be much more limited. Indeed, the interaction effect between CBC and NMW almost entirely offsets the coefficient associated to CBC. According to Model 5, a 10 percentage point increase in CBC decreases wage inequality by only 0.4 percentage points in countries with statutory minima. As expected, we also find that wage inequality is lower where the minimum wage is closer to the centre of the overall wage distribution. Indeed, Model 4 indicates that a 10-percentage point increase in the Kaitz index decreases wage inequality on average by 1.3 percentage points. Model 5 shows, in addition, that the relationship between these variables is quadratic. Results indeed suggest that overall wage inequality diminishes as the Kaitz index increases but at a decreasing rate. Put differently, the further the minimum wage is from the median wage, the stronger the (negative) relation between the Kaitz and Gini indices.

Inter-industry wage inequality

Table 3 reports pooled OLS estimates of equation (1) with the between-group Theil index (inter-industry wage inequality) as dependent variable. In other words, coefficients in Table 3 represent the relationship between the main characteristics of minimum wage regimes and inter-industry wage inequality. The regression results suggest that both NMW and CBC are negatively correlated with inter-industry wage inequality. Regression results for Models 3–5 suggest that inter-industry wage inequality is between 12 and 16 percentage points smaller in countries with a statutory minimum wage, such as the Central and Eastern European countries in our sample. Moreover, estimates show that a 10-percentage point increase in CBC decreases the inequality between sectors by around 2 percentage points. This suggests that minimum wage regimes with high collective bargaining coverage, such as the Scandinavian countries, can curb inter-industry wage inequality through higher collective bargaining coverage. What is more, results of Model 5 suggest that CBC has little impact on inter-industry wage inequality in countries with statutory minima. For the British minimum wage regime, for instance, this could imply that higher collective bargaining coverage is unlikely to have a significant effect on between-sector inequality. Indeed, the coefficient associated to the interaction variable between NMW and CBC is positive and almost equal (in absolute value) to that on CBC. As regards the Kaitz index, as with the regression results in Table 2, it appears to have a negative and convex impact on inter-industry wage dispersion. An increase of the Kaitz index from 0.4 to 0.5, for instance, is found to decrease the Theil index by 2.7 percentage points.

Table 3. Inter-industry wage inequality (Theil decomposition).

	Model 1	Model 2	Model 3	Model 4	Model 5
NMW	−0.01	−0.05***	−0.12**	−0.12**	−0.16***
	(0.03)	(0.02)	(0.06)	(0.06)	(0.05)
CBC	−0.01	−0.13***	−0.20***	−0.20***	−0.20***
	(0.05)	(0.03)	(0.05)	(0.05)	(0.05)
NMW*CBC			0.10	0.10	0.16**
			(0.08)	(0.08)	(0.08)
Kaitz index				−0.03	−0.96***
				(0.07)	(0.33)
Kaitz index squared					0.71***
					(0.25)
Sex ratio	No	Yes	Yes	Yes	Yes
Occupational controls	No	Yes	Yes	Yes	Yes
Educational controls	No	Yes	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes	Yes
Constant	0.12***	0.49	0.46	0.56	0.67*
	(0.05)	(0.32)	(0.32)	(0.39)	(0.37)
R-squared	−0.05	0.55	0.55	0.54	0.59
Observations	44	44	44	44	44
F-test	0.03	27.94	35.98	34.74	27.07
p-value	0.97	0.00	0.00	0.00	0.00

Significance levels: $*p < 0.1$; $**p < 0.05$; $***p < 0.01$. Robust standard errors are reported in parentheses.

Share of workers paid below prevailing minima

Table 4 shows regression results using as dependent variable the share of workers earning less than 75 percent of the corresponding minima. In other words, the coefficients represent the relationship between the main characteristics of minimum wage regimes and below-minima workers. Findings are in line with those obtained for overall and inter-industry wage inequalities. Indeed, they highlight that the incidence of workers earning less than 75 percent of the minimum wage: is on average between 12 and 15 percentage points smaller in the presence of NMW; diminishes on average by around 1.6 percentage points following a 10-percentage point increase in the CBC of a country with sectoral-level minima; is almost not influenced by CBC in countries with a NMW; and depends negatively (but at a decreasing rate given the significance of the quadratic term) on the level of the Kaitz index, which again suggests that the underlying effect is stronger the further the minimum wage is from the median wage.

Robustness tests

Findings so far suggest that both a statutory national minimum wage and, in countries with sectoral-minima, a higher CBC are significantly associated with lower levels of (overall and inter-industry) wage inequality and a smaller fraction of workers earning

Table 4. Proportion earning less than 75 percent of the corresponding minimum wage.

	Model 1	Model 2	Model 3	Model 4	Model 5
NMW	−0.03**	−0.02	−0.14***	−0.12***	−0.15***
	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)
CBC	0.01	−0.03	−0.15***	−0.16***	−0.16***
	(0.02)	(0.03)	(0.04)	(0.04)	(0.04)
NMW*CBC			0.16***	0.15***	0.19***
			(0.05)	(0.04)	(0.04)
Kaitz index				0.19***	−0.48***
				(0.05)	(0.13)
Kaitz index squared					0.51***
					(0.12)
Sex ratio	No	Yes	Yes	Yes	Yes
Occupational controls	No	Yes	Yes	Yes	Yes
Educational controls	No	Yes	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes	Yes
Constant	0.05***	0.72***	0.67**	0.16	0.24
	(0.02)	(0.25)	(0.25)	(0.20)	(0.18)
R-squared	0.25	0.39	0.46	0.69	0.80
Observations	44	44	44	44	44
F-test	3.93	3.29	8.69	7.26	11.81
p-value	0.03	0.01	0.00	0.00	0.00

Significance levels: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$. Robust standard errors are reported in parentheses.

less than 75 percent of the prevailing minima. As suggested by Schulten et al. (2006), it thus appears that the combination of sectoral minimum rates and high CBC can be regarded as a functional equivalent to a binding national minimum wage, at least for earnings inequalities.

We now focus on what are arguably the most relevant robustness tests and examine whether our conclusions are stable. First, we check the robustness of our estimations when regressions are run without countries with outlying values or systems, or when apprentices and very young workers are excluded from the sample. Next, we use an alternative threshold to measure the proportion of individuals paid below prevailing minima.

The Italian case is peculiar because its sectoral Kaitz indices are particularly high and in some cases even higher than 1 (a minimum wage higher than the median), indicating a high incidence of non-compliance or exclusion (20% of Italian workers are paid below the rates fixed by sectoral agreements). It therefore appears that the high Kaitz indices we observe for Italy (see online Appendix A3) should be interpreted with caution since their effective impact is relatively small compared to all other countries in our sample. In any case, results in columns 3, 7 and 11 of online Appendix A5 show that our conclusions are not affected by the exclusion of Italy.

As for Belgium, the specificity of this country's minimum wage system is that it is the only one offering effective dual protection against low wages: it combines a national

statutory minimum with high collective bargaining coverage and binding wage floors defined in sectoral agreements. While the French system also combines a national mini-mum with sectoral bargaining, collective agreements in France often fail to increase the minima above the national level (many collective agreements include wage floors *below* the SMIC). The interpretation of the Belgian figures on sectoral minima is therefore slightly different compared to other countries in our sample, a difference that makes it worthwhile to test whether our conclusions change if Belgium is dropped from the sam-ple. Findings in columns 4, 8 and 12 of online Appendix A5 show that conclusions are not affected by the exclusion of Belgium.

Many countries and sectors differentiate applicable minima according to the employ-ment status and age of individuals. This is notably the case for apprentices and employees younger than 18, and reflects the opinion shared by many policy-makers and social part-ners that lower rates for these groups could curb negative employment effects. The practi-cal difficulty of identifying reduced rates for apprentices and young workers in all national and sectoral minima creates a potential bias in our database. In order to examine the scope of this issue, we have rerun all regressions after excluding apprentices and younger work-ers from the EU-SILC. As shown in columns 2, 6 and 10 of online Appendix A5, results are not affected if apprentices and young workers are eliminated from our sample.

We also test the validity of our findings relative to the share of workers paid below the prevailing wage floors. To the extent that both the earnings variable and the hours meas-ure are prone to measurement errors, it might be worthwhile to assess whether our results are sensitive to alternative definitions of this indicator. To address this issue, we have experimented with an alternative threshold, namely the share of workers earning less than 85 percent of the prevailing minima. Again, the estimated coefficients, shown in online Appendix A6, do not significantly differ from our baseline model.

Finally, we examined the stability of our results to an alternative way of thinking about the country-level Kaitz index in systems with sectorally bargained minimum wages. Rather than computing the average Kaitz index across sectors as we do in our benchmark model (a measure that emphasizes representativeness), one could also argue that the relevant Kaitz index in these countries corresponds to the ratio between the mini-mum wage of the sector with the lowest wage floor and the national median wage (a measure that emphasizes the lowest minimum wage in the country without taking into account that this rate is not necessarily representative of the entire spectrum of sectoral minima).[11] Using this alternative index as explanatory variable leaves most of our bench-mark results unchanged: not only are the coefficients corresponding to the institutional features of minimum wage regimes (existence of a statutory minimum, collective bar-gaining coverage, interaction between the two) robust; but also the sign of the coeffi-cients of the benchmark and alternative Kaitz indices are very similar. However, because of higher standard errors the coefficients of the alternative Kaitz index are not always statistically significant (results are provided in online Appendix A7).

Conclusion

Minimum wages have reappeared on policy agendas across Europe. There are several factors that have contributed to this trend. On the one hand, in the richer EU countries the

successive waves of enlargement have led to streams of low-wage immigration which are sometimes perceived as a threat to existing wage differentials. A stricter wage policy at national or European level is seen by many as an attractive instrument to curb the resulting downward pressure on wages. On the other hand, the proportion of workers that are covered by collective agreements is dwindling in most Member States. Advocates of statutory minimum wages see them as an alternative mechanism that could substitute for collective bargaining in protecting workers against low wages.

These developments, among others, have fuelled a debate at European level as to whether it is desirable to implement a harmonized rate in all EU countries. We have argued that this debate lacks so far not only a framework to render the opposing positions between different minimum wage institutions more intelligible, but the debate also lacks crucial empirical evidence as to the labour market outcomes associated with different minimum wage systems.

In this article, we have explored the link between different institutional features of minimum wage systems and earnings inequalities across European countries. To do so, we used a combination of harmonized micro-data, data on national statutory minimum wages and coverage rates, and information on minimum rates in sectoral agreements. This effort notably allowed us to assess the distributive outcomes of the minimum wage systems in Austria, Belgium, Cyprus, Denmark, Finland, Germany and Italy, all of which are both absent from other empirical studies and among the main protagonists of the minimum wage debate at European level.

Our results clearly underline the importance of viewing the European debate as a choice between different minimum wage systems rather than a choice of a certain rate to be harmonized across the EU. Crucially, we are able to show empirically what many practitioners long suspected: the combination of sectoral minimum rates and high coverage of collective bargaining can, at least for earnings inequalities, be regarded as a functional equivalent to a statutory minimum wage at national level. Controlling for Kaitz indices, compositional and year effects, regression results suggest indeed that both a national statutory minimum wage and, in countries with sectoral minima, higher collective bargaining coverage are significantly associated with lower levels of (overall and inter-industry) wage inequalities and a smaller fraction of workers paid below prevailing minima.

If the policy objective at European level is to reduce the types of wage inequalities analysed in this article, our results suggest that this goal can be achieved through different minimum wage-setting mechanisms, so that institutional harmonization at European level may not be necessary. A possible way forward in the current European debate is therefore to think about which EU-wide targets for the minimum wage (but potentially also in terms of wage inequality) could be implemented through instruments such as the Open Method of Coordination that apply the principle of subsidiarity and allow for considerable institutional diversity as to how targets can be met.

This said, our results should be interpreted with caution, notably because the lack of variability in institutional variables does not allow us to apply panel data techniques. Nevertheless, they contribute to the European minimum wage debate as they provide first empirical evidence regarding the distributive outcomes of different minimum wage systems beyond the traditional division between countries with and without a statutory national minimum wage.

Notes

1. The dataset used in this paper can be downloaded at http://www.parisschoolofeconomics.eu/fr/garnero-andrea/

2. Like Boeri (2012), we also considered whether the national statutory minimum wage is set through a consultation or bargaining process. Regression results taking this additional information into account (not reported here because of space constraints but available on request) do not affect our conclusions.

3. The Theil index is widely used to decompose total inequality into within- and between-group inequality. It is based on a formal similarity between distributions of probabilities and wage shares. We computed inter-sectoral Theil inequality as a share of total inequality in each country. This step is necessary given that only relative values of Theil inequality are comparable between countries. For an exposition of the Theil statistic and its axiomatic base, see Kampelmann (2009).

4. The consequences for lower-tail inequality of the two types of systems can easily be illustrated graphically (see online Appendices A1 and A2 at http://homepages.ulb.ac.be/~frycx/research.html). Comparing the examples of Finland and the United Kingdom in 2009, the lower tail of the Finnish wage distribution shown in online Appendix A1 displays some dispersion around the vertical lines representing sectoral minimum wages; this contrasts with the clean cut induced by the national minimum wage in the UK's wage distribution shown in online Appendix A2.

5. Compared to other sources such as the Labour Force Survey, EU-SILC slightly over-represents female workers. This is, however, relatively homogeneous across countries so that the conclusions of our empirical analysis are not affected as the potential bias affects all countries in the sample.

6. Available at: http://www.boeckler.de/wsi-tarifarchiv_7052.htm

7. Belgium actually has a national minimum wage, but the collectively bargained minimum wages at industry level constitute the relevant minimum for most workers. We have thus collected information on both the interprofessional and sectoral minima and matched each individual to the minimum rate corresponding to his or her profile. Cyprus is a special case in that the minimum wage is not defined at sectoral but at occupational level. For the period under analysis a single rate applied to around 10 occupational groups in Cyprus; we used data on these rates for 2007 and 2008 from EIRO country reports.

8. A less frequently used data source for bargaining coverage is the European Company Survey, which also allows measurement of variations in coverage rates between different sectors in the same country. However, in most countries in our sample the interquartile range of

coverage rates is below 10 percentage points (Bulgaria and Ireland are exceptions with inter-quartile ranges between 20 and 25 percentage points). Given this relatively low intra-country dispersion of sectoral bargaining coverage rates, the use of national coverage data from the ICTWSS is therefore unproblematic.

9. Even if coverage and statutory floors may be historically related, over short time periods they can arguably be treated as independent since it is costly and politically difficult to switch from one system to another. This short-run exogeneity is relevant for this study, because the regressions presented in this section include both the coverage rate and the existence of a national minimum as explanatory variables, and the potential bias of any long-run interdependence between the two is reduced since we have only a short time period (2007–2009).

10. A more detailed description of the computation of Kaitz indices is provided in the second section of online Appendix A4.

11. We thank an anonymous referee for suggesting this robustness test. The formula for this alternative index is provided in Section 2.2 of online Appendix A4.

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