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Abstract
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Keywords
minimum wages, wage-fixing machinery, prime-age females, employment, unemployment, participation, cross-section time-series data, OECD countries, labor market flexibility, labor market institutions and policies

Cover Page Footnote
John T. Addison is Professor of Economics at University of South Carolina. Orgul Demet Ozturk is Assistant Professor of Economics at University of South Carolina. Sequential iterations of this paper were presented at the May 2011 Sixteenth Annual Meetings of the Society of Labor Economists in Vancouver, and seminars at the Institut für Höhere Studien (IHS) in Vienna, and the Institut für Arbeitsmarkt- und Berufsforschung (IAB) of the Bundesagentur für Arbeit in Nuremberg. The authors are indebted to participants for their insightful comments. In addition, they owe special thanks to David Neumark and William Wascher for supplying the data from their 2004 study, to Chris Ruhm for country data on parental leave, and to Per Skedinger for providing series on the ratio of the minimum wage to the average wage in various Swedish industries. The principle data sets and Stata files used in this study are available from Orgul D. Ozturk at the Moore School of Business, University of South Carolina, 1705 College Street, Columbia, SC 29208, odozturk@moore.sc.edu.

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MINIMUM WAGES, LABOR MARKET INSTITUTIONS, AND FEMALE EMPLOYMENT: A CROSS-COUNTRY ANALYSIS

JOHN T. ADDISON AND ORGUL DEMET OZTURK*

The authors investigate the employment consequences of minimum wage regulation for women in 16 OECD countries during 1970 to 2008. The treatment follows that of Neumark and Wascher's (2004) cross-country study using panel methods to estimate minimum wage effects among teenagers and young adults, although they focus on prime-age females—a group often neglected in the minimum wage literature. Moreover, their analysis covers a longer time interval and deploys time-varying policy and institutional regressors. They report average effects consistent with minimum wages causing material employment losses among the target group and, less conclusively, elevated joblessness as well. Their cross-country findings agree with Neumark and Wascher on the role of some individual labor market institutions and policies, but the authors do not observe the same patterns in the institutional data: specifically, prime-age females do not exhibit stronger employment losses in countries with the least regulated markets.

Comparatively little *cross-country* evidence on the effects of minimum wages on employment is available. This contrasts with the truly enormous country-specific literature on minimum wages. What evidence we have is contained in just two main empirical inquiries: an early study by the Organization for Economic Cooperation and Development (OECD 1998) that looks at the effect of minimum wages on the employment-to-population ratio of both teenagers and young persons (as well as adults) for a sample of between 7 and 9 OECD countries covering the period from 1975 to 1996, and Neumark and Wascher's (2004) expanded analysis of the employment-

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to-population ratio in 17 OECD nations for the 1975 to 2000 period, which focuses on teenagers and young adults (age 15 to 24 years).

By contrast, the parallel and burgeoning literature on employment protection is largely rooted in cross-country comparisons. And importantly, Neumark and Wascher's minimum wage study draws heavily (and presciently) on arguments from this literature that might be expected either to amplify or to moderate the employment consequences of minimum wages (on which more below).[1] Their study does not share the same breadth of outcome indicator, but focuses instead on disemployment and eschews consideration of labor force participation and unemployment rates or other outcome indicators such as average hours worked.

While further updating the period of analysis in our treatment we also seek to link the minimum wage and employment protection literatures. But our target group differs critically from that traditionally examined in the two literatures and especially the minimum wage literature; that is, we look at the labor market effects of minimum wages on workers other than teenagers and youths that are also at risk from wage minima, namely females aged 25 to 54 years. To the extent that this group of prime-age females includes low-productivity labor—reflecting their historically lower human capital accumulation due to interruptions in labor market experience and more limited access to education and training—the bite of minimum wages can also be expected to be material, and presumably more so in developing nations (Ozturk 2006). The impact of minimum wages may be underscored by the higher valued outside options of females, which in turn suggests that it might be useful to consider a wider range of outcomes other than employment such as participation rates. Furthermore, the existence of youth subminima that have been found to ameliorate the adverse consequences of minimum wages among that target group might be expected to have just the opposite effect among adult females.

We also examine the "policy complementarities" invoked by the wider literature. To this end, we examine all the labor market institutions considered by Neumark and Wascher (2004) in their innovative analysis.[2] As an additional refinement, we introduce time-varying measures of most such arguments. Only labor standards and in part the mechanics of minimum wage setting are one-off measures.

Previous Research

Despite the plethora of research on the employment and other consequences of minimum wages (see Neumark and Wascher 2007), there is

[1]This is an oversimplification to the extent that the existence of a minimum wage is sometimes present in the employment protection literature, where it is aggregated in a general measure of labor market (in)flexibility.

[2]We also considered the role of other labor market institutional and policy variables such as the tax wedge and the degree of coordination in collective bargaining, as well as some other mainstream arguments such as the output-gap. These proved mostly statistically insignificant and are not further discussed here.

scant cross-country analysis exploiting the tremendous variation in minimum wages at the country level.[3] The first of two principal analyses of minimum wages and employment, the OECD study (1998) looks at the effect of minimum wages on the employment of teenagers, young adults, and prime-age adults for a small sample of countries for the period 1975 to 1996.[4] The countries are Belgium, Canada, France, Greece, Japan, the Netherlands, Portugal, Spain, and the United States. For the gender analysis, however, the sample is reduced to seven countries because of the lack of adequate series of average wages for Portugal and Spain.

Our study's regressions follow the state-level panel data specifications now standard in the U.S. minimum wage literature. The dependent variable for the full sample is the employment-to-population ratio for teenagers aged 15 to 19 years, youths aged 20 to 24 years, and adults aged 25 to 54 years. For the reduced seven-country sample, separate male and female subsamples of each group are used. The key minimum wage ratio is calculated separately for each group using the relevant average wage and allowing for youth rates where applicable. The employment-population ratio is regressed on the ratio of minimum to median wages with controls for the business cycle (the prime-age male unemployment rate, the output gap, or both), different institutional features (but see below), country trend effects, and fixed country effects.

The OECD investigators find that increases in the minimum wage measure have a negative impact on teenage employment across all specifications, albeit in some instances attendant upon the exclusion of Portugal and Spain. For the full (partial) sample of countries, in the study's preferred specifications—with corrections for first-order autocorrelation for the error terms and heteroscedasticity across countries—a 10% increase in the minimum wage is associated with a fall in teenage employment of between 1.5% and 2% (2.7% and 4.1%). But, for young adults aged 20 to 24 years and for adult prime age males and females the elasticities are seldom statistically significant.[5]

The OECD study does not consider the role of labor market institutions and policies other than union density, the unemployment insurance (UI) replacement rate, and nonwage labor costs as a proportion of total costs (i.e., the tax wedge); nor, for that matter, does it report the respective coefficient estimates but offers just a summary of the estimated employment elasticities, partially documented above. Of course, empirical analysis of the consequences of employment protection in particular has mushroomed since Lazear's (1990) pioneering study. Now-familiar institutions examined in addition to employment protection include active labor market policies, coordination in collective bargaining, and labor standards (e.g., Scarpetta

[3]Although, for meta-analyses, see Card and Krueger (1995) and Boockmann (2010).

[4]Note that the OECD study ranges further afield to investigate the impact of minimum wages on poverty and the income distribution and on wages and the wage distribution.

[5]Among teenagers, female elasticities always exceeded those of males but no such gender pattern obtained in the cases of youths and adults.

1996; Nickell and Layard 1999). More recent developments have allowed for interactions between institutions and economic shocks and between the institutions themselves (e.g., Blanchard and Wolfers 2000; Addison and Teixeira 2003; Nickell, Nunziata, and Ochel 2005).[6] Yet more recent innovations have included the role of product market and business regulation, quality of industrial relations, and even family ties and religion (see respectively, Busse and Hefeker 2007; Feldmann 2007; Fiori et al. 2007; Addison and Teixeira 2009, Alesina et al. 2010). Unlike the minimum wage literature, most such analyses have focused on cross-country differences.

The study by Neumark and Wascher (2004) is notable in attempting to bridge the gap between these two literatures, even if as noted earlier minimum wages have sometimes figured in the armory of restrictionist labor market policies investigated in aggregate. Specifically, Neumark and Wascher investigate the effect of minimum wages on teenage and youth employment for 17 countries over the sample period 1976 to 2000. These countries include, in addition to those examined by the OECD (1998), Italy, Australia, Germany, Denmark, Sweden, Luxembourg, New Zealand, and the United Kingdom.

The dependent variable is the employment-to-population ratio for the particular demographic, although the minimum wage argument—the ratio of the minimum wage to the median wage—uses the adult minimum wage in the numerator and the all-worker average in the denominator. Neumark and Wascher's basic equation regresses the employment measure on a one-year lag of the minimum-to-median wage ratio, and controls for aggregate economic conditions and supply-side forces in the form of the adult unemployment rate and the ratio of the youth population to the adult population, respectively. The authors provide results for a simple OLS specification, fixed effect models with and without controls for year effects and time trends, and a dynamic version of the model estimated using the Generalized Method of Moments (GMM) technique (Arellano and Bond 1981). In all cases, including the latter, they obtain well-determined negative coefficient estimates for the minimum wage variable. For young adults the minimum wage elasticities range from –0.13 to –0.28, and for teenagers from –0.09 to –0.31.

The authors then augment their basic estimating equations with variables representing (a) characteristics of the minimum wage system, and (b) other labor market policies and institutions. Included under (a) are a bargained minimum wage (the omitted category is statutory minimum wage determination), subnational industry/regional wage minima, and youth subminima. Abstracting from the independent effects of the different types of minimum wage machinery and focusing on the interaction terms from the authors' fixed effect and GMM specifications, they report that bargained minima are associated with a smaller negative employment impact of minimum wages, while industry or geographic wage floors tend to increase disemployment effects. As expected, youth subminima reduce the adverse ef-

[6]Coe and Snower (1997) were the first to provide the theoretical basis for expecting complementarities between the various labor market policies including the minimum wage.

fects of minimum wages on young persons' employment, especially in the case of teenagers.

The institutions included under (b) are labor standards, employment protection, active labor market policies, the unemployment insurance (UI) replacement rate, and union density.[7] Again focusing on results from the preferred fixed effect and GMM specifications, the authors find evidence of certain complementarities. Thus, more restrictive labor standards and higher union density tend to exacerbate the disemployment effects of minimum wages, while stricter employment protection and active labor market policies appear to have the opposite effect. Of the institutional variables, only UI replacement rates appear to bear no relation to minimum wages—even if their independent effect is seemingly to reduce employment.

Finally, Neumark and Wascher seek to erect a typology of minimum wage countries and investigate their component minimum wage effects. The categories are fourfold: high employment protection/active labor market policies in combination with either high or low labor standards and low employment protection/active labor market policies again in combination with either high or low labor standards. It emerges that negative employment minimum wage effects are strongest for the group of countries having the least regulation, namely Canada, Japan, the United States, and the United Kingdom.

Theoretical Backdrop and Econometric Specification

Our theoretical model is implicit. It is in the spirit of Cahuc and Zylberberg (1999) and Coe and Snower (1997). Cahuc and Zylberberg offer a dynamic search and matching model with wage negotiations and employment protection—namely, severance payments and limitations on dismissals—and they introduce minimum wage setting into this framework to study its impact on job creation and job destruction. Their model implies that employment protection may strongly elevate unemployment of lower skilled workers when the minimum wage is high but have little impact where the minimum wage is low or when wages are flexible. For their part, Coe and Snower develop a model of policy complementarities and show that policies and institutions that affect the bargaining power of incumbent employees, that influence the search behavior of the unemployed, or that influence barriers to job creation can have complementary effects on unemployment such that minimum wage–like measures that cost jobs can be magnified or ameliorated according to the restrictiveness of the ruling labor market environment. Both models, then, capture the interaction of minimum wages with labor market rigidities and labor force characteristics, and imply that minima will be less disruptive when policies are less rigid.[8]

[7]The authors exclude from these regressions the prior institutional arrangements centering on the mechanics of minimum wage setting.

[8]For theoretical implications based on the conjunction of wage rigidity and mandated benefits, see Kahn (2012).

The more obvious component of our model is the extent to which the minimum wage is effective. When the minimum wage is binding, the demand curve determines the level of employment for the given minimum wage; otherwise, equilibrium employment is a function of both demand and supply. We do not model the determinants of the probability that the minimum wage will bind (see, for instance, Neumark and Wascher 2002; Addison et al. 2012) but simply attempt to capture its bite here by expressing the minimum wage as a ratio of the median wage.[9] Use of the minimum-to-median wage ratio also reduces the bias arising from the correlation between minimum wage levels and macroeconomic events affecting minimum wage levels. But because this ratio is only available for all workers, we shall supplement it with a measure of the gender wage gap interacted with the minimum wage. The argument here is that the smaller the gap between males and females, the greater the implied relative skill level of females and the less likely they are to be adversely impacted by hikes in the minimum wage. We will subsequently address the potential endogeneity of this variable.

Our econometric specification is

$$(1)\quad Y_{it} = \alpha_i + \lambda_t + \theta_i t + \beta MW_{it-1} + \delta X_{it} + \gamma Z_i + \phi MW_{it-1} X_{it} + \zeta MW_{it-1} Z_i + \varepsilon_{it}$$
$$i = 1,\ldots,I = 16; t = 1,\ldots,T = 39$$

where Y_{it} is the prime-age female employment rate in country i and time t; $MW_{it\text{-}1}$ is the minimum-to-median wage ratio; X_{it} and Z_i are the time-varying and time-invariant supply, demand, and institutional arguments, respectively; α_i indexes fixed country effects and λ_t fixed year effects; θ_i captures the time trends in the outcome indicator for country i; and ε_{it} is an error term.

With this model, we can estimate the minimum wage *effect* as the partial derivative of Equation (1) with respect to $MW_{it\text{-}1}$, namely

$$E_{it} = \beta + \phi X_{it} + \zeta Z_i,$$

that is, the sum of the minimum wage coefficient and the coefficients of the interaction terms multiplied by the value of the relevant covariate, where all the non-dummy arguments are normalized.[10] The minimum wage *elasticity* is then simply this partial derivative multiplied by the ratio of the mean lagged minimum-to-median wage to the mean employment rate (or mean participation rate or mean unemployment rate).

The data cover 16 countries and the time frame is 1970 to 2008. Observe that although our primary focus is on the adult female employment rate, we

[9]On the superiority of expressing the minimum wage as a ratio of the median as opposed to the average wage in international comparisons, see OECD (1998: 38).

[10]That is, the policy variables were differenced from their mean values and divided by their standard deviations prior to estimation and before forming the interactions.

will also consider the corresponding labor force participation and unemployment rates as in the employment protection literature.[11]

The time-varying arguments in the vector X_{it} consist of our three base regressors and four conventional institutional regressors. The former comprise the adult male unemployment rate, the fertility rate, and the wage gap. The latter include employment protection, union density, the unemployment insurance (UI) replacement rate, and active labor market policies. Finally, the time-invariant arguments in the vector Z_i are twofold: the labor standards index and the presence of a youth subminimum wage. Were it not for changes in the way minimum wages are fixed in the United Kingdom, all three component measures of the minimum wage machinery would also have been time invariant. Given those changes, however, both bargained minimum wages and the presence of wage floors differentiated by region, industry, or both are now time varying, albeit identified by the British changes alone, leaving only the youth subminimum component time invariant. But note that all institutional components of the vectors X_{it} and Z_i are interacted with the lagged minimum wage measure.

We ran OLS and fixed effect versions of Equation (1). Additionally, we estimated our preferred dynamic version of the employment model by including the relevant lagged dependent variable as a regressor. We employed the GMM technique developed by Arellano and Bond (1981) to estimate the dynamic model.

Data

We gathered the data used in this inquiry from OECD online databases and published resources and from the CEP-OECD Institutions Data Set (Nickell 2006). The data in question cover employment-to-population ratios, unemployment rates, labor force participation rates, adult male unemployment rates (as a business cycle control), minimum wages and minimum wage rules, measures of labor market rigidity, the gender wage gap, and the fertility rate. OECD data on minimum wages are available where a national minimum wage is set by statute or by a national collective bargaining agreement. For countries where no national minimum exists but where industry- or occupation-specific minima are set by legislation or collective bargaining agreements, we use summary estimates constructed by Dolado et al. (1996) as our base measure, as did Neumark and Wascher (2004). These estimates relate the minimum wage to average wages whereas the corresponding OECD values are based on the minimum-to-median wage ratio; however, a referee suggested that the data for the Nordic countries—Sweden, Denmark, and Finland—were inappropriately low. In response to this concern, we re-estimated our *employment* models (a) dropping the Nordic group entirely and (b) since most of the observations for the Nordic group pertain to

[11]After Lazear (1990), we contemplated also using average hours as a dependent variable but did not proceed with this indicator because female hours were available for just one-half of our sample.

Sweden, retaining the Nordic group but substituting four separate "sectors" for that country drawing on data kindly provided by Per Skedinger (see Skedinger 2010). The sectors in question are retail trade, hotels and restaurants, food and bakeries, and an across-sector measure obtained by averaging in the corresponding ratios for engineering, construction, and slaughter houses to data from the three aforementioned sectors. In order to allow ready comparisons with the earlier literature, however, our tables preserve the data in Dolado et al. (1996) but we summarize throughout the results of either excluding or modifying the Nordic data in the manner indicated.[12]

Most OECD countries have some sort of minimum wage policy. Table 1 provides for those countries for which we have been able to assemble consistent data on all variables information on these minima, as well as the machinery of minimum wage determination. As is immediately evident, the countries differ not only in terms of the relative level of minimum wages—and hence in the potential bite of minimum wages—but also in rule setting. The first two columns of the table give the relative values of the minimum wage at two points in time, namely 1970 and 2008, unless otherwise stated. For most countries, minimum-to-median (or minimum-to-mean) wage ratios declined through time, the principal exceptions being France and the United Kingdom. European countries generally have higher relative values of the minimum wage than their non-European counterparts, including the United States. This empirical regularity has, of course, been noted in the wider literature and, taken in conjunction with the greater degree of labor market regulation obtaining in Europe, cited as a principal cause of that region's high unemployment rates (e.g., Siebert 1997). We also give average values of the minimum wage in the third column of the table. The figures in parentheses for Sweden are taken from Skedinger (2010) and give the ratio of the minimum wage to the average wage in the four sectors mentioned earlier. As is evident, each value exceeds the Dolado et al. measure (1996).

The last three columns of Table 1 describe the minimum wage fixing machinery. The first indicates how minimum wages are determined. Here *yes* signifies that the minimum wage is negotiated (i.e., set via bipartite or tripartite negotiations), while *no* signifies the wage is set by statute. For the United Kingdom we observe a switch in regimes from bargained (via tripartite wages councils) to statutory minimum wages over the sample period. The fourth column shows whether the minimum wage is national in scope or instead varies across industries or regions; for example, in Japan the minimum wage varies across prefectures, whereas in the United States each state can set its own minimum exceeding the federal level.[13] For our sample of countries, regional and industry variation is more common than a unified national minimum. The final column of the table indicates whether there

[12]Full tables of this sensitivity analysis are available from the authors upon request.

[13]The "new minimum wage research" in the United States has used this geographic variation to help identify employment effects, albeit in quite different ways (cf. Neumark and Wascher 1992; Card and Krueger 1994).

Table 1. Minimum Wage Levels and Rules

Country	Minimum-to-Median Wage Ratio: First observation	Last observation	Average	Bargained Minimum Wage		Presence of Subnational Minimum Wage		Presence of Youth Subminimum Wage	
Australia	0.65 (1985)	0.52	0.60	No		No		Yes	<21
Belgium	0.54 (1975)	0.5	0.54	Yes		No		Yes	<21
Canada	0.48	0.41	0.41	No		Yes	Province	No	
Denmark	0.55	0.54 (1994)	0.54	Yes		Yes	Industry	Yes	<18
Finland	0.52 (1993)	0.52 (1993)	0.52	Yes		Yes	Industry	Yes	<18
France	0.42	0.62	0.54	No		No		No	Limited
Germany	0.57	0.58 (1994)	0.59	Yes		Yes	Industry	No	Some
Ireland	0.67 (2000)	0.52	0.54	No		No		Yes	<18
Italy	0.78 (1976)	0.71 (1991)	0.73	Yes		Yes	Industry	No	Some
Japan	0.78 (1975)	0.34	0.31	No		Yes	Prefecture	No	
The Netherlands	0.58	0.42	0.52	No		No		Yes	<23
New Zealand	0.6	0.59	0.52	No		No		Yes	<20
Spain	0.7	0.44	0.43	No		No		Yes	<18
Sweden	0.53 (1975)	0.51	0.53 (0.79/0.80/0.83/0.73)	Yes		Yes	Industry	Yes	<24
United Kingdom	0.365	0.46	0.44	Yes/No	Wages Councils [up to 1993]/ statute (after 1999)	Yes/No	[Industry]	Yes	<21
United States	0.49	0.34	0.38	No		Yes	State	No	Limited

Sources: Minimum-to-median wage ratios are taken from the OECD online database for all countries, other than Denmark, Germany, Italy, Sweden, and the United Kingdom (before 1933), for which we use estimates constructed by Dolado et al. (1996) as our base measure following Neumark and Wascher (2004). Minimum wage rules are from Neumark and Wascher (2004: 228) and the ILO TRAVAIL Legal database.

Notes: The information in the first and second columns refers to minimum-to-median (or minimum-to-mean) wage ratios in 1970 and 2008, respectively, unless otherwise stated. The figures in the third column give average values for the relevant ratio. The higher values shown here in parentheses for Sweden are taken from Skedinger (2010) and give minimum-to-mean wage ratios for four separate sectors (see text). The series from which the latter are drawn are used in our sensitivity analysis.

Table 2a. Means (Standard Deviations) of Labor Market Outcomes and Gender Variables

Country	*Employment-to-Population Ratio*	*Labor Force Participation Rate (LFPR)*	*Unemployment*	*Fertility*	*Wage Gap*
Australia	0.586 (0.094)	0.619 (0.101)	0.052 (0.015)	1.969 (0.295)	0.170 (0.026)
Belgium	0.609 (0.087)	0.678 (0.077)	0.104 (0.031)	1.709 (0.170)	0.122 (0.031)
Canada	0.672 (0.087)	0.726 (0.088)	0.075 (0.015)	1.679 (0.174)	0.271 (0.129)
Denmark	0.792 (0.023)	0.848 (0.018)	0.066 (0.021)	1.719 (0.171)	0.132 (0.012)
Finland	0.785 (0.040)	0.831 (0.042)	0.055 (0.035)	1.727 (0.086)	0.227 (0.026)
France	0.643 (0.076)	0.705 (0.098)	0.084 (0.033)	1.903 (0.203)	0.164 (0.058)
Germany	0.611 (0.091)	0.657 (0.112)	0.066 (0.027)	1.442 (0.163)	0.252 (0.022)
Ireland	0.469 (0.162)	0.509 (0.161)	0.084 (0.051)	2.523 (0.702)	0.190 (0.045)
Italy	0.444 (0.097)	0.490 (0.117)	0.088 (0.039)	1.561 (0.394)	0.166 (0.011)
Japan	0.603 (0.050)	0.621 (0.058)	0.028 (0.012)	1.619 (0.272)	0.379 (0.038)
The Netherlands	0.518 (0.184)	0.548 (0.193)	0.054 (0.033)	1.682 (0.223)	0.237 (0.046)
New Zealand	0.691 (0.036)	0.726 (0.031)	0.048 (0.014)	2.152 (0.330)	0.162 (0.069)
Spain	0.403 (0.131)	0.479 (0.164)	0.145 (0.085)	1.765 (0.630)	0.231 (0.060)
Sweden	0.806 (0.066)	0.836 (0.072)	0.036 (0.022)	1.778 (0.174)	0.172 (0.019)
United Kingdom	0.701 (0.045)	0.742 (0.033)	0.057 (0.021)	1.829 (0.175)	0.307 (0.075)
United States	0.653 (0.088)	0.688 (0.089)	0.052 (0.012)	1.968 (0.149)	0.287 (0.070)
Total	0.619 (0.152)	0.664 (0.156)	0.068 (0.044)	1.814 (0.400)	0.225 (0.090)
Correlation with the lagged minimum wage measure	0.042	0.155	0.508	0.773	–0.716

Sources: The labor market indicators (including unemployment rates) are taken from the OECD.Stat online database. Fertility rates are from the OECD Family database. The wage gap is the difference between median male and female wages expressed as a percentage of the male median wage. This variable is generated using OECD data. The mean wage ratio is used instead for The Netherlands, downloaded from http://www.oecd.org/dataoecd/9/59/39606921.xls. The fertility rate and wage gap variables are standardized for the regressions.

are any subminimum wages for younger persons and, if so, the age at which they apply.[14]

There are also significant cross-country differences in the extent of labor market regulation, sociodemographics, and labor market activity, as charted in Tables 2a and 2b. Beginning with the outcome indicators in Table 2a, although the observed changes in female labor force participation rates are consistent with the general worldwide trend (increasing in all of the countries over the thirty-nine year period), participation rates vary sometimes quite considerably. Thus, at any point in time, Italy and Spain have significantly lower participation rates when compared with other countries, and

[14]As noted by Neumark and Wascher (2004: note 18), the classification of minimum wage systems is inevitably open to some discretion, especially with respect to youth subminima. We follow their convention in treating the cases of Italy, France, Germany, and the United States, where there is some such limited wage differentiation, as having no such differentiation. On the broader question of Germany, where the differentiation stems from its famous apprenticeship system, there is of course the very much wider issue of whether that nation is properly classified as having minimum wages at all—at least prior to the recent posted workers act and latterly the introduction of minima for individual sectors such as waste disposal. As a practical matter, the exclusion of Germany did not materially affect any of the major findings reported below; full results are available from the authors upon request.

Table 2b. Means (Standard Deviations) of Labor Market Structural Variables

Country	*Labor Standards Index*	*Employment Protection*	*Active Labor Market Policies*	*Union Density*	*Unemployment Insurance Replacement Rate*
Australia	3	0.335 (0.048)	5.685 (0.667)	5.468 (9.443)	23.12 (3.368)
Belgium	2	0.955 (0.159)	15.04 (1.924)	12.87 (23.23)	42.45 (2.556)
Canada	1	0.270 (0.000)	6.026 (0.369)	7.381 (13.21)	17.58 (2.339)
Denmark	2	0.655 (0.146)	24.58 (6.306)	25.96 (34.85)	50.11 (8.053)
Finland	3	0.733 (0.043)	15.41 (5.129)	17.99 (32.49)	30.98 (7.488)
France	3	0.929 (0.105)	10.04 (1.480)	2.318 (4.070)	33.82 (6.257)
Germany	4	0.970 (0.128)	18.76 (4.020)	5.370 (9.493)	28.45 (1.101)
Ireland	2	0.297 (0.052)	16.34 (6.526)	13.48 (17.99)	29.09 (6.312)
Italy	3	1.049 (0.235)	11.11 (0.533)	7.949 (14.14)	13.19 (14.45)
Japan	1	0.677 (0.049)	4.787 (1.120)	4.683 (8.306)	9.988 (1.793)
The Netherlands	4	0.845 (0.090)	30.64 (12.36)	5.197 (9.212)	51.32 (2.803)
New Zealand	3	0.350 (0.088)	11.69 (2.849)	5.249 (9.226)	29.01 (1.814)
Spain	3	1.184 (0.141)	4.105 (1.222)	3.241 (5.853)	30.17 (8.196)
Sweden	5	0.889 (0.268)	48.72 (19.13)	18.19 (32.66)	23.86 (6.379)
United Kingdom	0	0.202 (0.022)	7.582 (1.484)	7.155 (12.56)	19.86 (3.361)
United States	0	0.070 (0.000)	3.587 (0.349)	2.949 (5.170)	12.86 (1.301)
Total	2.434 (1.370)	0.651 (0.359)	14.63 (13.15)	9.090 (19.02)	27.87 (13.32)
Correlation with the lagged minimum wage measure	0.658	–0.119	0.436	0.031	0.711

Sources: The labor standards index is as described by Neumark and Wascher (2004: 237). It refers to the situation as of 1993 and is taken from the OECD Jobs Study (1994) and specifically excludes the contributions of minimum wages and employment protection policies. The employment protection variable is taken from Nickell (2006) and is the employment protection legislation data from the OECD.Stat using Version 1 of that indicator: the strictness of employment protection legislation. Nickell (2006) extends this data set using Blanchard and Wolfers (2000). These data are available only until 2004, with 2004 values being used for later years. The union density measure is again taken from Nickell (2006) and is calculated as union membership divided by employment, using administrative and survey data from the OECD labor market statistics database. This base measure is then extended by splicing in data from Visser (2006). These data are available only until 2004, with 2004 values being used for later years. The unemployment insurance replacement rate is the original benefit replacement rate data published by the OECD. These data are also available only until 2004, with 2004 values again being used for later years. The active labor market policies variable is taken from Nickell (2006). It is calculated as expenditures divided by the unemployment rate. These data are available only until 2004; missing values are now interpolated using unemployment and GDP measures. All variables are standardized for the regressions.

especially the Nordic nations of Finland, Denmark, and Sweden. Participation rates are one of the margins investigated in our treatment because minimum wages, and other rigidities, may inhibit low productivity workers from actively seeking employment once they become unemployed. Equally, they may encourage the labor market entry of other such individuals (see, for example, Mincer 1976).

Employment-to-population ratios rose significantly in all countries other than Sweden and Finland, where the observed changes were modest. Although employment rates do vary markedly across countries—from just 40.3% in Spain to 80.6% in Sweden—it is unemployment rates that show the greatest variance over the sample period. Even if by the early 2000s unemployment rates were close to their 1980 values, most European countries

experienced very high unemployment in the intervening years; and the female unemployment rate actually rose from 1.7% in 1970 to 6.6% in 2009.

In general, fertility rates declined significantly over the sample period; the exceptions being Norway, the United Kingdom, the Netherlands, and Sweden. In the 1980s the fertility rate averaged 2.5 children per woman across all OECD countries. By 2004 this average had declined to 1.8 children (and was even as low as 1.6 children during the late 1990s). Childbirth is the main reason for interruptions in a woman's work life, and caring for young children either keeps women off the market or directs them to careers that permit flexibility to balance work and family. Such interruptions and career choices imply lower wages for women vis-à-vis men of the same age and education.

The wage gap given in the last column of Table 2a is the difference between median male and female wages expressed as a percentage of the median male wage. As noted earlier, this variable was included to capture the existence of gender differences in occupational choice and education that might be expected to affect the bite of minimum wages in the case of females. Historically, females have had lower rates of labor market attachment and have tended to concentrate in lower-paying occupations, both of which tendencies make them susceptible to minimum wage–induced disemployment. As can be seen from the table, the wage gap averaged 22.5% over the period, ranging from 12.2% in Belgium to 37.9% in Japan.

Finally, there are striking differences in the labor market conditions and institutions of the countries covered by the data, which can potentially shape the manner and the intensity with which minimum wages affect the outcome indicators. Thus, for example, one can readily envision how any disemployment effects of minimum wages might be amplified by other labor market rigidities, such as national restrictions on hours adjustment or the use of flexible contracts. If, however, there are also institutions in place that help the unemployed locate jobs, the frictions resulting from the impedimenta of minimum wage changes may be considerably attenuated. For these reasons, we include in the model measures of labor standards, the strictness of employment protection laws, the extent of active labor market policies, the generosity of UI replacement rates, and the degree of unionization rates. Table 2b provides the descriptive statistics.

Findings

Basic Regression Results

Our initial multiple regression results are provided in Table 3 for the adult female employment-to-population ratio and the adult female labor force participation rate. We focus on the former; results for the adult female unemployment rate are remitted to the Appendix in Table A.1. Each of the OLS results given in the first three columns of the table excludes country fixed effects. The results in the first column include our wage gap and fer-

tility arguments but no country-specific trend or year fixed effects. This specification reveals a well-determined negative association between the minimum wage argument and female employment and the expected negative coefficient estimate for the general labor demand measure, namely the adult male unemployment rate. For their part, the coefficients for wage gap and fertility are also negative. But their interaction terms are both positive. The implication is that the net effect of the wage gap (fertility rates) on employment is negative if the ratio of the minimum wage to the median wage is less than 2.29 (0.34). But as a practical matter, the diagnostics at the foot of the table indicate that we can reject the restriction that the year and country controls and time trends are excludable.

Turning therefore to the results in the second column of the table, the coefficient estimate for the minimum wage variable is somewhat smaller in absolute terms than before. The same is true of the other coefficients with the exception of the wage gap. Moreover, the wage gap–minimum wage interaction term is now also negative—as is to be expected if the wage gap is an inverse measure of the skill level of the female workforce and a greater wage gap implies an increased bite of the minimum wage—and this suggests that wage gap effects are reinforcing in reducing female employment. As before, higher fertility is associated with reduced employment but the interaction term is positive. In this case, the net effect of higher fertility rates on female employment is negative if the minimum-to-median wage ratio is less than 0.44. The estimated minimum wage elasticity indicates that a 10% increase in the lagged minimum wage variable is associated with a 3.5% fall in female employment, which is of course a high value for developed nations. But again the bottom line diagnostic is that the exclusion restriction (here an absence of country fixed effects) is again contraindicated.

In the third column of the table, we report results from dropping the fertility and wage gap variables on the grounds of their potential endogeneity. For example, if minimum wage hikes narrow the wage gap, this should lead to an understatement of the effect of minimum wages on employment in equations containing both arguments (see, in particular, Blau and Kahn 2003, on the effect of wage floors on female relative wages). For this specification at least, excluding both arguments does indeed increase the absolute magnitude of the lagged minimum wage coefficient.

Given the indication that country effects are important, what are the consequences of controlling for country fixed effects as well as for year fixed effects and country specific time trends? The results are given in the fifth column of Table 3. The most obvious effect is of course a marked fall in the coefficient estimate for the minimum wage variable, indicating that a sizable part of the effect obtained earlier does, as expected, reflect country-specific factors. But the lagged minimum wage argument remains highly significant, even if the estimated minimum wage elasticity (of –0.079) on this occasion is only marginally statistically significant. The coefficient estimate for the demand argument (the adult male unemployment rate) remains highly significant albeit reduced in absolute magnitude. Interestingly,

Table 3. Estimates of the Standard Minimum Wage Model Using International Data

	Adult Female Employment-to-Population Ratio						
Variable	*OLS*			*FE*		*GMM*	
Lagged adult female employment						0.704***	0.681***
						[0.070]	[0.072]
Lagged adult female LFPR							
Lagged min-to-median wage ratio	–0.306***	–0.279***	–0.477***	–0.139	–0.114***	–0.063***	–0.062***
	[0.063]	[0.067]	[0.088]	[0.088]	[0.034]	[0.022]	[0.020]
Adult male unemployment rate	–0.614***	–0.588***	–0.966***	–0.645**	–0.622***	–0.355***	–0.367***
	[0.204]	[0.182]	[0.186]	[0.134]	[0.122]	[0.052]	[0.049]
Wage gap	–0.096***	–0.02			0.071***		0.017**
	[0.020]	[0.022]			[0.016]		[0.009]
Fertility rate	–0.202***	–0.579***			0.012		0.009
	[0.046]	[0.093]			[0.032]		[0.016]
Lagged minimum-to-median wage ratio interacted with:							
Wage gap	0.042	–0.064			–0.160***		–0.035*
	[0.049]	[0.054]			[0.034]		[0.018]
Fertility rate	0.586***	1.325***			0.042		–0.016
	[0.095]	[0.173]			[0.076]		[0.040]
Constant	0.843***	0.640***	0.681***	0.454***	0.416***	0.165***	0.167***
	[0.026]	[0.039]	[0.035]	[0.046]	[0.022]	[0.024]	[0.025]
Minimum wage effect[a]	–0.394***	–0.463**	–0.477	–0.139	-0.106*	–0.063	–0.056***
	[0.096]	[0.222]			[0.065]		[0.014]
Minimum wage elasticity	–0.295***	–0.347**	–0.347	–0.104	–0.079*	–0.047	–0.042***
	[0.072]	[0.166]			[0.048]		[0.011]
Country fixed effects	No	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Country specific time trends	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	339	339	339	339	339	307	307
R-squared	0.527	0.889	0.847	0.982	0.985		
Number of countries				16	16	14	14
Hausman/Sargan tests (*p*-values)	0.000	0.000	0.000	0.000	0.000	0.000	—

Notes: [a]Minimum wage effects are calculated as $E=(1/N)(1/T)\Sigma_i\Sigma_t(\beta+\varphi X_{it}+\zeta Z_i)$, where X_{it} is the vector of time-variant characteristics that are interacted with minimum wages and Z_i is the vector of time constant characteristics that are interacted with minimum wages, and φ and ζ are the vectors of the estimated coefficients for these interaction terms. Elasticities are then calculated as this effect at the average minimum-median wage and average outcome measure. Hubert-White robust standard errors are given in parenthesis. The STATA xtreg command reports a constant for the fixed effects regressions: It is the mean of all country-specific effects. The Hausman specification test is for the exclusion of year and country controls and time trends in the first specification, for

the own effect of the wage gap variable effect is now positive and well determined, while its effect when interacted with lagged minimum wage is strongly negative. The implication is that the net effect of the wage gap on employment is negative if the minimum wage ratio exceeds 0.44. The own and interaction effects of fertility are positive and reinforcing, although neither coefficient estimate is statistically significant. On this occasion, the results of dropping the wage gap and fertility rate variables—shown in the fourth column of the table—are more modest than before. That is, the absolute magnitude of the lagged minimum wage coefficient increases rather modestly in absolute magnitude.

Adult Female Labor Force Participation Rate (LFPR)						
OLS			*FE*		*GMM*	
					0.708	0.699***
					[0.000]	[0.075]
–0.328***	–0.313***	–0.485***	–0.134	–0.109**	–0.037	–0.035**
[0.067]	[0.067]	[0.095]	[0.078]	[0.041]	[0.000]	[0.017]
0.085	–0.125	–0.481**	–0.182	–0.183	–0.101	–0.111*
[0.201]	[0.185]	[0.189]	[0.162]	[0.152]	[0.000]	[0.059]
–0.085***	–0.025			0.071***		0.013
[0.021]	[0.022]			[0.018]		[0.009]
–0.196***	–0.665***			0.007		–0.001
[0.045]	[0.097]			[0.037]		[0.017]
0.001	–0.059			–0.158***		–0.030*
[0.053]	[0.054]			[0.041]		[0.017]
0.526***	1.432***			–0.002		–0.013
[0.096]	[0.186]			[0.090]		[0.040]
0.853***	0.696***	0.692***	0.455***	0.431***	0.146	0.151***
[0.027]	[0.039]	[0.039]	[0.039]	[0.026]	[0.000]	[0.024]
–0.403***	–0.513**	–0.485	–0.134	–0.095	–0.037	–0.030***
[0.086]	[0.239]			[0.063]		[0.012]
–0.282***	–0.358**	–0.338	-0.094	–0.066	–0.026	–0.021***
[0.060]	[0.167]			[0.044]		[0.008]
No	No	No	Yes	Yes	Yes	Yes
No	Yes	Yes	Yes	Yes	Yes	Yes
No	Yes	Yes	Yes	Yes	Yes	Yes
339	339	339	339	339	307	307
0.514	0.882	0.834	0.983	0.985		
			16	16	14	14
0.000	0.000	0.000	0.000	0.000	0.000	—

the exclusion of the country fixed effect in the second specification, and for the exclusion of the wage gap and fertility variables and their minimum wage measure interactions in the third, fourth, and sixth specification for each outcome variable. We also use the Hausman test to determine whether the assumption of no correlation between the error terms and the independent variables is correct. As this restriction is rejected in all specifications, we report only the fixed effects regression results here.

* Statistically significant at the .10 level; ** at the .05 level; *** at the .01 level.

Our preferred estimates are given in the seventh column of the table for the dynamic version of the employment model. These GMM estimates do indicate a further diminution in the point estimate of the lagged minimum wage coefficient but both it and the minimum wage elasticity are highly significant. The signs and significance levels of the coefficients of the other variables carry over from the fixed effects specification to the dynamic version of the model, although each is reduced in absolute magnitude. Observe that that the inclusion of the lagged employment rate—which is highly significant—can also be interpreted as helping to distinguish between the short-run and long-run effects of the minimum wage on employment. Given

these estimates, –0.062 is the short-run coefficient and –0.194 (= –0.062/(1 – 0.681) is the long-run coefficient. The own and interaction effects of the wage gap and fertility arguments are of opposing sign and imply that the net effect of a greater wage gap on female employment is negative if the minimum-to-median wage ratio exceeds 0.49, and that the net effect of higher fertility is negative if that ratio exceeds 0.56. Observe from the sixth column of the table that some understatement of the minimum wage effect is implied by the inclusion of the wage gap argument, but it is now only at the third decimal place.

Before turning to the results for labor force participation in the remaining columns of Table 3, we pause to summarize the effects of excluding all three Nordic countries from the sample and then reinstating them but with Skedinger's data in the form of four separate minimum-wage-to-mean-wage series for the retail, hotel and restaurants, and food and bakery sectors and a cross-sector average measure (all the previous sectors plus slaughter houses, engineering, and construction). First, the exclusion of Denmark, Finland, and Sweden makes very little difference in the results reported earlier. That is, the pattern of the coefficients estimates is broadly replicated, and for our preferred GMM specification, the point estimates are particularly close. Second, reinstating the Nordic countries but with the new data for Sweden changes the picture scarcely at all. (As noted earlier, full results in corresponding tabular form are available from the authors upon request.) We conclude that our employment results reported thus far are essentially unchallenged by data issues attendant on an understatement in part of the key minimum wage argument deployed in the previous literature and the present treatment. But we will need to see if the same applies when we estimate our augmented model.

We then repeated each specification used earlier but for a different outcome indicator: the adult female *labor force participation rate* (shown in the last seven columns of Table 3). The bottom line of this exercise is that disemployment appears to have something of a counterpart in lowered female labor force participation. In all full regressions, the coefficient estimate for the lagged minimum wage is negative and statistically significant. But few other arguments are statistically significant across specifications. For the fixed effect and GMM estimates, the net effect of a higher wage gap on participation is negative if the minimum wage ratio is greater than 0.45 or greater than 0.43, respectively. The effects of the fertility rate are negative and reinforcing for the GMM specification, although in the case of the fixed effect specification they would become negative only if the minimum wage were to equal three and one-half times the median wage! Excluding the wage gap and fertility arguments in all cases raises the coefficient estimate for the lagged minimum wage, but in our preferred GMM specification, any implied understatement of the minimum wage effect would appear inconsequential.

Finally, results for adult female unemployment are provided in Table A.1, and generally offer some suggestion that minimum wage increases feed into

higher female employment. Thus, an adverse minimum wage effect is clearly discernible for our preferred specification, where again inclusion of the wage gap argument seemingly provides little understatement of any minimum wage effect.

The Augmented Model

In an augmented model we examined whether the employment effects of the minimum wage are influenced by differences in minimum wage systems across countries and by the presence of diverse labor market policies or institutions. As far as the minimum wage is concerned, we consider the method used to set minimum wages (whether it was bargained, as opposed to being statutorily determined), whether provision is made for a youth subminimum, and whether subnational minima (i.e., wage floors that vary across regions or industries) are present. At the same time—rather than sequentially as in Neumark and Wascher—we also examined the role of more encompassing employment protection, higher labor standards, and greater union density, as well as more generous UI systems and more comprehensive active labor market policies. Observe that, with the two exceptions noted earlier, all these variables are time varying rather than fixed as in Neumark and Wascher.[15]

Results for the augmented model are given in Table 4. The OLS results for employment shown in the second column of the table suggest that bargained minimum wages (as opposed to statutorily determined minima) have an ambiguous effect on female employment. Although the own effect of a bargained minimum is positive, the interaction term is negative, such that the net effect on employment is negative so long as the ratio of the minimum wage to the median wage is greater than 0.50. Whatever the benefits of the flexibility introduced by bargained minimum wage systems for other groups of workers, then, the results for females are mixed. The net effect of subnational minima at industry or regional level is negative if the minimum-to-median wage ratio is less than 0.38; and although the own effect of a youth subminimum is negative, the interaction term is positive such that the presence of a youth minimum is on net associated with lower female employment rates where the minimum wage ratio is less than 0.52.

[15]Since it might be objected to that our gender controls are thin, as part of our augmentation strategy we also experimented with a parental leave variable, measured as weeks of entitlement and constructed combining information from Ruhm and Teague (1997) and Ruhm (1998) with OECD data. Parental leave may stimulate the employment and participation rates of women—while lowering their unemployment—by increasing their stability in the firm and also by encouraging them to qualify for leave benefits. Increases in the cost of employing eligible women, however, might lead employers to discriminate against them in employment, particularly if minimum wage hikes make it less possible for women to "pay" for their leave. In the event, our parental leave measure was strongly and negatively correlated with the wage gap argument in each country, while its inclusion in the fitted model was formally contraindicated. Problems associated with the sparse formal representation of "gender and the labor market" in the present study are of course mitigated by the use of country fixed effects.

Table 4. Estimates of the Augmented Minimum Wage Model with Characteristics of Minimum Wage Systems and Other Labor Market Policies and Institutions for the Employment and Labor Force Participation Outcomes

	Adult Female Employment-to-Population Ratio					
Variable	*OLS*		*FE*		*GMM*	
Lagged adult female employment					0.618***	0.602***
					[0.073]	[0.072]
Lagged adult female LFPR						
Lagged min to median wage ratio	–1.655***	–1.454***	–0.477***	–0.394***	–0.312***	–0.304***
	[0.275]	[0.199]	[0.122]	[0.133]	[0.058]	[0.058]
Adult male unemployment rate	–1.014***	–0.857***	–0.558***	–0.543***	–0.370***	–0.377***
	[0.133]	[0.126]	[0.111]	[0.102]	[0.050]	[0.048]
Wage gap		0.041		0.057**		0.030**
		[0.032]		[0.022]		[0.012]
Fertility rate		–0.194***		–0.055		–0.039**
		[0.053]		[0.044]		[0.015]
Bargained minimum wage	0.318***	0.265***	0.018	0.032		
	[0.083]	[0.083]	[0.065]	[0.065]		
Youth subminimum	–0.849***	–0.623***				
	[0.145]	[0.117]				
Subnational minimum	–0.509***	–0.463***				
	[0.146]	[0.118]				
Employment protection index	–0.159***	–0.181***	–0.041	–0.068	–0.030	–0.052**
	[0.031]	[0.030]	[0.044]	[0.055]	[0.021]	[0.026]
Union density	0.079***	0.003	–0.039	–0.025	–0.009	–0.008
	[0.028]	[0.031]	[0.025]	[0.022]	[0.010]	[0.008]
Unemployment insurance replacement rate	–0.120***	–0.074**	–0.093*	–0.100***	–0.081***	–0.098***
	[0.044]	[0.037]	[0.046]	[0.040]	[0.022]	[0.022]
Active labor market policies	0.073***	0.051**	0.014	0.006	–0.013	–0.013
	[0.027]	[0.024]	[0.019]	[0.019]	[0.012]	[0.012]
Labor standards index	0.266***	0.258***				
	[0.057]	[0.051]				
Lagged Minimum to Median Wage Ratio interacted with:						
Wage gap		–0.211***		–0.126***		–0.060**
		[0.065]		[0.052]		[0.028]
Fertility rate		0.391***		0.120		0.055
		[0.113]		[0.115]		[0.039]
Bargained minimum wage	–0.518***	–0.534***	–0.481**	–0.575***	–0.373***	–0.431***
	[0.174]	[0.156]	[0.192]	[0.200]	[0.123]	[0.138]
Youth subminimum	1.629***	1.200***	0.484**	0.370*	0.291***	0.280***
	[0.298]	[0.230]	[0.198]	[0.175]	[0.077]	[0.080]
Subnational minimum	1.215***	1.220***	0.458**	0.516**	0.323***	0.401***
	[0.298]	[0.223]	[0.213]	[0.188]	[0.077]	[0.069]
Employment protection index	0.220***	0.240***	0.08	0.134	0.057	0.098**
	[0.059]	[0.059]	[0.081]	[0.104]	[0.037]	[0.047]
Union density	–0.154***	–0.028	0.059	0.037	0.001	0.002
	[0.051]	[0.054]	[0.045]	[0.036]	[0.019]	[0.016]
Unemployment insurance replacement rate	0.060	0.070	0.147	0.156*	0.150***	0.179***
	[0.084]	[0.069]	[0.087]	[0.075]	[0.044]	[0.042]
Active labor market policies	–0.125**	–0.076*	–0.013	0.003	0.031	0.032
	[0.050]	[0.044]	[0.035]	[0.037]	[0.025]	[0.025]

Adult Female Labor Force Participation Rate (LFPR)					
OLS		*FE*		*GMM*	
				0.672***	0.660***
				[0.063]	[0.063]
–1.760***	–1.525***	–0.480***	–0.432**	–0.210**	–0.237**
[0.304]	[0.210]	[0.112]	[0.136]	[0.069]	[0.061]
–0.549***	–0.413***	–0.161	–0.163	–0.113	–0.123*
[0.120]	[0.116]	[0.158]	[0.147]	[0.069]	[0.069]
	0.078**		0.076**		0.026*
	[0.032]		[0.033]		[0.015]
	–0.235***		–0.038		–0.033*
	[0.054]		[0.038]		[0.017]
0.225**	0.225***	0.030	0.040		
[0.087]	[0.084]	[0.062]	[0.072]		
–0.878***	–0.630***				
[0.152]	[0.119]				
–0.429***	–0.431***				
[0.161]	[0.122]				
–0.155***	–0.177***	–0.038	–0.062	–0.024	–0.046**
[0.031]	[0.029]	[0.058]	[0.067]	[0.020]	[0.022]
0.108***	0.032	–0.004	0.005	0.002	-0.002
[0.029]	[0.028]	[0.018]	[0.022]	[0.011]	[0.012]
–0.047	–0.021	–0.043	–0.044	–0.056***	–0.065***
[0.044]	[0.037]	[0.052]	[0.041]	[0.018]	[0.019]
0.062**	0.035	–0.003	–0.012	–0.014	–0.013
[0.028]	[0.024]	[0.018]	[0.020]	[0.016]	[0.015]
0.322***	0.318***				
[0.064]	[0.050]				
	–0.290***		–0.174**		–0.058*
	[0.067]		[0.077]		[0.033]
	0.409***		0.055		0.031
	[0.114]		[0.102]		[0.040]
–0.355*	–0.431***	–0.335*	–0.469**	–0.226*	–0.304**
[0.185]	[0.161]	[0.176]	[0.213]	[0.127]	[0.152]
1.720***	1.207***	0.472**	0.363*	0.202***	0.228***
[0.317]	[0.237]	[0.176]	[0.197]	[0.078]	[0.077]
1.088***	1.140***	0.258	0.365**	0.165**	0.258***
[0.329]	[0.233]	[0.185]	[0.156]	[0.080]	[0.067]
0.239***	0.237***	0.077	0.115	0.048	0.085**
[0.059]	[0.059]	[0.114]	[0.131]	[0.037]	[0.041]
–0.194***	–0.069	0.001	–0.013	–0.012	–0.004
[0.053]	[0.051]	[0.039]	[0.042]	[0.023]	[0.024]
–0.05	0.001	0.089	0.09	0.120***	0.137***
[0.086]	[0.070]	[0.094]	[0.073]	[0.043]	[0.043]
–0.109**	–0.047	0.015	0.033	0.029	0.03
[0.054]	[0.044]	[0.034]	[0.039]	[0.033]	[0.031]

(*continued*)

Table 4. Continued

	Adult Female Employment-to-Population Ratio					
Variable	*OLS*		*FE*		*GMM*	
Labor standards index	–0.384***	–0.388***	–0.031	–0.09	–0.117*	–0.160**
	[0.101]	[0.091]	[0.114]	[0.115]	[0.062]	[0.062]
Constant	1.113***	1.080***	0.394***	0.377***	0.164***	0.154**
	[0.115]	[0.085]	[0.037]	[0.048]	[0.049]	[0.060]
Minimum wage effect	–1.016***	–0.981***	–0.319***	–0.268***	–0.207***	–0.194***
	[0.267]	[0.202]	[0.119]	[0.107]	[0.089]	[0.092]
Minimum wage elasticity	–0.761***	–0.734***	–0.239***	–0.201***	–0.155***	–0.145***
	[0.199]	[0.152]	[0.089]	[0.080]	[0.067]	[0.069]
Country fixed effects	No	No	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country specific time trends	Yes	Yes	Yes	Yes	Yes	Yes
Observations	339	339	339	339	307	307
R-squared	0.959	0.972	0.988	0.989		
Number of countries			16	16	14	14
Hausman/Sargan tests (*p*-values)	0.000	0.000	0.000	0.000	0.000	—

Notes: See Notes to Table 3. All minimum wage setting institution dummies are time invariant in all countries except for the subnational minimum wage dummy and the negotiated minimum wage dummy for Britain. Thus, in the OLS and FE specifications the coefficient for the negotiated minimum wage dummy is identified

One possibility here is that the youth "discount" is lower the higher the minimum wage. As far as the other institutions are concerned, the own effect of more generous employment protection and higher UI replacement rates is negative, while that of active labor market policies and labor standards is positive. But in each case, the associated interaction terms are opposite in sign such that the net effects of employment protection (unemployment insurance) are negative if the minimum wage ratio is less than 0.75 (1.06, which is of course always the case). As far as active labor market policies (labor standards) are concerned, the net effect is negative if the minimum wage ratio exceeds 0.67 (0.66). The union coefficients, while insignificant, imply that higher union density has a negative effect when the minimum wage ratio is greater than 0.11, which is always the case in our data. Finally, with respect to the fertility rate and wage gap measures, it is the case that higher fertility rates depress female employment on net where the minimum-to-median wage ratio is less than 0.50, and the net impact of the wage gap is always negative since the minimum wage ratio always exceeds the tipping point of 0.19 in our data.

When we omit the wage gap and fertility variables on account of their potential endogeneity (see the first column of Table 4), the pattern and significance of the other coefficient estimates is largely unaffected, and the expected increase in the coefficient estimate of the lagged minimum wage is but modest. Similarly, the absolute value of the minimum wage elasticity is little affected. We therefore have greater confidence in the use of both variables. More generally, and as before, we can reject the exclusion of country effects in this specification.

Adult Female Labor Force Participation Rate (LFPR)					
OLS		*FE*		*GMM*	
–0.529***	–0.531***	–0.136	–0.193	–0.135*	–0.176**
[0.112]	[0.089]	[0.136]	[0.142]	[0.071]	[0.073]
1.179***	1.154***	0.435**	0.434***	0.141***	0.144***
[0.127]	[0.090]	[0.045]	[0.050]	[0.043]	[0.053]
–1.096***	–1.039***	–0.338***	–0.303***	–0.139**	–0.149***
[0.309]	[0.245]	[0.102]	[0.095]	[0.071]	[0.076]
–0.766***	–0.726***	–0.236***	–0.212***	–0.097**	–0.105***
[0.216]	[0.171]	[0.071]	[0.066]	[0.045]	[0.032]
No	No	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
339	339	339	339	307	307
0.953	0.971	0.985	0.987		
		16	16	14	14
0.000	0.000	0.000	0.000	0.000	—

only with British data. We do not estimate a coefficient for the subnational minimum wage dummy because this variable is dropped due to collinearity.
* Statistically significant at the .10 level; ** at the .05 level; *** at the .01 level.

Fixed effects and our preferred GMM estimates are contained in the fourth and sixth columns of Table 4, prefaced in each case by a specification that excludes the wage gap and fertility rate arguments. Beginning with the fixed effects results, the strongly negative effect of the lagged minimum wage on employment is again reported; it is smaller in absolute value than in the OLS estimates (but larger than reported in Table 3). The own effects of employment protection, union density, and the UI replacement rate are all negative but, with the exception of the latter, not statistically significant, while the directional influence of the basic variables is again confirmed. (Note that little reliance can be placed on the dummy bargained minimum wage variable in the fixed effects specification because it is solely identified by the British innovation, and is necessarily unidentified in the GMM estimation. Note, too, that the labor standards index drops out because it is a time invariant measure.)

The interactions of the minimum wage argument with the wage gap, fertility, and the labor market institutions and policies are also of interest and—abstracting from youth subminima and subnational minima and labor standards—are opposite in sign from the own effects (with the exception of active labor market policies that are always favorable). The wage gap has a negative effect on net if the minimum ratio is greater than 0.45, while that of fertility is negative once that ratio falls below 0.46. The effect on female employment of a bargained minimum wage is always negative because the tipping-point value for the minimum wage rate of 0.06 is always exceeded in our data. Employment protection has a negative influence on net so long as the minimum wage ratio is less than 0.51; unemployment insurance has a

negative effect where the wage ratio is less than 0.64; and union density has a negative effect where the ratio is less than 0.68. As before, excluding the wage gap and fertility variables (see the third column of Table 4) leaves the pattern of coefficient estimates unaffected. The coefficient estimate on the key lagged minimum wage variable increases in absolute value, but the change is insufficient for us to downplay the hypothesized role of the wage gap and fertility arguments.

Our preferred GMM estimates in the sixth column of the table are even sharper. Thus, the own effect of higher fertility rates is now statistically significant as is the negative own effect of employment protection. Also, the interaction terms are generally better determined. Cases in point include employment protection, youth and national subminima, and labor standards. The effect of higher labor standards and union density are always negative on net, though the latter coefficient estimates are not statistically significant. Positive interaction effects for fertility, employment protection, unemployment insurance, and active labor market policies are nevertheless consistent with negative employment effects on net if the minimum wage ratio is less than 0.71, 0.53, 0.55, and 0.41, respectively. Much as before, the positive own wage effect associated with the wage gap argument is consistent with a negative net effect once the minimum wage exceeds 0.50. The seeming detriment of a bargained minimum wage is underscored (see Bertola et al. 2007), even if the presence of different wage floors by industry and region seems to reduce the sting of minimum wages. Excluding the wage gap and fertility arguments (in the fifth column) leaves the key lagged minimum wage coefficient, as well as the minimum wage elasticity, virtually unaffected. Finally, we see that the latter is considerably larger in absolute terms than earlier reported for the more parsimonious regression in Table 3 that contains no information on the minimum wage fixing machinery and other labor market institutions.

We also ran the augmented employment model for our sample of countries that excludes the Nordic group and again for all countries but with revised data for Sweden using four separate minimum wage measures for that nation (detailed results are available from the authors on request). The main results can be summarized as follows: First, other than for the OLS results, it is clear that removing the Nordic group entirely produces only modest changes. For the fixed effect estimates the new coefficient estimates are somewhat smaller in absolute terms—including the key lagged minimum wage coefficient, which is also less precisely estimated than before. But there are no changes in sign, and significant variables generally remain so. More important, the GMM results are closer still in all respects, including the magnitude of the key lagged minimum wage regressor. Second, as for the estimates with revised data for Sweden, these results are again very close. Focusing on just the GMM results for the broadest measure of the Swedish minimum-to-mean wage ratio, there is close correspondence between the point estimates of the lagged minimum wage variable and the

minimum wage elasticities with their counterparts in Table 4. Although there are no changes in sign for this sample, the employment protection and fertility arguments (and the interaction of the former with the minimum wage ratio) are not statistically significant. The labor standards interaction term is likewise statistically insignificant. But, to repeat, the two sets of estimates for this preferred specification are again very close, and there does not appear to be a material data issue here.

Returning to Table 4, the last six columns of the table present results for labor force participation. It is striking that the impact of minimum wages on this outcome indicator is much more pronounced than in the parsimonious model that generated the results in Table 3. The lagged minimum wage term is now considerably stronger and better determined than before and the minimum wage participation elasticities correspondingly greater in absolute terms. As a result, therefore, the findings also more closely parallel those for employment. Focusing on the GMM results in the final column of the table, we see that in conjunction with the minimum wage argument the wage gap, bargained minima, and labor standards have a negative effect on participation rates (the tipping point for the first argument is 0.45). The interaction effects of youth subminima and subnational minima are both positive; and although the interaction effects of employment protection, unemployment insurance, and active labor market policies are positive, the net effect of these variables on participation is negative if the wage ratio is greater than 0.54, 0.47, and 0.04, respectively. The own and interaction effects of unions are negative and hence reinforcing, although neither coefficient estimate is statistically significant.

Results for unemployment are given in Table A.2. For the preferred GMM measure, the lagged minimum wage argument is weakly significant, but few other arguments achieve significance. Those that do are quite consistent (i.e., opposite in sign) with the employment results. Cases in point include the positively signed coefficient estimates for the adult male unemployment rate variable, and for the employment protection, unemployment insurance replacement rate and bargained minimum wage terms and the negative coefficient estimate for the subnational minimum wage. Excluding the wage gap and fertility rate arguments on grounds of their potential endogeneity inflates the point estimate for lagged minimum wages more substantially than for the other outcome indicators but does not greatly affect the other coefficient estimates. The more important bottom line, however, would be that the unemployment results are somewhat less coherent than the employment findings. The reason for this is to be found in the improved participation rate findings.

As a final exercise, in the spirit of Neumark and Wascher (2004) we investigate differences in minimum wage effects across countries. First, the individual country minimum wage effects are reported in Table 5. The estimates in question are based on the GMM specifications given in the sixth and twelfth columns of Table 4 (and, in the case of the unemployment outcome

Table 5. Minimum Wage Effects for Labor Market Indicators

	Average Minimum Wage Effect (Standard Deviation)					
Country	*Employment*		*Labor Force Participation Rate (LFPR)*		*Unemployment*	
Australia	–0.231 ***	(0.017)	–0.184 ***	(0.015)	0.052 ***	(0.003)
Belgium	–0.191 ***	(0.021)	–0.104 ***	(0.022)	0.111 ***	(0.008)
Canada	–0.185 ***	(0.017)	–0.145 ***	(0.018)	0.048 ***	(0.002)
France	–0.223 ***	(0.071)	–0.174 ***	(0.059)	0.049 ***	(0.013)
Germany	–0.380 ***	(0.013)	–0.329 ***	(0.013)	0.094 ***	(0.003)
Ireland	–0.050 ***	(0.021)	–0.024	(0.018)	0.032 ***	(0.004)
Italy	–0.515 ***	(0.032)	–0.404 ***	(0.025)	0.117 ***	(0.004)
Japan	–0.240 ***	(0.004)	–0.188 ***	(0.003)	0.047 ***	(0.002)
The Netherlands	–0.043 ***	(0.018)	–0.050 ***	(0.013)	–0.003	(0.009)
New Zealand	–0.188 ***	(0.026)	–0.149 ***	(0.022)	0.043 ***	(0.008)
Spain	–0.142 ***	(0.016)	–0.107 ***	(0.014)	0.023 ***	(0.004)
Sweden	–0.180 ***	(0.051)	–0.175 ***	(0.043)	0.018	(0.015)
United Kingdom	–0.186 ***	(0.016)	–0.108 ***	(0.018)	0.085 ***	(0.017)
United States	–0.194 ***	(0.012)	–0.142 ***	(0.010)	0.059 ***	(0.002)

Notes: The minimum wage effects for each country are based on the indicated specifications in the sixth and twelfth columns of Table 4 and the final column of Table A.2 in the Appendix. Employment, participation, and unemployment effects are computed as described in Table 3. Averages of these minimum wage effects across years are then calculated for each country. Values for Finland and Denmark are not in this table since they are not included in the GMM regression due to lack of sufficient observations.
* Statistically significant at the .10 level; ** at the .05 level; *** at the .01 level.

indicator, the sixth column of Table A.2 in the Appendix) and represent averages of the annual values for each country.[16] We also calculated individual country minimum wage effects (and elasticities) without controls for the wage gap and fertility, and with the Nordic countries and without them (but in the former case substituting separate series of minimum wage ratios for Sweden). The results generally follow the pattern of Table 5 and again are available from the authors upon request.

The minimum wage effects with respect to employment range from –0.043 in the case of the Netherlands to –0.515 for Italy. The corresponding range for minimum wage effects with respect to participation is from –0.024 for Ireland to –0.404 for Italy. These results imply material disemployment effects. But the effects of minimum wages on this labor market segment are not confined to employment and participation. As shown in the final column of the table, minimum wage unemployment effects are (with one exception) also positive and in almost all cases statistically significant as well. To be sure, these latter effects, if not the elasticities, are smaller, but evidently the shake-out of female labor from higher minimum wages also feeds through into unemployment.

The next issue concerns combinations of policies. As we have seen, Neumark and Wascher (2004: 242–43) were able to detect certain patterns in

[16]We also estimated the corresponding minimum wage effects and elasticities for the fixed effect specifications given in the fourth and tenth columns of Table 4 (and the fourth column of Table A.2 in the Appendix). In each case the respective absolute values were somewhat larger, and all were well determined. The results are available from the authors upon request.

the data, the most notable of which was their finding that the disemployment effects of minimum wages were strongest in those countries with the least regulated markets: Canada, Japan, the United States, and the United Kingdom. In our framework of time-varying regressors, identification of individual countries with set regimes is not straightforward. We first followed Neumark and Wascher's methodology and grouped our countries into four categories based on the restrictiveness of their labor standards, the strength of their employment protection laws, and the reach of their active labor market policies. In parentheses we report a ranking for labor standards and a joint ranking for employment protection laws and active labor market policies. We created these rankings using average values of these policy measures for each country across all years, and the joint ranking simply sums the two component rankings. As is evident from Table 6, which includes the effects of minimum wages on unemployment in addition to those on employment and participation, we cannot replicate their results for prime-age females. Indeed, if anything, the suggestion is that the least regulated markets produce the best outcomes for women.

It is manifestly the case, however, that the patterns are by no means consistent for all countries in these groups, and this points to the role of other factors in explaining the differences. Moreover, with our time-varying regressors, countries move in their rankings over the years, making it hard to characterize countries as populating a unique cluster. In Table 7, therefore, we allow each country to be in different cells in different years.[17] We can see from this table that in highly regulated countries, especially in circumstances where the wage gap is high (where women are less productive or concentrated in low-paying industries), and where fertility rates are also high (implying less job experience), minimum wages seem to do the highest collateral damage to female employment and participation. In short, policy parameters alone cannot explain the labor market effects of minimum wages in a cohesive manner. Other country characteristics play a more crucial role in explaining female labor market activity.

The bottom line is that despite the results of our regression analysis sharing a key commonality with the study of Neumark and Wascher (2004), there is little evidence of similar patterns of effects in our data. This is not unexpected, given the time-varying nature of our regressors and the different demographic group studied.

Concluding Remarks

This study is one of only a handful to have investigated the sensitivity of female employment to the minimum wage and almost the only one to exploit a cross-country panel. Our study was motivated by Neumark and Wascher's seminal study of the sensitivity of teenage and youth unemployment to min-

[17]As in Table 5, the country samples in Tables 6 and 7 are dictated by our preferred GMM specification for the augmented model, and therefore Finland and Denmark are excluded.

Table 6. Minimum Wage Effects across Labor Market Characteristics

	Low employment protection/Low active labor market policies					*High employment protection/High active labor market policies*					
Low labor standards											
Canada (13,14)	e_emp	–0.185	*United Kingdom (15, 14)*	e_emp	–0.186	*Belgium (10,4)*	e_emp	–0.191			
	e_unemp	0.048		e_unemp	0.085		e_unemp	0.111			
	e_lfpr	–0.145		e_lfpr	–0.108		e_lfpr	–0.104			
Ireland (10,10)	e_emp	–0.050	*United States (15,16)*	e_emp	–0.194						
	e_unemp	0.032		e_unemp	0.059						
	e_lfpr	–0.024		e_lfpr	–0.142						
Japan (13,12)	e_emp	–0.240									
	e_unemp	0.047									
	e_lfpr	–0.188									
High labor standards											
Australia (4,13)	e_emp	–0.231				*Sweden (1,1)*	e_emp	–0.180	*Italy (4,4)*	e_emp	–0.515
	e_unemp	0.052					e_unemp	0.018		e_unemp	0.117
	e_lfpr	–0.184					e_lfpr	–0.175		e_lfpr	–0.404
New Zealand (4,11)	e_emp	–0.188				*France (4,7)*	e_emp	–0.223	*The Netherlands (2,3)*	e_emp	–0.043
	e_unemp	0.043					e_unemp	0.049		e_unemp	–0.003
	e_lfpr	–0.149					e_lfpr	–0.174		e_lfpr	–0.050
Spain (4, 9)	e_emp	–0.142				*Germany (2,1)*	e_emp	–0.380			
	e_unemp	0.023					e_unemp	0.094			
	e_lfpr	–0.107					e_lfpr	–0.329			

Notes: Joint rankings are created as the ranking of the sum of employment protection and active labor market policy rankings. The first ranking in parentheses is for labor standards, and the second ranking is for this joint measure. These rankings are based on average policy values for each country, not the yearly values. Values for Finland and Denmark are missing because they are not included in GMM regression due to lack of sufficient observations.

Table 7. Minimum Wage Effects across Labor Market Policies and Social Characteristics

		Low labor standards		*High labor standards*	
		Low wage gap	*High wage gap*	*Low wage gap*	*High wage gap*
Low employment protection					
Low fertility	e_emp	–0.144	–0.207	–0.224	
	e_unemp	0.051	0.061	0.051	
	e_lfpr	–0.096	–0.154	–0.177	
High fertility	e_emp	–0.127	–0.193	–0.191	–0.227
	e_unemp	0.048	0.059	0.043	0.052
	e_lfpr	–0.083	–0.140	–0.152	–0.185
High employment protection					
Low fertility	e_emp	–0.191	–0.240	–0.197	–0.181
	e_unemp	0.111	0.046	0.039	0.034
	e_lfpr	–0.104	–0.188	–0.162	–0.160
High fertility	e_emp			–0.168	–0.342
	e_unemp			0.025	0.071
	e_lfpr			–0.149	–0.275

Notes: High and low classifications for each labor market policy or social characteristic are assigned on the basis of the yearly value, not a unique value for each country across years but unique to each country and each year given the values of these characteristics. Thus, effects for one country for different years can be averaged in different cells. Values for Finland and Denmark are missing because they are not included in GMM regression due to lack of sufficient observations.

imum wages, the innovation here being their analysis of a cross-country panel rather than the target group selected. In this regard, we were also struck by the authors' caveat that, by using the adult minimum wage in constructing the minimum wage ratio, they had "overstated the relevant (or 'effective') minimum wage for the age groups under study." (Hence their use of a youth subminimum in their first set of extended regressions.) In our study, use of the adult minimum wage raises no such difficulties of interpretation, although our understanding of minimum wage effects is enhanced by the inclusion of a gender wage gap argument, which offers insights into the bite of minimum wages even after taking the potential endogeneity of the variable into account. Indeed we found consistent evidence that increases in minimum wages translated into lower female employment and participation rates. The results for unemployment were somewhat less transparent, presumably because of labor market withdrawal. Nevertheless, we were frankly surprised by the failure of the presence of youth subminima to strengthen the minimum wage effect, although one possible explanation for this might be that the youth discount may vary inversely with the magnitude of the minimum wage. Future research might usefully examine this relation and also whether the effect might reflect complementarities between youth and particular age groups within the female labor force. Another issue concerns the seemingly unfavorable effect of bargained wage minima. This might reflect a familiar union effect not otherwise really discernible in the union indicator deployed here.

There were also some interesting commonalities between our study and that by Neumark and Wascher that have to do with the interaction of labor standards and employment protection with minimum wages. That said, our data for adult females do not permit such a tidy configuration of nations as reported by Neumark and Wascher for youths and teenagers of both genders. We do not find any obvious alignment of labor market institutions and policies. Indeed, the institutional patterns we detect are, if anything, the reverse of those reported by Neumark and Wascher.

Yet the more fundamental agreement was the finding of consistent disemployment effects for the target group examined. Our preferred estimates of the elasticity of the adult female employment-to-population ratio with respect to the minimum wage ranged from –0.042 to –0.347 in the basic model and from –0.145 to –0.734 in the augmented model. These are not trivial values for developed nations.

Appendix

Table A.1. Estimates of the Standard Minimum Wage Model Using International Data for the Unemployment Outcome

Variable	*OLS*			*FE*		*GMM*	
Lagged adult female unemployment						0.691***	0.663***
						[0.075]	[0.088]
Lagged minimum-to-median wage ratio	–0.005	–0.025	0.033	0.034	0.033	0.046***	0.046***
	[0.015]	[0.023]	[0.024]	[0.048]	[0.036]	[0.015]	[0.015]
Adult male unemployment rate	1.029***	0.745***	0.822***	0.732***	0.704***	0.388***	0.395***
	[0.084]	[0.080]	[0.092]	[0.081]	[0.076]	[0.070]	[0.075]
Wage gap	0.021***	–0.008			–0.020*		–0.011
	[0.005]	[0.008]			[0.010]		[0.007]
Fertility rate	0.027*	–0.130***			–0.030		–0.019*
	[0.014]	[0.038]			[0.044]		[0.011]
Lagged Minimum-to-Median Wage Ratio interacted with:							
Wage gap	–0.054***	0.015			0.044*		0.017
	[0.013]	[0.017]			[0.024]		[0.014]
Fertility rate	–0.151***	0.126*			-0.023		0.017
	[0.025]	[0.072]			[0.079]		[0.029]
Constant	0.000	0.093***	0.005	0.01	0.039**	–0.021**	–0.008
	[0.008]	[0.015]	[0.010]	[0.024]	[0.018]	[0.009]	[0.012]
Minimum wage effect	0.021	–0.044**	0.033	0.034	0.032*	0.046	0.042***
	[0.031]	[0.021[			[0.018]		[0.007]
Minimum wage elasticity	0.149	–0.313**	0.231	0.238	0.229*	0.324	0.295***
	[0.221]	[0.145]			[0.131]		[0.05]
Country fixed effects	No	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Country specific time trends	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	339	339	339	339	339	307	307
R-squared	0.697	0.88	0.847	0.863	0.881		
Number of countries				16	16	14	14

Notes: See Notes to Table 3.

* Statistically significant at the .10 level; ** at the .05 level; *** at the .01 level.

Table A.2. Estimates of the Augmented Minimum Wage Model with Characteristics of Minimum Wage Systems and Other Labor Market Policies and Institutions for the Unemployment Outcome

Variable	*OLS*		*FE*		*GMM*	
Lagged adult female Unemployment					0.580***	0.571***
					[0.064]	[0.067]
Lagged min-to-median wage ratio	–0.009	0.054	0.015	–0.055	0.118***	0.073*
	[0.091]	[0.072]	[0.114]	[0.087]	[0.049]	[0.040]
Adult male unemployment rate	0.860***	0.812***	0.659***	0.637***	0.416***	0.412***
	[0.093]	[0.077]	[0.089]	[0.086]	[0.074]	[0.071]
Wage gap		0.058***		0.010		–0.007
		[0.015]		[0.022]		[0.009]
Fertility rate		–0.104***		0.012		0.005
		[0.029]		[0.035]		[0.016]
Bargained minimum wage	–0.211***	–0.115***	–0.064	–0.076		
	[0.039]	[0.035]	[0.061]	[0.062]		
Youth subminimum	0.087	0.100**				
	[0.062]	[0.050]				
Subnational minimum	0.132***	0.049				
	[0.051]	[0.045]				
Employment protection index	0.048***	0.046***	0.049	0.051	0.026**	0.026*
	[0.017]	[0.018]	[0.045]	[0.053]	[0.013]	[0.015]
Union density	0.020**	0.034***	0.041*	0.032	0.012	0.006
	[0.011]	[0.012]	[0.023]	[0.020]	[0.009]	[0.009]
Unemployment insurance replace-	0.126***	0.076***	0.037	0.041	0.019	0.029***
ment rate	[0.021]	[0.017]	[0.030]	[0.025]	[0.014]	[0.009]
Active labor market policies	–0.017	–0.024***	–0.017	-0.014	0.001	0.003
	[0.014]	[0.011]	[0.010]	[0.009]	[0.007]	[0.007]
Labor standards index	0.046*	0.060***				
	[0.024]	[0.021]				
Lagged Minimum to Median Wage Ratio interacted with:						
Wage gap		–0.109***		–0.028		0.006
		[0.032]		[0.048]		[0.020]
Fertility rate		0.101**		–0.069		–0.022
		[0.060]		[0.071]		[0.031]
Bargained minimum wage	0.359***	0.265***	0.305*	0.265	0.230***	0.207**
	[0.079]	[0.072]	[0.158]	[0.181]	[0.080]	[0.084]
Youth subminimum	–0.086	–0.186*	–0.133	–0.076	–0.137*	–0.086
	[0.112]	[0.095]	[0.126]	[0.109]	[0.073]	[0.061]
Subnational minimum	–0.229**	–0.164*	–0.176	–0.104	–0.164***	–0.142***
	[0.107]	[0.095]	[0.125]	[0.142]	[0.051]	[0.052]
Employment protection index	–0.033	–0.062*	–0.079	–0.094	–0.042*	–0.045
	[0.030]	[0.033]	[0.090]	[0.103]	[0.024]	[0.028]
Union density	–0.01	–0.038	–0.063	–0.046	–0.012	–0.001
	[0.024]	[0.023]	[0.044]	[0.040]	[0.018]	[0.018]
Unemployment insurance replace-	–0.181***	–0.096***	–0.001	–0.007	–0.007	–0.023
ment rate	[0.037]	[0.030]	[0.071]	[0.062]	[0.032]	[0.024]
Active labor market policies	0.026	0.042**	0.023	0.02	–0.006	–0.009
	[0.027]	[0.021]	[0.020]	[0.020]	[0.014]	[0.014]
Labor standards index	–0.165***	–0.170***	–0.078	–0.073	–0.001	0.003
	[0.042]	[0.037]	[0.085]	[0.098]	[0.036]	[0.036]
Constant	0.054	0.066**	0.097**	0.116**	0.014	0.027
	[0.040]	[0.030]	[0.037]	[0.045]	[0.015]	[0.018]

(*continued*)

Table A.2. Continued

Variable	*OLS*		*FE*		*GMM*	
Minimum wage effect	–0.030	0.011	–0.004	–0.039	0.080***	0.051
	[0.139]	[0.123]	[0.059]	[0.059]	[0.035]	[0.032]
Minimum wage elasticity	–0.210	0.081	–0.027	–0.274	0.568***	0.364
	[0.988]	[0.871]	[0.423]	[0.423]	[0.245]	[0.224]
Country fixed effects	No	No	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country specific time trends	Yes	Yes	Yes	Yes	Yes	Yes
Observations	339	339	339	339	307	307
R-squared	0.935	0.951	0.919	0.923		
Number of countries			16	16	14	14
Hausman/Sargan tests (*p*-values)	0.000	0.000	0.001	0.000	—	—

Notes: See Notes to Table 3 and Table 4.
* Statistically significant at the .10 level; ** at the .05 level; *** at the .01 level.

References

Addison, John T., and Paulino Teixeira. 2003. The economics of employment protection. *Journal of Labor Research* 24(1): 85–128.

———. 2009. Are good industrial relations good for the economy? *German Economic Review* 10(3): 253–69.

Addison, John T., McKinley L. Blackburn, and Chad D. Cotti. 2012. The effect of minimum wages on labor market outcomes: County-level estimates from the restaurant-and-bar sector. *British Journal of Industrial Relations* 50(3): 412–35.

Alesina, Alberto, Yann Algan, Pierre Cahuc, and Paola Giuliano. 2010. Family values and the regulation of labor. IZA Discussion Paper No. 4747. Bonn: Institute for the Study of Labor/Forschungsinstitut zur Zukunft der Arbeit.

Arellano, Manuel, and Stephen Bond. 1981. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies* 58(2): 277–97.

Bertola, Giuseppe, Francine D. Blau, and Lawrence M. Kahn. 2007. Labor market institutions and demographic employment patterns. *Journal of Population Economics* 20(4): 833–67.

Blanchard, Olivier, and Justin Wolfers. 2000. The role of shocks and institutions in the rise of European unemployment: The aggregate evidence. *Economic Journal* 110(462): C1–C33.

Blau, Francine D., and Lawrence M. Kahn. 2003. Understanding international differences in the gender pay gap. *Journal of Labor Economics* 21(1): 106–44.

Boockmann, Bernhard. 2010. The combined employment effects of minimum wages and labor market regulation: A meta-analysis. IZA Discussion Paper No. 4983. Bonn: Institute for the Study of Labor/Forschungsinstitut zur Zukunft der Arbeit.

Busse, Matthias, and Carsten Hefeker. 2007. Political risk, institutions and foreign direct investment. *European Journal of Political Economy* 23(2): 397–415.

Cahuc, Pierre, and André Zylberberg. 1999. Job protection, minimum wage and unemployment. IZA Discussion Paper No. 95. Bonn: Institute for the Study of Labor/Forschungsinstitut zur Zukunft der Arbeit.

Card, David, and Alan B. Krueger. 1994. Minimum wages and employment: A case study of the fast-food industry in New Jersey and Pennsylvania. *American Economic Review* 85(5): 772–93.

———. 1995. Time-series minimum wage studies: A meta-analysis. *American Economic Review* 85(2): 238–43.

Coe, David T., and Dennis J. Snower. 1997. Policy complementarities. The case for fundamental labor market reform. *IMF Staff Papers* 44(1): 1–35.

Dolado, Juan, Francis Kramarz, Stephen Machin, Alan Manning, David Margolis, and Coen

Teulings. 1996. The economic impact of minimum wages in Europe. *Economic Policy* 11(23): 319–72.

Feldmann, Horst. 2007. Protestantism, labor force participation and employment across countries. *American Journal of Economics and Sociology* 66(4): 795–816.

Fiori, Giuseppe, Giuseppe Nicoletti, Stafano Scarpetta, and Fabio Schiantarelli. 2007. Employment outcomes and the interactions between product market and labor market deregulation: Are they substitutes or complements? IZA Discussion Paper No. 2770. Bonn: Institute for the Study of Labor/Forschungsinstitut zur Zukunft der Arbeit.

Hausman, Jerry A., and William E. Taylor. 1981. Panel data and unobservable individual effects. *Econometrica* 49(6): 1377–98.

Kahn, Lawrence M. 2012. Labor market policy: A comparative view on the costs and benefits of labor market flexibility. *Journal of Policy Analysis and Management* 31(1): 94–110.

Lazear, Edward P. 1990. Job security provisions and employment. *Quarterly Journal of Economics* 105(3): 699–726.

Mincer, Jacob. 1976. Unemployment effects of minimum wages. *Journal of Political Economy* 84 (4, part 2): S87–S104.

Neumark, David, and William Wascher. 1992. Employment effects of minimum and subminimum wages: Panel data on state minimum wage laws. *Industrial and Labor Relations Review* 46(1): 55–81.

———. 2002. State-level estimates of minimum wage effects: New evidence and interpretations from disequilibrium models. *Journal of Human Resources* 37(1): 35–62.

———. 2004. Minimum wages, labor market institutions, and youth employment: A cross-country analysis. *Industrial and Labor Relations Review* 57(2): 223–48.

———. 2007. Minimum wages and employment. IZA Discussion Paper No. 2750. **Bonn: Institute for the Study of Labor/Forschungsinstitut zur Zukunft der Arbeit.**

Nickell, Stephen, and Richard Layard. 1999. Labor market institutions and economic performance. In Orley Ashenfelter and David Card (Eds.), *Handbook of Labor Economics*, Vol. 3, pp. 3029–84. New York: Elsevier.

Nickell, Stephen, Luca Nunziata, and Wolfgang Ochel. 2005. Unemployment in the OECD since the 1960s. What do we know? *Economic Journal* 115(500): 1–27.

Nickell, William. 2006. The CEP-OECD institutions data set (1960–2004). CEP Discussion Paper No. 759. London: Centre for Economic Performance, London School of Economics and Political Science.

[OECD] Organization for Economic Cooperation and Development. 1994. *The OECD Jobs Study: Evidence and Explanations. Part II: The Adjustment Potential of the Labour Market.* Paris: OECD.

———. 1998. Making the most out of the minimum: Statutory minimum wages, employment and poverty. *Employment Outlook*, Chapter 2, pp. 31-79. Paris: OECD.

Ozturk, Orgul Demet. 2006. Employment effects of minimum ages in markets with fixed employment costs. Unpublished manuscript, University of Wisconsin-Madison.

Ruhm, Christopher J. 1998. The economic consequences of parental leave mandates: Lessons from Europe. *Quarterly Journal of Economics* 113(1): 285–317.

Ruhm, Christopher J., and Jacqueline L. Teague. 1997. Parental leave policies in Europe and North America. In Francine Blau and Ronald G. Ehrenberg (Eds.), *Gender and Family Issues in the Workplace,* pp. 133–56. New York: Russell Sage Foundation.

Scarpetta, Stefano. 1996. Assessing the role of labor market policies and institutional settings on unemployment: A cross-section study. *OECD Economic Studies*, no. 26, pp. 43–98.

Siebert, Horst. 1997. Labor market rigidities: At the root of unemployment in Europe. *Journal of Economic Perspectives* 11(1): 37–54.

Skedinger, Per. 2010. Sweden: A minimum wage model in need of modification. In Daniel Vaughan-Whitehead (Ed.), *The Minimum Wage Revisited in the Enlarged EU*, pp. 367–406. Cheltenham and Northampton: Edward Elgar.

Visser, Jelle. 2006. Union membership statistics in 24 countries. *Monthly Labor Review* 129(1): 38–49.