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Document de Travail n° 2020 – 47

*Octobre 2020*



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# Reforms of Collective Bargaining Institutions in European Union Countries: Bad Timing, Bad Outcomes?*

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October, 2020

**Abstract**

This paper investigates whether flexibility-enhancing reforms of national collective bargaining systems have positive outcomes in terms of employment and unemployment in the short-term, especially when implemented during an economic downturn. The analysis consists in applying local projections to a novel panel database of reforms of collective bargaining institutions in EU countries in the period 2000–2018. There is no evidence that making collective bargaining institutions more flexible during a recession has a positive effect on employment or unemployment in the short term. More specifically, reforms that reduce bargaining coverage have negative short-term effects, particularly on the employment of young people and low-educated workers, and are associated with a decline in the share of temporary jobs. The results do not support the idea that collective bargaining institutions should be reformed during a recession to boost employment.

**Keywords:** Employment, Unemployment, Short-term effects, Labor market, Collective bargaining, Reforms

**JEL Classification:** E24, E32, J08, J21, J50

*I would like to thank François Fontaine (PSE), Mathieu Lefebvre (BETA) and Late Ayao Lawson (BETA) for their helpful comments. I also thank Mehdi El Herradi (AMSE) for his help with Stata codes related to the Local Projections method.

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# 1 Introduction

*"The Great Recession has not been kind to collective bargaining."*
(Visser, 2016, p.3)

During the Great Recession, many European labor markets were reformed with the aim of maintaining price competitiveness to limit unemployment. The reforms mainly facilitated workforce management, by weakening job protection (facilitating adjustment by quantities) and increasing the flexibility of wages and employment conditions (facilitating price adjustment). Many of these reforms were prioritized by European economic governance (the European Central Bank, International Monetary Fund, European Commission and national governments) both in the European Semester, through their inclusion in the Macroeconomic Imbalance Procedure, and by setting them as conditions for financial assistance (Leonardi and Pedersini, 2018).[1] As a result, collective bargaining institutions have undergone major changes, as pointed out by Visser (2016). Did these reforms carried out during the economic crisis increase or decrease employment? This paper provides some evidence to answer this question.

Collective bargaining refers to negotiations between workers' representatives, usually organized in trade unions, and employers on several aspects of employment contracts, such as wages, overtime pay, bonuses, working hours, and health and safety rules in the workplace. Political considerations notwithstanding, the trade unions' main objective is to defend the interests of their members, or of all workers when the agreements they negotiate apply to the whole workforce through administrative extension procedures. This objective leads to a compression of nominal wages and therefore to real wage rigidity (Holden and Wulfsberg, 2008; Babecky et al., 2010; Guimaraes et al., 2017). It is this rigidity that motivated the collective bargaining reforms undertaken during the Great Recession, namely *(i)* reducing the scope of collective bargaining (e.g., ending the mandatory extension of collective agreements to non-organized employers, reducing the length of agreements and their validity beyond expiry); *(ii)* decentralizing bargaining by moving it closer to the firm-level (e.g., abolishing the favorability principle, allowing derogation, developing temporary clauses to renegotiate higher-level agreements at a lower level, or simply removing higher levels of bargaining) *(iii)* reducing the influence of trade unions (e.g., restricting the right to strike, tightening representativeness criteria or limiting the voice of trade unions in national tripartite councils).[2]

It is far from clear however that shifts from inclusive to more exclusive collective bargaining systems are beneficial, especially during economic recessions. Several arguments can be made that changing the structure of collective bargaining during a recession does not necessarily yield the expected outcomes in the short term. As argued by Brandl and Ibsen (2017), the institutional stability of collective bargaining is needed to moderate unit

[1] One of the goals of the European Semester is to implement '*structural reforms, to create more jobs and growth*' (see. The European Semester: why and how).

[2] See Marginson (2015); Koukiadaki and Grimshaw (2016) and Visser (2016).

labor cost growth. Their theoretical argument, which motivates my research question, comes from the literature on institutional economics (Knight and Jack, 1992; Hall and Soskice, 2001; Baccaro and Simoni, 2010; Pierson, 2011). Changing the way institutions work alters the distribution of power between the main protagonists, who struggle to retain as much of it as possible. These struggles reduce the capacity for collective action and the ability of institutions to function as they should. More specifically, reforms of collective bargaining institutions alter horizontal arrangements (between bargaining units at the same level) and/or vertical arrangements (between different levels of bargaining) and thus alter power relations within the system itself, with workers' representatives given new missions and responsibilities. As a result, they have only a very vague idea of the potential gains and losses of signing agreements, which sometimes involve significant transaction costs. In the end, workers' representatives struggle to fulfill one of their main roles, which is to reduce uncertainty by negotiating stable agreements that ensure stable labor cost growth, stable agreements being crucial for employers' workforce planning (Zagelmeyer, 2005). This argument gains even more weight when placed in perspective with path dependency theories. Indeed, according to neo-institutionalist thinking and historical dependence, wage bargaining institutions should be characterized by inertia, i.e. not change much. However, they are often altered by rather abrupt reforms, sometimes imposed by supranational institutions, which amplify institutional instability and its potentially adverse effects (Marginson, 2015).

Taking prevailing economic conditions into account, the timing of the reform is crucial in this context, mainly because trade unions' objectives vary over the business cycle. Unions are more aggressive during recessions, which explains why wage premiums are countercyclical (Freeman and Medoff, 1984; Bratsberg and Ragan Jr, 2002; Blanchflower et al., 2004). As outlined theoretically by Morin (2017), the cyclicality of trade unions' objectives is also driven by the trade-off they face between employment and wages. The trade unions' marginal rate of substitution fluctuates endogenously. When unemployment is low, unions focus on wages because the marginal utility of increasing wages is high. This arbitration remains when a recession hits. However, once the shock has spread and unemployment is high, trade unions focus on employment.

While the literature on the effects of trade unions and collective bargaining on economic performance is extensive, there is still very little evidence on the short-term economic effects of collective bargaining reforms, and even less with the timing of the reforms taken into account (see Addison (2016) for a recent survey). Yet this is a key issue in the shaping of economic policies during economic crises.[3] Exploiting data on reforms of collective bargaining institutions implemented by EU countries since 2000, this paper evaluates their employment outcomes, depending on whether they were implemented in a period of recession or a period of expansion. The paper approaches the question from

[3]Mario Draghi stressed the need for further research on the evaluation of structural reforms in the euro area, declaring: *"we should evaluate how the design of reforms and the overall policy mix affect the impact of structural policies, especially during a downturn"* - Frankfurt on 18 October 2017, speech at the conference entitled "Structural reforms in the euro area".

a macroeconomic perspective by analyzing the short-term effects on the employment and unemployment rates — the aggregate values, and by age, level of education and type of contract. For this purpose, I built an original database of all the reforms of national collective bargaining systems carried out between 2000 and 2018 in EU countries and classified them using a typology that allows their effects to be analyzed in detail. I assess their impacts on employment using local projections (LP) (Jordà, 2005), an approach that is robust to misspecification, allows for non-linearities and cross-sectional dependence, and addresses uncertainties on possible interactions between the reforms considered and the macroeconomic environment. I explore the sensitivity of the results to alternative empirical strategies, including changes in lags, addition of controls and substitution of the reform variables. Finally, although endogeneity does not seem to be an important issue in this study, I present instrumental variable (IV) estimates as a precaution, using original instruments based on geographically close reforming countries and how minimum wages are set in the domestic country.

The main findings are that reforms to make wage bargaining institutions more flexible should not be introduced during an economic recession, as these types of reforms have a detrimental effect on employment in the first few years after their implementation. The results also suggest that the most affected groups are young and low-educated workers, by both the negative effects of reforms that reduce bargaining coverage and by the positive effects of trade union reforms that reduce their capacity to represent workers. One possible transmission channel for the negative effects is the decline in the share of temporary jobs in total employment.

My work has implications for economic governance in the EU. When policy-makers request collective bargaining reforms from national governments, a crucial consideration is the timing of these reforms. Indeed, when they are implemented during an economic downturn, they do not have the expected beneficial effects on employment and may even be detrimental. It might be worth considering a "positive conditionality" mechanism, as suggested by Boeri and Jimeno (2016).

The paper proceeds as follows. Section 2 outlines the literature related to my research question. Section 3 presents the data used in the empirical investigation. The empirical methodology is described in Section 4. Section 5 presents the results. Section 6 discusses the issue of endogeneity. Section 7 concludes.

## 2 Related Literature

This paper is part of a renewed literature on the impact of structural reforms on the economy and the labor market. Many studies have shown that the characteristics of the tax system, employment protection legislation (EPL), activation policies and wage determination are key determinants of the employment and unemployment rates, with Nickell and Layard (1999) and Blanchard and Wolfers (2000) often seen as pioneering papers.

From a theoretical standpoint, studies inspired by recent *Mortensen-Pissarides*-style labor market modeling show that labor market deregulation may have short-term negative effects because the layoffs they imply occur immediately, while positive effects on hiring and firm creation take some time to percolate through the system (Cahuc et al., 2014; Cacciatore et al., 2016). Also involved in the effect of labor market reforms is membership of a common currency area, as is the case for several of the EU countries analyzed in this paper. Galí and Monacelli (2016) show that the success of reforms that increase wage flexibility depends on how prices evolve. That is, if in order to increase price competitiveness, wage flexibility is increased through wage bargaining decentralization but prices do not fall accordingly, the result will be a decline in purchasing power and no gain in competitiveness. However, price evolution in the Eurozone is shaped by the European Central Bank (ECB), whose mandate is to ensure price stability throughout the euro area, without regard to the situation in particular countries. This may explain the poor success, at least in the short term, of the adjustment programs imposed on some southern countries. In the same vein, Cacciatore et al. (2016) demonstrate that labor reforms do not lead to deflation and therefore do not require interest rates to be lowered in subsequent years.

While many studies of the influence of collective bargaining and trade unions have investigated the influence of bargaining coverage, bargaining centralization, and unionization – with sometimes conflicting results (see Aidt and Tzannatos (2008) and chapter 3 in OECD (2019) for a complete review), very few analyze the specific effects of reforms of features of collective bargaining systems. Gnocchi et al. (2015) show from a panel of 19 OECD countries that reforms of wage-setting institutions that make the labor market more flexible strengthen the correlation between wages and productivity over the business cycle and increase unemployment volatility. Fiori et al. (2012) theoretically and empirically explore potential synergies between product and labor market reforms and their effects on employment. They find that product market deregulation yields better employment outcomes when workers have strong bargaining powers. The theoretical mechanism is as follows. When workers have little bargaining power, real wages are already at levels conducive to full employment in the labor market, leaving little room for the positive effects of product market reforms, unlike when workers have strong bargaining powers.

Many collective bargaining reforms aim to maintain or enhance firms' competitiveness by allowing employers to use internal flexibility mechanisms, in particular the ability to easily adjust labor costs to productivity changes and thus avoid external flexibility (i.e. dismissals). As summarized by Sánchez et al. (2017), the key channels through which these reforms can rapidly influence activity in "normal times" (i.e. outside of a severe recessions) are (i) an increased responsiveness of wages to local labor and product markets, (ii) a decrease in real wages for low-skilled workers, increasing the corresponding labor demand, but with an ambiguous effect on aggregate disposable income and consumption, (iii) higher markups because of lower labor costs, which for firms dependent on internal financing leads to more investment, (iv) lower prices because of lower labor costs, which

increases demand via net exports. These effects promote employment. However, this ignores some of these reforms' other effects. Brandl and Ibsen (2017) and Brandl and Ibsen (2019) highlight an aspect neglected by most studies, which is the institutional instability that reforms of collective bargaining systems induce. These authors show that institutional changes limit the capacity of these systems to moderate unit labor cost growth in subsequent years, whether or not the reforms are protection-raising or flexibility-enhancing. As major determinants of these adverse effects, they point to the detrimental influence of these changes on trust between negotiating parties and the more uncertain nature of the negotiating environment. Hijzen et al. (2017) compare the existing collective bargaining systems in the Netherlands and Portugal. While after decentralization reforms, both systems are now similar, their outcomes are different: the Portuguese system seems to perform less than the Dutch system. This difference in performance is due to the pace at which changes have taken place. Indeed, in the Netherlands, reforms were gradually implemented in a climate of consensual labor relations (after the Wassenaar agreement of 1982). On the contrary, in Portugal, after a status quo for several decades, they implemented abrupt reforms in response of the Great Recession.

The effect of labor market reforms may also depend on the state of the economy when they are implemented and this is an issue that has been investigated several times recently using LPs. However, these papers focus mainly on EPL reforms, showing that flexibility-enhancing reforms decrease employment when they are implemented during an economic downturn and increase employment during periods of positive growth (Bassanini and Cingano, 2019; Duval et al., 2020).

The present paper addresses some of the same questions as Bouis et al.'s (2012). The latter assesses – among other institutional reforms – the effects of administrative extensions of bargaining agreements, measured by the difference between the coverage rate of workers and union density in OECD country-level panel data over the period 1983–2007. Using a quantitative measure of this "excess" coverage by collective agreements, they consider a strong decline in this indicator to be equivalent to a reform shock. They estimate impulse response functions (IRF) and show that decreases in administrative extensions of collective agreements reduce unemployment and increase employment, especially for the oldest workers. They also present some evidence that reductions in "excess" coverage have beneficial effects on the employment of most workers regardless of whether the economy is in recession or expansion.

Excess coverage as a proxy for administrative extensions of collective agreements is in many ways a good indicator of institutional reforms – in particular because it is a continuous and non-subjective variable – but it has some limitations. Indeed, union density and collective bargaining coverage rates are relatively stable in many countries, and in that sense vary slowly. In addition, when the coverage rate varies, lack of data makes it difficult to know exactly why, e.g. whether it may be due to withdrawal from employers' associations (Villanueva, 2015; Visser, 2016). Also, during crises prior to the Great Recession, the unionization rate decreased more than bargaining coverage did,

thus increasing excess coverage without any relaxation of the procedures for extending agreements (Visser, 2016). It therefore seems more appropriate to use excess coverage in a static perspective than to identify reforms.

# 3 Data

In this section I present and justify my choices of data and variables for the empirical analysis. I consider the 28 member states of the European Union, namely Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom[4]. The time span is 2000-2018.[5]

## 3.1 Macroeconomic Aggregates

I use several macroeconomic aggregates. First, the dependent variable is either the employment rate – the proportion of the working age population (15–64 years old) in work - or the unemployment rate – the proportion of the labor force (15–74 years old) out of work. This choice of dependent variables stems from the research question of how collective bargaining reforms have affected firms' labor adjustments. Indeed, changes in employment/unemployment rates largely reflect firms' hiring and firing decisions from a macroeconomic perspective. Second, I consider several control variables in the different specifications, namely the output gap to control for cyclical fluctuations, the yield curve to capture financial instability, the change in total government expenditure (excluding interest) to control for fiscal stimulus, and the short term interest rate to adjust for monetary policy. Finally, I consider additional control variables to account for changes in the institutional environment of the labor market, including changes in EPL and expenditure related to labor market policies. The latter include expenditures on public employment services and administration, on training, on employment incentives, on sheltered and supported employment, on direct job creation, on start-up incentives, and on early retirement and out-of-work income maintenance and support. Table 1 presents the main statistical characteristics of the variables.

[4]the United Kingdom is included as I consider membership as of 2017.

[5]The time period considered is bounded by data availability.

Table 1 – Summary statistics - Macroeconomic variables

| Variable | Obs | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| **Dependent variables** | | | | | |
| Employment rate of 15–64-year-olds (%) | 529 | 64.48 | 6.30 | 48.80 | 77.40 |
| Unemployment rate of 15–74-year-olds (%) | 532 | 8.83 | 4.35 | 1.90 | 27.50 |
| Temporary employment rate (%) | 527 | 11.41 | 6.72 | 1.00 | 33.95 |
| Employment rate of 15–24-year-olds (%) | 530 | 34.47 | 12.68 | 11.84 | 70.02 |
| Employment rate of 25–54-year-olds (%) | 530 | 78.25 | 5.34 | 61.04 | 87.66 |
| Employment rate of 55–64-year-olds (%) | 530 | 45.96 | 11.87 | 20.81 | 78.15 |
| Employment rate of low-educated adults (%) | 421 | 53.12 | 9.55 | 26.28 | 73.13 |
| Employment rate of secondary-educated adults (%) | 421 | 74.06 | 5.41 | 54.07 | 86.74 |
| Employment rate of tertiary-educated adults (%) | 421 | 84.44 | 3.34 | 68.54 | 91.05 |
| **Control variables - Baseline specification** | | | | | |
| Output gap (%) | 531 | -0.30 | 3.40 | -15.90 | 13.86 |
| Yield Curve (%) | 500 | 1.61 | 2.10 | -6.98 | 21.93 |
| Change in government expenditure (excluding interest) (%) | 503 | 2.62 | 5.44 | -28.03 | 40.88 |
| Short-term interest rate (%) | 521 | 0.17 | 2.64 | -9.52 | 25.21 |
| **Control variables - Additional** | | | | | |
| Strictness of employment protection – Regular contracts | 388 | 2.62 | 0.51 | 1.57 | 4.10 |
| Strictness of employment protection – Temporary contracts | 388 | 1.69 | 0.91 | 0.13 | 4.75 |
| Expenditure on labor market policies (%) | 364 | 1.72 | 1.00 | 0.15 | 4.30 |

**Notes**: The detailed definition and source of each variable are provided in Table 9.

### 3.2 Tracking Reforms of Collective Bargaining Institutions in the European Union

The variable of interest is the implementation of a collective bargaining reform.[6] To build a dataset of reforms of collective bargaining systems in all EU countries between 2000 and 2018, I used three main sources of data. The first is the LABREF database provided by the European Commission. This database, validated by the Economic Policy Committee (EPC) of the Economic and Financial Affairs Council (ECFIN), consists of information collected by the Directorate-General for Economic and Financial Affairs (DG ECFIN) from publicly available national and international sources. It describes reforms in several policy fields: labor taxation, unemployment benefits, other welfare-related benefits, active labor market policies, job protection, early withdrawal, wage-setting, working time and immigration/mobility. I focus on wage-setting reform data, which were initially grouped into 5 categories: statutory minima, social pacts, bipartite or tripartite framework agreements on wage-setting, regulation by the government of the wage bargaining framework (e.g. extension of collective agreements, representativeness of social partners, etc.), public wages, or other. From there, I identified and classified reforms that fall into one of the following three categories:[7]

1. Reduction of the coverage of collective bargaining (e.g., abolition of extension procedures or the period of validity of collective agreements after expiry)

[6] I focus on reforms written in law. Reforms may be also implemented in more informal ways, such as through informal agreements between trade unions and employer federations or changes in social norms. It is difficult to obtain data on the former, and the latter is a long-term process that is beyond the scope of this study of short-term effects.

[7] These categories are those proposed by Marginson (2015) to classify recent reforms of the collective bargaining systems in Europe, whose common features allow them to be grouped into three categories.

2. Decentralization of bargaining toward the firm-level (e.g., abolition of higher-level (national-, sectoral-level) agreements, new derogation possibilities for company agreements, suspension of the favorability principle)

3. Weakening of trade unions' role in worker representation (e.g., non-unionized workers allowed to negotiate and sign agreements)

Beyond the descriptive value of this classification, the rationale for breaking down reforms into three categories is as follows. First, the aim of these reforms may be to change a single feature of a collective bargaining system. According to Visser (2016), a collective bargaining system is defined by three main features: *(i)* the scope of collective bargaining: its coverage and the mechanisms that extent agreements to non-organized firms and workers; *(ii)* the vertical structure of collective bargaining: multi-employer or single-employer (the level(s) at which bargaining takes place, the relationship between these levels, existence of opening clauses and the involvement or not of non-union bodies in negotiations) *(iii)* horizontal bargaining coordination between bargaining units: how wage policies are synchronized between units via wage norms, guidelines, patterns and recommendations issued by central organizations or the State (e.g. the SMIC in France affects how wage policies are coordinated). Second, some of the macroeconomic effects of the different features of collective bargaining systems are unclear. This is mainly because the effects do not all seem to go in the same direction and sometimes stem from interactions between different components (Aidt and Tzannatos, 2008). For instance, high union density is only detrimental to employment if coordination between bargaining units in the labor market is weak. Grouping reforms into categories isolates the effects of each component to ensure they are precisely attributed. It also adds refined evidence to the existing literature on the macroeconomic effects of collective bargaining systems and changes in these systems.

I validated and completed the dataset using the ICTWSS database. The latter provides a large set of variables describing the institutional characteristics of trade unions, wage setting, state intervention and social pacts in 55 countries between 1960 and 2018. I selected categorical variables that characterize elements related to either the coverage of agreements, bargaining centralization or the capacity of trade unions to represent workers[8]. More precisely, I verified whether the reforms identified through the LABREF database match a variation of the relevant categorical variables in the ICTWSS database. Finally, I consulted information provided by ETUI, describing national industrial relations, to check the consistency of the database by ensuring all major reforms had been included. In addition to the above-mentioned categories of reform, I identified what I call national changes, i.e. changes in national minimum wages or social pacts and tripartite agreements. For instance, in Belgium in 2007, the social partners set the wage standard (i.e. the maximum wage increase) for 2007-2008 at 5%. Another example is the introduction of national legislation on equal pay for men and women. These are not reforms of

[8]The variables are described in more detail in the ICTWSS Codebook..

collective bargaining systems, but correspond to decisions that generally arise from these systems, and may influence employment.

I distinguish flexibility-enhancing reforms that decrease the institutional wedge from protection-raising reforms that increase the institutional wedge. The institutional wedge is defined by Boeri and Van Ours (2013) as a wedge between the marginal productivity of labor and its opportunity cost implied by institutions, affecting equilibrium take-home wages and firms' labor costs either directly or indirectly. For each category of reform, I created two binary variables: one to assess whether the reform increased the institutional wedge (1 if it did, 0 otherwise) and the other to assess whether it decreased the institutional wedge (1 if it did, 0 otherwise). This approach translated collective bargaining reforms into six binary variables. For national changes, I similarly created one dummy variable (1 if yes, 0 otherwise). Table 2 gives an overview of the classification.

A few points should be noted regarding the construction of the reform dataset. Sometimes, reforms in opposite directions succeed each other a few years apart. This usually happens after elections that lead to a change in political orientation. A telling example is Slovakia, which amended its rules on administrative extensions of collective agreements in 2007 (allowing sectoral collective agreements to be extended without company consent), in 2010 (reinstating the requirement of company consent) and in 2014 (removing the company consent requirement). In rare cases, reforms of collective bargaining systems are a package with aspects that increase the institutional wedge and others that reduce it. When these cases arose, I decided on the general direction of the reform by looking at other elements of reform in the same year. In summary, the normative choices made in creating this reform dataset are evidently subject to discussion. Details of the classification by category, country, year, and change in institutional wedge are provided in Table 8.

Table 2 – Summary of the reform classification and examples

| Category | Description | Examples |
|---|---|---|
| Category 1.<br><br>Modification of collective bargaining coverage | These are reforms that modify the coverage of bargaining agreements.<br><br>Characteristics included: extension mechanisms, continued application of collective agreements after expiration, etc. | - *Wedge increase*<br>**Slovakia (2014) -** Change of extensions rules for collective agreements: employer's consent is no longer a condition for extension.<br><br>- *Wedge decrease*<br>**Portugal (2011) -** Suspension by the government of close-to-automatic extensions for wage agreements. |
| Category 2.<br><br>Modification of bargaining centralization/decentralization | These are reforms that change the horizontal arrangement of the different components of collective bargaining<br><br>Characteristics included: levels at which bargaining takes place, possibility of derogation, favorability principle, etc. | - *Wedge increase*<br>**Ireland (2015) -** Re-establishment of a sectoral wage setting system through the creation of a framework for Sectoral Employment Orders.<br><br>- *Wedge decrease*<br>**Greece (2010) -** Introduction of the possibility of derogating from higher level agreements. |
| Category 3.<br><br>Modification of union strength | These are reforms that change the role of trade unions in worker representation.<br><br>Characteristics included: right to strike, representativeness criteria, role of trade unions in national competitiveness councils, etc. | - *Wedge increase*<br>**Latvia (2007) -** Formation of trade unions facilitated and membership opened to all potential workers, including students and the unemployed.<br><br>- *Wedge decrease*<br>**Italy (2013) -** Agreement hardening representativity conditions for trade unions: sectoral collective bargaining only open to those that can justify representation of more than 5% of the workforce (on the basis of membership and election results). |

**Notes**: Based on the author's reform dataset and classification.

The construction of the reform dataset was completed as follows. Since the purpose of the paper is to assess the reforms' effects on employment depending on their timing relative to the business cycle, I categorized the reforms according to whether they were implemented during "good times" or "bad times". I considered economies to be "slack" (bad times) when the output gap was less than -1 and "non-slack" (good times) otherwise. The distribution of the reforms by category and direction of wedge change and in terms of their timing in the business cycle is reported in Table 3.

Table 3 – Distribution of reforms

| | Category 1 | Category 2 | Category 3 |
|---|---|---|---|
| | Modification of bargaining coverage | Modification of bargaining centralization | Modification of union strength |
| **Total** | 55 | 46 | 55 |
| **Wedge increasing** | 34 | 11 | 27 |
| - *Good times* | 19 | 7 | 19 |
| - *Bad times* | 15 | 4 | 8 |
| **Wedge decreasing** | 21 | 35 | 28 |
| - *Good times* | 7 | 11 | 11 |
| - *Bad times* | 14 | 24 | 17 |

**Notes**: Based on the author's reform dataset and classification.

# 4 Empirical Methodology

In this section, I present the methodology I use to assess the dynamic macroeconomic effects of flexibility-enhancing reforms of collective bargaining systems depending on the state of the economy in the business cycle. I analyzed the new dataset of country-level reforms of collective bargaining institutions covering EU countries over the period 2000-2018 using local projections (LPs) (Jordà, 2005). Local projections are a sequence of regressions of the dependent variable shifted several steps ahead, yielding an IRF representing the evolution of a macro variable following structural shocks. I explain the motivations for using LPs to address the research question below. I then present the baseline specification and the subgroup specifications.

First of all, as is common in macroeconomics, analyzing the effects of structural reforms presents an identification challenge (Nakamura and Steinsson, 2018). Collective bargaining systems are not exogenous and not randomized between countries. They are the result of social preferences and norms with specific historical paths and are regularly modified through reforms, implemented before/during/after cyclical economic fluctuations and accompanied by demand-driven stimulus trough expansionary fiscal and monetary policies. It is therefore difficult to know if a change in the employment rate stems from these numerous factors or a given reform. The LP method is convenient for including multiple control variables and therefore allows the various employment-affecting factors acting in parallel to the reforms to be controlled for.

There may be nonlinearities or threshold effects in the way collective bargaining reforms affect employment outcomes. This may be due, for instance, to interactions between collective bargaining and other features of the labor market, such as employment protection, minimum wages and unemployment insurance. Indeed, OECD (2004) has pointed out that "the impact of the organization of collective bargaining on labor market performance appears to be contingent upon other institutional or policy factors and these interactions need to be clarified in order to provide robust policy advice".

Another challenge is to properly identify reforms and their implementation date, which may be later than their inclusion in legislative texts. This challenge is made harder by differences between *de jure* and *de facto* practices: the letter of the law is not necessarily applied to the letter. Collective bargaining reforms may also take time to implement because they often come at the end of a collective agreement or apply only from the following round of works council elections onward. This is why estimating the dynamic effects of a reform over subsequent years, as LP does, is crucial.

Finally, another method that is used to analyse the propagation of structural shocks is structural vector autoregression (SVAR) (Sims, 1980). The conventional wisdom is that SVAR is more efficient and LP is more robust to misspecification, but requires a measure of the shock. I chose LP for this analysis as state-dependence is easily incorporated (useful to account for differences between periods of expansion and recession) and the approach is more robust to misspecification because the coefficients of the IRF are estimated directly

for each time horizon and not recursively[9].

### 4.1 Main Specifications

*Baseline specification* — The main objective is to assess how reforms of collective bargaining systems affect the employment rate and the unemployment rate in the short term at the country level. Using Jordà's (2005) method, LPs are performed from year 0, when the collective bargaining reform is implemented, and employment effects are observed from year 1 to year 5. The baseline LP specification is:

$$Y_{i,t+h} = \theta_h CBR_{i,t} + X'_{i,t}\varphi_h + \gamma_i + \gamma_t + \varepsilon_{i,t+h} \tag{1}$$

for $h = 1, ..., 5$ and where $Y_{i,t+h} = y_{i,t+h} - y_{i,t}$ with $y_{i,t}$ corresponding either to the employment rate or the unemployment rate - depending on the specification used - in country $i$ and year $t$. The reform variable, $CBR_{i,t}$, is 0 if no reform has been implemented, 1 otherwise. $X_{i,t}$ is a vector of control variables, including two lags of the change in employment or unemployment, two lags of dummies representing collective bargaining reforms implemented in previous years, the current and lagged output gap (control for cyclical fluctuations), the current and lagged yield curve (control for financial instability), a dummy representing national changes in minimum wage agreements/legislation during the year or the previous year, and finally, membership of the euro area. $\gamma_i$ and $\gamma_t$ are the fixed effects for country and year, respectively. $\varepsilon_{i,t+h}$ is an error term. The number of lags was chosen based on the Akaike information criterion (AIC) and the Bayesian information criterion (BIC).

The parameter of interest is $\theta_h$, which quantifies the impact of collective bargaining reforms on the cumulative change in the employment (or unemployment) rate at each year horizon from year 1 ($h = 1$), which is assumed to be the year in which the first effects of the reforms can be observed. Equation 1 is estimated via a fixed effects estimator that accounts for heteroscedasticity by clustering at the country-level. (Breusch-Pagan/Cook-Weisberg testing for heteroscedasticity strongly rejected the null of constant variance.)

*Interaction with the Business Cycle* — I consider the economy to be "slack" (bad times) when the output gap is less than -1 and "not slack" (good times) otherwise. The distribution of reforms by category and direction of wedge change according to their positioning in the business cycle is balanced, as shown in the table Table 3. Incorporating the LP specification to account for state dependence, I consider the following regression model:

[9] While Ramey (2016) argues that the two approaches can lead to different conclusions when applied to the same problem, Plagborg-Møller and Wolf (2019) show that under certain conditions, linear LPs and SVARs estimate the same IRF for population parameters.

$$Y_{i,t+h} = \theta_{1h} CBR_{i,t} \times slack_{i,t} + \theta_{2h} CBR_{i,t} \times (1 - slack_{i,t}) + X'_{i,t}\varphi_h + \gamma_i + \gamma_t + \varepsilon_{i,t+h} \quad (2)$$

where *slack* is a variable indicating the state of the economy with respect to the business cycle, with $slack = 1$ in "bad times" and $slack = 0$ in "good times".

### 4.2 Subgroup Specifications

Changes in aggregate employment rates may mask heterogeneous variations in population subgroups, divided for instance by age, level of education, or job status (permanent vs. temporary) (Cahuc et al., 2014). Boeri et al. (2015) note that the effects of minimum wage increases or changes in bargaining coverage can differ between population groups, being particularly detrimental for low-productivity workers – i.e. young and unskilled workers – but beneficial for more senior workers. Moreover, young and low-skilled workers are more likely to be on temporary contracts (ter Weel, 2018).[10] Arguably also, firms' first workforce adjustment strategy when facing institutional instability is to not renew temporary contracts and freeze their hiring plans.

For all these reasons, I analyze the effects of the reforms on components of the aggregate employment rate: the share of temporary contracts in total employment, the employment rates by age (15–24, 25–54 and 55–64 years), and education-level (low, secondary and tertiary).[11]

This exercise provides evidence as to whether collective bargaining reforms affect certain categories of workers more strongly than others. The specifications are similar to those of Eq. (1) (without interaction with the business cycle) and Eq. (2) (interaction with the business cycle), with some modifications:

(i) $y_{i,t}$ corresponds to the employment rate of the subgroup considered in the analysis – i.e. either the temporarily employed, 15–24-year-olds, 25–54-year-olds, 55–64-year-olds, the low-educated, the secondary-educated, or the tertiary-educated – in country $i$ and year $t$.

(ii) $X_{i,t}$ is supplemented by two additional control variables which represent the strictness of employment protection for regular contracts and the strictness of employment protection for temporary contracts. This accounts for the fact that, for example, governments often reduce constraints on the use of temporary jobs in order to boost youth employment (OECD, 2006). More generally, fixed-term employment is replaced by permanent employment when protection of the latter is loosened (Cahuc et al., 2016).

[10] See also the OECD - Temporary Employment data.
[11] As imperfect proxies for seniority and for skills, respectively.

(iii) When the dependent variable is the rate of temporary employment, I add the employment rate of 15–64-year-olds as an explanatory variable, to account for size effects related to the proportion of workers in the population.

# 5 Results

The results obtained on the transitory employment effects of collective bargaining reforms are first presented at the aggregate level, and then for the different subgroups, i.e., by type of contract, age and level of education.

## 5.1 Main Results

Figure 1 shows the cumulative IRF of the employment rate to the implementation of collective bargaining reforms, with 90% confidence bands. It shows that reforms of collective bargaining systems have mixed effects on the employment rate in the short-run. The first row of IRFs illustrates the effects of the reforms without taking timing into account. The bottom rows show what the effects are when interactions with the business cycle are accounted for. Figure 2 presents the results of a similar exercise but investigating changes in the unemployment rate.[12] The estimates are listed in Table 10.

*No interaction with the business cycle* — Implementing a reform that decreases bargaining coverage *(category 1)* has statistically significant negative effect on employment in the first two years after the reform, with a decrease of up to 0.94 percentage points (pp) in the employment rate compared with a no reform scenario [Fig. 1a]. However, reforms that decentralize negotiations closer to the firm-level *(category 2)* do not have a significant effect on the employment rate in the first five years after their implementation [Fig. 1b]. Conversely, reforms that reduce trade unions' ability to represent workers *(category 3)* have a statistically significant positive effect on employment of up to 0.59 pp in the first two years after implementation [Fig. 1c]. The results for the unemployment rate point in the same direction: reforms that reduce bargaining coverage *(category 1)* increase unemployment in the following year [Fig. 2a], while reforms that weaken unions reduce unemployment [Fig. 2c]. In addition however, the unemployment rate decreases significantly in the medium term – i.e. 4–5 years after implementation – when the reform restricts bargaining coverage *(category 1)* [Fig. 2a].

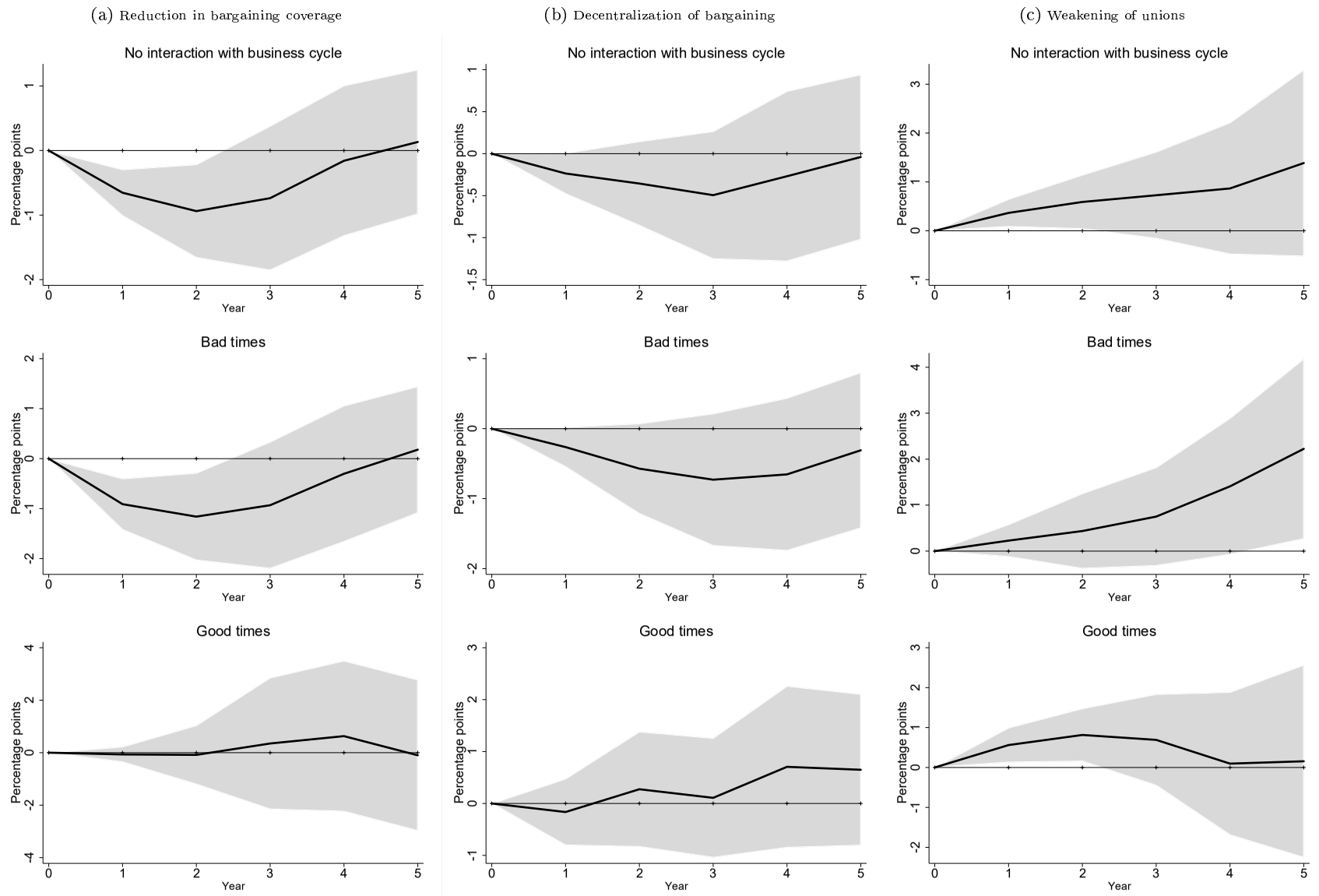
*Interaction with the business cycle* — Reforms do not have the same effect depending on the prevailing economic climate when they are implemented. The negative effect of lowering bargaining coverage *(category 1)* exists only when the reform is implemented during "bad times" [Fig. 1a]. On the contrary, weakening unions by altering their capacity

[12]The employment rate and the unemployment rate are correlated aggregates but differ in the way they are constructed and in what they define. The state of the labor market is often better reflected by the employment rate because its measurement is less biased by possible underlying mechanisms, such as unemployment registration procedures and the precise criteria used to define "unemployment" in official statistics.

to represent workers *(category 3)* only has a beneficial short-term effect on employment in "good times" [Fig. 1c]. Analysis of the unemployment rate reveals that reforms that reduce bargaining coverage *(category 1)* increase unemployment in the following year only in 'bad times', while the positive medium-term effect is observed regardless of the timing of the reform [Fig. 2a].

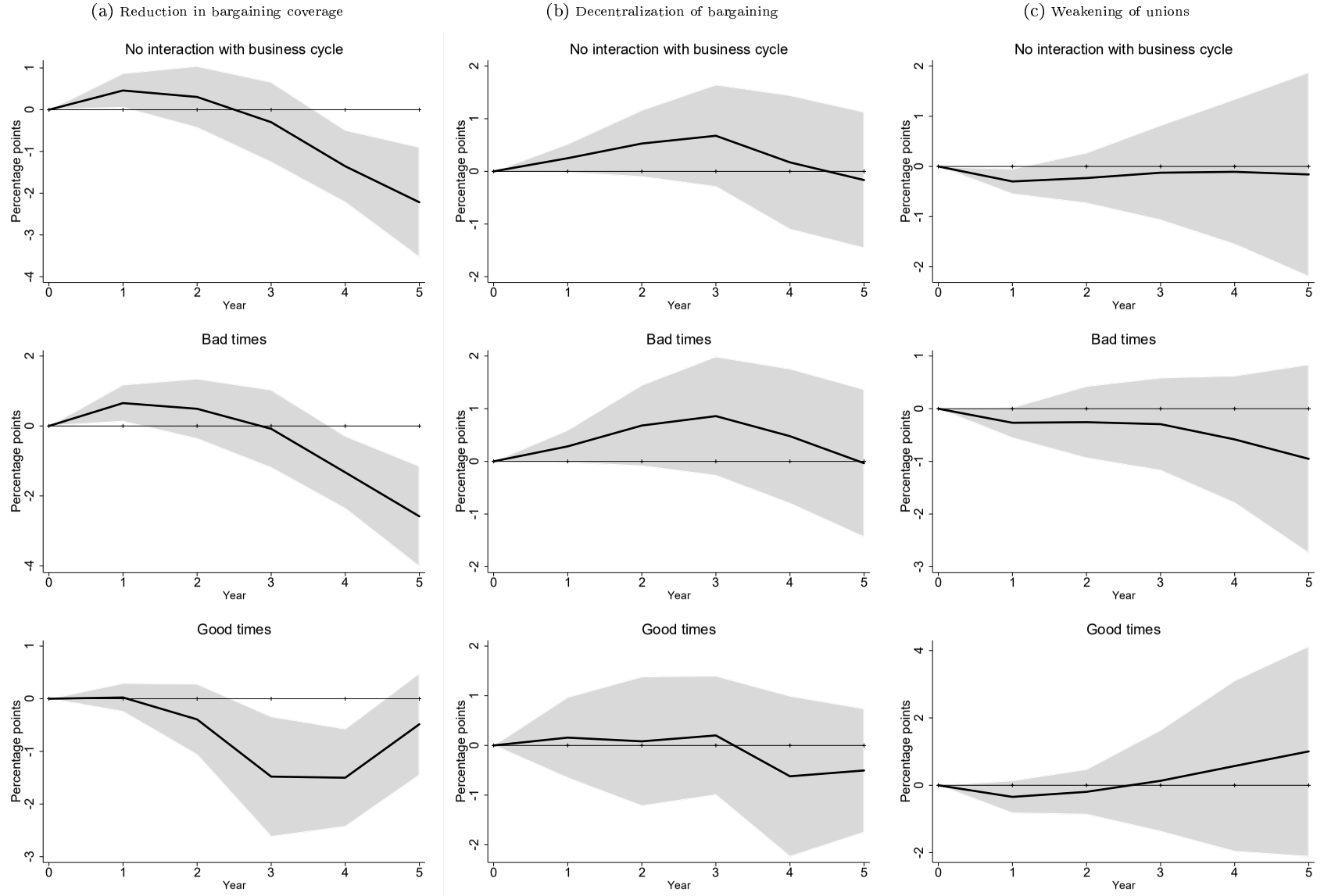
Taken together, these results suggest that reforming collective bargaining in times of economic recession does not boost employment, at least in the short term. It may even have a negative effect in the very short-term, if the reform reduces the coverage of workers by collective agreements. While procedures that extend coverage are detrimental to employment growth and are likely to have accentuated the increase in unemployment following the global financial crisis, as shown by Martins (2014), the results presented here suggest that repealing them during a recession has a negative impact on aggregate employment in the very short term. The effect on the unemployment rate is more ambiguous: a rise in the very short term followed by a fall a few years after the reform. Nevertheless, these results do not contradict the theoretical literature on the short-term negative effects of structural reforms Cahuc et al. (2014); Boeri et al. (2015), although they do diverge from Bouis et al.'s 2012 findings of a positive short term effect of reductions in "excess" coverage.

Figure 1 – Impact of CB Reforms That Decrease the Institutional Wedge on Aggregate Employment




**Notes**: The figures show the cumulative impulse responses of the employment rate of 15–64-year-olds (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on employment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$). The corresponding estimates are listed in Table 10 (a).

Figure 2 – Impact of CB Reforms That Decrease the Institutional Wedge on Aggregate Unemployment




**Notes**: The figures show the cumulative impulse responses of the unemployment rate of 15–74-year-olds (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show effects on unemployment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on unemployment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$). The corresponding estimates are listed in Table 10 (b).

The findings related to the baseline specification shown in Figure 1 and Figure 2 should be interpreted with caution, mainly because the estimated effects on (un)-employment may be partly those of other reforms carried out at the same time. Specification and sensitivity checks are presented in Appendix E.

A first check is to include potentially influential parameters as control variables. Indeed, collective bargaining was not the only labor market institution reformed during the period considered. National EPLs were modified and governments introduced or withdrew certain employment policies (e.g., policies to facilitate employment of women and members of disadvantaged groups). There is a large body of evidence that these changes affected employment (see Boeri et al. (2015) for a literature review). This is controlled for by adding three variables: changes in total public expenditure on labor market policies, changes in indexes of the strictness of employment protection regarding individual and collective dismissals (for regular contracts) and temporary contracts.[13] The main results on the changes in the employment rate are robust to the inclusion of these controls. With this specification furthermore, reforms introduced in "good times" that reduce bargaining coverage now seem to have a detrimental effect on employment, but with a somewhat longer time lag, i.e. only from three years after the reform. These results are presented in Figure 10. For the unemployment rate, the main results are similarly robust to the addition of the control variables. However it seems that the result for the effect of a decline in bargaining coverage only holds in "bad times", with unemployment increasing in the very short term and then decreasing after five years. Reforms that weaken unions reduce the unemployment rate in the very short term, regardless of when in the business cycle they are implemented. The results are presented in Figure 11.

A second check is to assess the sensitivity to the number of lags. Although the baseline specification includes two lags, in accordance with the AIC and BIC, it is important to check that the results do not disappear when the number of lags is changed. I therefore present the estimates of the modified baseline specification with 1 or 3 lags. The results for the employment rate are unchanged, but for the unemployment rate, the differences highlighted are no longer statistically significant. The results are presented in Figure 19 to Figure 22.

A final check is to replace the binary variables representing the collective bargaining reforms with three variable indicators from the ICTWSS database: a categorical variable defining mandatory extension of collective agreements to non-organized employers (as a proxy for reforms that modify bargaining coverage), an index measuring bargaining centralization (as a proxy for reforms that modify bargaining centralization) and a summary measure of the formal authority of unions in setting wages (as a proxy for reforms that modify union strength).[14] An advantage of this final check is that variation in the indicators also provides information on the intensity of the reforms: a larger variation in the indicator means a more substantial change in the collective bargaining institution. The

[13] See Table 9 for details.

[14] All of these variables are defined more precisely in the ICTWSS Codebook.

main results for the employment rate are robust to the use of these indicators as a proxy for reforms. These are presented in Figure 37. However, the unemployment results do not hold when these indicators are used. These results are presented in Figure 38.

Other social norms and policies relating to education or retirement are also likely to affect the employment and unemployment rates, but I consider them to be fairly stable over time, at least over the rather short period considered in this paper, and are therefore captured by the country fixed effects.

### 5.2 Subgroup Results

*Temporary Employment* — Table 4 provides estimates of the impact of collective bargaining reforms on the share of temporary employment in total dependent employment. Reforms that reduce bargaining coverage *(category 1)* have a negative effect on the share of temporary jobs in the short term, especially between the second and fourth year after the reform, regardless of whether the reform is launched in "bad times" or "good times". This result may be consistent with the hypothesis that the institutional instability associated with this type of reform freezes hiring, since in many countries with pronounced duality in the labor market, most hirings are on temporary contracts. However, reforms that decentralize collective bargaining *(category 2)* or reduce the strength of trade unions *(category 3)* do not have a significant effect on temporary employment.

*Employment by Age Group* — Table 5 brings together three subtables, each of which presents the estimated effects of a given type of collective bargaining reform on the employment rate by age group. Table 5a shows that the negative employment effects of reforms that reduce bargaining coverage *(category 1)* are mainly felt by young workers (employment rate of 15–24-year-olds). Table 5b shows that decentralizing bargaining *(category 2)* has no significant effect in any age group. Table 5c presents estimates suggesting that the positive short-term effects of reforms that weaken unions *(category 3)* are concentrated in 15–54-year-olds, but do not benefit older workers. This may be because older workers tend to be more unionized than younger workers (Schnabel, 2013), and are therefore less likely to benefit from reforms that reduce the ability of unions to represent workers. However, this is only a tentative interpretation as the results here are not conclusive. This positive effect of reduced trade union involvement in wage-setting is in keeping with Bertola et al.'s 2007 findings that countries with influential trade unions have lower employment rates for young workers.

*Employment by Education-Level* — Table 6 presents the results in terms of levels of education. Table 6a shows that reforms that reduce bargaining coverage *(category 1)* affect all types of workers in the short run, but more or less intensely: low-educated workers are the most strongly affected, followed by the tertiary-level educated, and to a lesser extent the secondary-level educated. Table 6b shows that reforms that decentralize bargaining closer to the firm level have no significant effect *(category 2)*, while Table 6c shows that reforms that reduce the ability of trade unions to represent workers *(category 3)* increase employment for all workers, with the low-educated benefiting the most.

To summarize, these findings suggest that the effects of collective bargaining reforms differ by type of contract, worker age, and level of education. Although other categories are also affected, the effects are strongest for temporary workers, who tend also to be younger and have a lower level of education.

I present robustness checks for these estimates by subgroups. Along the same lines as for the main results (aggregate employment and unemployment), I add control variables – here, only total expenditure on labor market policies, since employment protection is already present in the specification – (see Figure 12 to Figure 18), investigate sensitivity to the number of lags (see Figure 23 to Figure 36), and use ICTWSS variables as substitutes for the reform dummies (see Figure 39 to Figure 41). The results are all robust to the addition of the extra control variable. In terms of sensitivity to the number of lags, most of the results are robust, with some nuances in the estimation by age subgroup. First, regarding reforms that reduce bargaining coverage, only the results for youth employment (15–24-year-olds) are maintained. Moreover, the effects of weakening unions become insignificant with only 1 lag. Finally, the use of ICTWSS variables instead of the reform dummies only marginally modifies the results for youth employment (15–24-year-olds), while the changes in the employment rate of 25–54-year-olds become non-significant. As for the subgroups by level of education, the negative short-term effects of reductions in bargaining coverage – here the relaxation of extension procedures – remain significant for the low-educated. However, only reforms that reduce the formal authority of trade unions affect temporary employment.

Table 4 – Effects of CB reforms on Temporary Employment - OLS Estimates

| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Category 1** | **Reduction in bargaining coverage** | | | | | |
| | No interaction with business cycle | -0.61* | -1.29** | -1.47*** | -0.50 | 0.30 |
| | | (0.32) | (0.46) | (0.42) | (0.69) | (1.05) |
| | $R^2$ | 0.387 | 0.432 | 0.434 | 0.392 | 0.393 |
| | Observations | 290 | 268 | 246 | 225 | 204 |
| | Bad times | -0.61 | -1.14** | -1.42*** | -0.32 | 0.54 |
| | | (0.36) | (0.52) | (0.49) | (0.80) | (1.20) |
| | Good times | -0.62 | -1.86** | -1.89** | -1.70* | -1.16 |
| | | (0.43) | (0.73) | (0.67) | (0.83) | (0.87) |
| | $R^2$ | 0.387 | 0.434 | 0.435 | 0.394 | 0.396 |
| | Observations | 290 | 268 | 246 | 225 | 204 |
| **Category 2** | **Decentralization of bargaining** | | | | | |
| | No interaction with business cycle | -0.06 | -0.07 | 0.16 | 0.49 | 0.59 |
| | | (0.17) | (0.28) | (0.24) | (0.37) | (0.56) |
| | $R^2$ | 0.371 | 0.405 | 0.410 | 0.395 | 0.401 |
| | Observations | 290 | 268 | 246 | 225 | 204 |
| | Bad times | -0.09 | -0.13 | 0.10 | 0.62 | 0.74 |
| | | (0.17) | (0.36) | (0.32) | (0.44) | (0.63) |
| | Good times | -0.01 | 0.10 | 0.31 | 0.19 | 0.27 |
| | | (0.25) | (0.32) | (0.40) | (0.49) | (0.65) |
| | $R^2$ | 0.372 | 0.406 | 0.411 | 0.396 | 0.402 |
| | Observations | 290 | 268 | 246 | 225 | 204 |
| **Category 3** | **Weakening of unions** | | | | | |
| | No interaction with business cycle | 0.11 | 0.06 | 0.18 | 0.13 | -0.49 |
| | | (0.18) | (0.27) | (0.37) | (0.63) | (0.88) |
| | $R^2$ | 0.372 | 0.405 | 0.410 | 0.390 | 0.395 |
| | Observations | 290 | 268 | 246 | 225 | 204 |
| | Bad times | -0.07 | -0.27 | -0.21 | -0.08 | -1.25 |
| | | (0.26) | (0.41) | (0.38) | (0.72) | (1.15) |
| | Good times | 0.30 | 0.45 | 0.68 | 0.40 | 0.35 |
| | | (0.20) | (0.38) | (0.67) | (0.96) | (0.93) |
| | $R^2$ | 0.374 | 0.409 | 0.414 | 0.391 | 0.406 |
| | Observations | 290 | 268 | 246 | 225 | 204 |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the coefficient estimates. Coefficient estimates of control variables and fixed effects are not reported. The dependent variable is the change in the rate of temporary employment. The control variables are the twice-lagged values of *(i)* the change in the rate of temporary employment; *(ii)* the reform variables (category 1, category 2, category 3, national change); *(iii)* the employment rate of 15–64-year-olds; and the contemporaneous and twice-lagged values of *(iv)* the output gap; *(v)* the yield curve; *(vi)* the short-term interest rate; *(vii)* real total government expenditure excluding interest; *(viii)* indexes of the strictness of employment protection for permanent and temporary contracts ; and the contemporaneous value of *(ix)* euro zone membership. "Bad times" means implementation of the reform when the output gap is $< -1$. "Good times" means implementation of the reform when the output gap is $> -1$. The corresponding IRFs are shown in Figure 3.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# Table 5 – Effects of CB Reforms on Employment - By Age Group - OLS Estimates

(a) Reduction in bargaining coverage

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| **Employment Rate of 15–24-year-olds** | | | | | |
| No interaction with business cycle | -0.74** | -1.97** | -2.27* | -2.09 | -1.81 |
| | (0.35) | (0.86) | (1.17) | (1.58) | (1.62) |
| $R^2$ | 0.515 | 0.593 | 0.612 | 0.619 | 0.659 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| Bad times | -1.09*** | -1.98* | -2.08* | -1.72 | -1.43 |
| | (0.33) | (0.98) | (1.20) | (1.67) | (1.82) |
| Good times | 0.01 | -1.92 | -3.69* | -4.65 | -4.34* |
| | (0.69) | (1.20) | (2.12) | (2.73) | (2.42) |
| $R^2$ | 0.517 | 0.593 | 0.612 | 0.620 | 0.660 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| **Employment Rate of 25–54-year-olds** | | | | | |
| No interaction with business cycle | -0.41* | -0.24 | 0.38 | 0.73 | 1.33 |
| | (0.23) | (0.47) | (0.78) | (0.76) | (0.92) |
| $R^2$ | 0.696 | 0.692 | 0.693 | 0.711 | 0.752 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| Bad times | -0.43 | -0.08 | 0.48 | 0.92 | 1.62 |
| | (0.29) | (0.53) | (0.87) | (0.88) | (1.06) |
| Good times | -0.37 | -0.86 | -0.38 | -0.58 | -0.66 |
| | (0.35) | (0.54) | (1.04) | (1.09) | (1.14) |
| $R^2$ | 0.696 | 0.693 | 0.693 | 0.712 | 0.753 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| **Employment Rate of 55–64-year-olds** | | | | | |
| No interaction with business cycle | -0.61 | -0.43 | -0.03 | 0.34 | 0.57 |
| | (0.61) | (0.68) | (0.90) | (1.12) | (1.21) |
| $R^2$ | 0.471 | 0.556 | 0.585 | 0.628 | 0.666 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| Bad times | -0.99 | -0.58 | -0.13 | 0.05 | 0.41 |
| | (0.73) | (0.83) | (0.99) | (1.21) | (1.36) |
| Good times | 0.22 | 0.17 | 0.71 | 2.37* | 1.65 |
| | (0.73) | (0.55) | (1.08) | (1.22) | (1.50) |
| $R^2$ | 0.477 | 0.557 | 0.585 | 0.629 | 0.666 |
| Observations | 293 | 271 | 249 | 228 | 207 |

(b) Decentralization of bargaining

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| **Employment Rate of 15–24-year-olds** | | | | | |
| No interaction with business cycle | -0.23 | -0.33 | 0.20 | -0.02 | 0.12 |
| | (0.29) | (0.45) | (0.61) | (0.84) | (0.93) |
| $R^2$ | 0.512 | 0.584 | 0.604 | 0.615 | 0.655 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| Bad times | -0.11 | -0.40 | 0.08 | -0.53 | -0.39 |
| | (0.32) | (0.48) | (0.79) | (0.93) | (1.00) |
| Good times | -0.49 | -0.15 | 0.43 | 1.00 | 1.13 |
| | (0.54) | (1.25) | (1.20) | (1.58) | (1.64) |
| $R^2$ | 0.513 | 0.584 | 0.604 | 0.616 | 0.657 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| **Employment Rate of 25–54-year-olds** | | | | | |
| No interaction with business cycle | -0.03 | -0.08 | -0.26 | 0.12 | 0.46 |
| | (0.15) | (0.31) | (0.43) | (0.58) | (0.54) |
| $R^2$ | 0.692 | 0.692 | 0.693 | 0.71 | 0.749 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| Bad times | 0.01 | -0.04 | -0.17 | -0.09 | 0.48 |
| | (0.18) | (0.35) | (0.48) | (0.55) | (0.66) |
| Good times | -0.13 | -0.20 | -0.46 | 0.56 | 0.44 |
| | (0.37) | (0.66) | (0.81) | (1.04) | (0.71) |
| $R^2$ | 0.693 | 0.692 | 0.693 | 0.711 | 0.749 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| **Employment Rate of 55–64-year-olds** | | | | | |
| No interaction with business cycle | -0.25 | -0.20 | -0.36 | -0.34 | 0.06 |
| | (0.36) | (0.42) | (0.68) | (0.86) | (0.84) |
| $R^2$ | 0.466 | 0.556 | 0.586 | 0.628 | 0.665 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| Bad times | -0.15 | -0.51 | -0.59 | -0.36 | 0.02 |
| | (0.38) | (0.60) | (0.92) | (0.93) | (0.85) |
| Good times | -0.48 | 0.58 | 0.13 | -0.30 | 0.14 |
| | (0.49) | (0.40) | (0.62) | (1.16) | (1.37) |
| $R^2$ | 0.467 | 0.56 | 0.587 | 0.628 | 0.665 |
| Observations | 293 | 271 | 249 | 228 | 207 |

(c) Weakening of unions

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| **Employment Rate of 15–24-year-olds** | | | | | |
| No interaction with business cycle | 0.74** | 1.40** | 2.03** | 2.07* | 2.01 |
| | (0.33) | (0.58) | (0.85) | (1.15) | (1.25) |
| $R^2$ | 0.517 | 0.59 | 0.613 | 0.621 | 0.661 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| Bad times | 0.24 | 1.20 | 1.96 | 2.29 | 2.51 |
| | (0.38) | (0.74) | (1.21) | (1.53) | (1.54) |
| Good times | 1.31** | 1.63** | 2.12** | 1.81 | 1.50 |
| | (0.52) | (0.73) | (0.99) | (1.16) | (1.21) |
| $R^2$ | 0.521 | 0.591 | 0.613 | 0.621 | 0.661 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| **Employment Rate of 25–54-year-olds** | | | | | |
| No interaction with business cycle | 0.57*** | 0.84** | 0.79 | 0.75 | 0.51 |
| | (0.17) | (0.35) | (0.54) | (0.63) | (0.73) |
| $R^2$ | 0.703 | 0.699 | 0.696 | 0.712 | 0.749 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| Bad times | 0.34* | 0.66 | 0.89 | 1.15 | 0.99 |
| | (0.18) | (0.50) | (0.74) | (0.72) | (0.84) |
| Good times | 0.84** | 1.05** | 0.67 | 0.26 | -0.01 |
| | (0.30) | (0.37) | (0.51) | (0.82) | (0.81) |
| $R^2$ | 0.705 | 0.699 | 0.696 | 0.713 | 0.750 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| **Employment Rate of 55–64-year-olds** | | | | | |
| No interaction with business cycle | 0.14 | 0.66* | 0.74 | 0.90 | 1.31 |
| | (0.32) | (0.33) | (0.74) | (1.13) | (1.21) |
| $R^2$ | 0.464 | 0.559 | 0.588 | 0.631 | 0.670 |
| Observations | 293 | 271 | 249 | 228 | 207 |
| Bad times | 0.26 | 0.46 | 0.77 | 1.35 | 1.94 |
| | (0.33) | (0.32) | (0.87) | (1.52) | (1.56) |
| Good times | 0.01 | 0.90 | 0.70 | 0.34 | 0.62 |
| | (0.47) | (0.53) | (0.75) | (0.87) | (1.04) |
| $R^2$ | 0.465 | 0.56 | 0.588 | 0.632 | 0.672 |
| Observations | 293 | 271 | 249 | 228 | 207 |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the coefficient estimates. Coefficient estimates of control variables and fixed effects are not reported. The dependent variable is the change in the employment rate of the age-group considered. The control variables are the twice-lagged values of *(i)* the change in the employment rate of the considered age group; *(ii)* the reform variables (category 1, category 2, category 3, national change); and the contemporaneous and twice-lagged values of *(iii)* the output gap; *(iv)* the yield curve; *(v)* the short-term interest rate; *(vi)* real total government expenditure excluding interest; *(vii)* indexes of the strictness of employment protection for permanent and temporary contracts ; and the contemporaneous value of *(viii)* euro zone membership. "Bad times" means implementation of the reform when the output gap is $< -1$. "Good times" means implementation of the reform when the output gap is $> -1$. The corresponding IRFs are shown in Figure 4 to Figure 6.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# Table 6 – Effects of CB Reforms on Employment - By Education Level - OLS Estimates

(a) Reduction in bargaining coverage

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| **Employment Rate of Low-level Educated Adults** | | | | | |
| No interaction with business cycle | -1.20** | -1.06* | -0.10 | 0.95 | 0.92 |
| | (0.43) | (0.57) | (1.04) | (1.13) | (1.44) |
| $R^2$ | 0.526 | 0.599 | 0.631 | 0.648 | 0.660 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| Bad times | -1.26** | -0.83 | -0.32 | 0.78 | 0.72 |
| | (0.50) | (0.53) | (1.09) | (1.28) | (1.62) |
| Good times | -1.06 | -1.95 | 1.49 | 2.13 | 2.37* |
| | (0.76) | (1.40) | (1.19) | (1.35) | (1.24) |
| $R^2$ | 0.526 | 0.600 | 0.632 | 0.648 | 0.661 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| **Employment Rate of Secondary-level Educated Adults** | | | | | |
| No interaction with business cycle | -0.43** | -0.65 | -0.14 | 0.01 | 0.20 |
| | (0.18) | (0.42) | (0.77) | (0.71) | (0.88) |
| $R^2$ | 0.639 | 0.677 | 0.688 | 0.719 | 0.760 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| Bad times | -0.49* | -0.67 | -0.06 | 0.09 | 0.12 |
| | (0.25) | (0.54) | (0.87) | (0.84) | (1.02) |
| Good times | -0.30 | -0.59 | -0.70 | -0.61 | 0.77 |
| | (0.34) | (0.42) | (1.22) | (1.00) | (0.90) |
| $R^2$ | 0.639 | 0.677 | 0.688 | 0.719 | 0.760 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| **Employment Rate of Tertiary-level Educated Adults** | | | | | |
| No interaction with business cycle | -0.70*** | -0.86*** | -0.53 | -0.37 | 0.46 |
| | (0.15) | (0.29) | (0.74) | (0.68) | (0.85) |
| $R^2$ | 0.557 | 0.618 | 0.666 | 0.703 | 0.765 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| Bad times | -0.82*** | -1.02** | -0.57 | -0.32 | 0.46 |
| | (0.23) | (0.38) | (0.82) | (0.78) | (0.95) |
| Good times | -0.42 | -0.23 | -0.19 | -0.72 | 0.49 |
| | (0.34) | (0.63) | (0.87) | (0.82) | (0.79) |
| $R^2$ | 0.558 | 0.619 | 0.666 | 0.703 | 0.765 |
| Observations | 283 | 262 | 241 | 220 | 199 |

(b) Decentralization of Bargaining

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| **Employment Rate of Low-educated Adults** | | | | | |
| No interaction with business cycle | -0.28 | -0.52 | -0.01 | 0.33 | 0.83 |
| | (0.28) | (0.40) | (0.66) | (0.79) | (0.78) |
| $R^2$ | 0.512 | 0.597 | 0.631 | 0.646 | 0.662 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| Bad times | 0.01 | -0.26 | 0.10 | 0.27 | 0.76 |
| | (0.32) | (0.46) | (0.70) | (0.75) | (0.91) |
| Good times | -1.01* | -1.27 | -0.30 | 0.49 | 1.00 |
| | (0.50) | (0.78) | (1.21) | (1.62) | (1.28) |
| $R^2$ | 0.517 | 0.599 | 0.631 | 0.647 | 0.662 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| **Employment Rate of Secondary-educated Adults** | | | | | |
| No interaction with business cycle | -0.09 | -0.16 | -0.55 | -0.23 | 0.14 |
| | (0.19) | (0.28) | (0.50) | (0.66) | (0.64) |
| $R^2$ | 0.635 | 0.675 | 0.690 | 0.719 | 0.760 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| Bad times | 0.09 | -0.12 | -0.62 | -0.41 | 0.11 |
| | (0.18) | (0.27) | (0.49) | (0.64) | (0.69) |
| Good times | -0.54 | -0.26 | -0.36 | 0.21 | 0.2 |
| | (0.47) | (0.75) | (0.93) | (1.09) | (0.98) |
| $R^2$ | 0.639 | 0.675 | 0.690 | 0.720 | 0.760 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| **Employment Rate of Tertiary-educated Adults** | | | | | |
| No interaction with business cycle | -0.03 | -0.12 | -0.16 | 0.13 | 0.54* |
| | (0.14) | (0.30) | (0.36) | (0.47) | (0.28) |
| $R^2$ | 0.540 | 0.610 | 0.665 | 0.702 | 0.766 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| Bad times | -0.05 | -0.22 | -0.20 | -0.11 | 0.40 |
| | (0.13) | (0.37) | (0.43) | (0.47) | (0.30) |
| Good times | 0.01 | 0.17 | -0.05 | 0.73 | 0.88 |
| | (0.46) | (0.49) | (0.67) | (0.97) | (0.70) |
| $R^2$ | 0.54 | 0.611 | 0.665 | 0.704 | 0.767 |
| Observations | 283 | 262 | 241 | 220 | 199 |

(c) Weakening of unions

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| **Employment Rate of Low-educated Adults** | | | | | |
| No interaction with business cycle | 0.52 | 1.67*** | 1.55** | 1.11 | 1.70 |
| | (0.40) | (0.42) | (0.73) | (1.12) | (1.21) |
| $R^2$ | 0.514 | 0.613 | 0.64 | 0.649 | 0.665 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| Bad times | 0.34 | 1.18** | 1.67* | 1.77 | 2.14 |
| | (0.37) | (0.50) | (0.92) | (1.54) | (1.67) |
| Good times | 0.73 | 2.25*** | 1.41 | 0.31 | 1.21 |
| | (0.60) | (0.58) | (0.92) | (1.19) | (1.07) |
| $R^2$ | 0.515 | 0.616 | 0.640 | 0.651 | 0.666 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| **Employment Rate of Secondary-educated Adults** | | | | | |
| No interaction with business cycle | 0.42* | 0.64 | 0.57 | 0.49 | 0.86 |
| | (0.21) | (0.42) | (0.58) | (0.74) | (0.89) |
| $R^2$ | 0.640 | 0.679 | 0.689 | 0.720 | 0.762 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| Bad times | 0.30 | 0.56 | 0.60 | 0.65 | 1.47 |
| | (0.26) | (0.55) | (0.71) | (0.98) | (1.16) |
| Good times | 0.56* | 0.73 | 0.54 | 0.30 | 0.21 |
| | (0.32) | (0.48) | (0.57) | (0.80) | (0.67) |
| $R^2$ | 0.641 | 0.679 | 0.689 | 0.720 | 0.764 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| **Employment Rate of Tertiary-educated Adults** | | | | | |
| No interaction with business cycle | 0.65*** | 0.76** | 0.83 | 0.79 | 0.72 |
| | (0.18) | (0.33) | (0.50) | (0.63) | (0.66) |
| $R^2$ | 0.561 | 0.619 | 0.671 | 0.706 | 0.766 |
| Observations | 283 | 262 | 241 | 220 | 199 |
| Bad times | 0.44** | 0.40 | 0.70 | 0.90 | 0.95 |
| | (0.17) | -0.38 | -0.52 | -0.68 | -0.80 |
| Good times | 0.88** | 1.16** | 0.98 | 0.67 | 0.50 |
| | (0.36) | (0.45) | (0.78) | (0.95) | (0.76) |
| $R^2$ | 0.564 | 0.622 | 0.671 | 0.706 | 0.767 |
| Observations | 283 | 262 | 241 | 220 | 199 |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the coefficient estimates. Coefficient estimates of control variables and fixed effects are not reported. The dependent variable is the change in the employment rate of the considered education-level group. The control variables are the twice-lagged values of *(i)* the change in the employment rate of the considered education-level group; *(ii)* the reform variables (category 1, category 2, category 3, national change); and the contemporaneous and twice-lagged values of *(iii)* the output gap; *(iv)* the yield curve; *(v)* the short-term interest rate; *(vi)* real total government expenditure excluding interest; *(vii)* indexes of the strictness of employment protection for permanent and temporary contracts; and the contemporaneous value of *(viii)* euro zone membership. "Bad times" means implementation of the reform when the output gap is $< -1$. "Good times" means implementation of the reform when the output gap is $> -1$. The corresponding IRFs are shown in Figure 7 to Figure 9.
The statistical significance levels are $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

## 6 Endogeneity

In the estimates presented so far, I control for a variety of factors that could lead to unreliable estimations. These include lagged employment growth, the output gap, the yield curve, indicators of fiscal and monetary policies and euro membership. In addition, I control for country fixed effects – which account for countries' time-invariant characteristics (geographic, historical path, social norms) that could affect both the adoption of collective bargaining reforms and employment growth, and year fixed effects that control for time effects across countries. Biases due to omitted variables should therefore not be an important problem here.

Nevertheless, there could still be endogeneity problems related to reverse causality and simultaneity. The (un)-employment rate, which reflects the state of the labor market, could trigger the implementation of a reform. Reforms may be easier to push through in a recession, when trade union resistance may be weaker, and harder in times of expansion (Goerke and Madsen, 2004; Brandl and Traxler, 2010). Conversely, insider-oriented unions may be less resistant in times of employment expansion because institutional changes in the labor market pose less of a threat to insiders. If these potential endogeneity problems do exist and are not addressed in the empirical strategy, then OLS estimates of the relationship between (un)-employment changes and collective bargaining reforms will be biased.

I argue, however, that there are several reasons why reverse causality and simultaneity should not be a problem here. Firstly, I exclude contemporaneous effects of the reform variable (the impulse variable) in the response functions. It is reasonable to assume indeed that the effect of a reform is only felt with a one-period lag since its implementation by collective bargaining actors may not be immediate and uniform in all sectors. Secondly, employment in period $t+1$ cannot affect the decision to introduce the reform, which is usually taken in the year before the reform is introduced. It seems even less likely that the employment rate of a subgroup in period $t+1$ should influence the implementation of a national collective bargaining reform in period $t-1$. Following Bassanini and Cingano (2019), I investigate the severity of the reverse-causality issue by augmenting Eq. (1) with forward terms of collective bargaining reforms.[15] Indeed, an effect of future reforms on current employment rates would be evidence of reverse causality. Estimates of forward terms are reported in Table 11. The only significant forward term – at a significance level of 10% – is the one corresponding to a weakening of unions. There is therefore no evidence of reverse causality.

*Instruments* — In spite of the above arguments against major endogeneity problems, I use an instrumentation strategy to obtain potentially more reliable estimates.

I use an instrument for each category of reform. For categories 1 and 2 – respectively

[15] I do not apply local projections in this exercise, i.e. I do not consider different $h$ horizons, but only $h = 1$.

reduction in bargaining coverage and bargaining decentralization – I construct an indicator representing the average level of collective bargaining reform in the same category in nearby countries (countries with which it shares a land border). Since this is an average of one or more dummy variables – depending on the number of bordering countries – this implies that the instrumental variable ranges from 0 to 1. For instance, if country A shares a border with two countries, country B and country C, and country B implements a category 1 reform in 2013, then the instrumental variable for the category 1 $CBR$ associated with country A and year 2013 will be equal to 0.5. Thus, for a given country and year, the more bordering countries implement a collective bargaining reform in the reform category considered, the more the instrumental variable tends toward one. To construct the instrumental variables, I use geographic data (GeoDist) provided by CEPII, which include dummy variables indicating whether two countries are contiguous (see Mayer and Zignago (2011) for more details).

The economic argument for the use of these instruments is twofold. Firstly, it is plausible that neighboring governments look to each other for information on the consequences of reforms implemented abroad. This is a proposal tested by Buera et al. (2011), who show that experiences of structural reforms in neighboring countries influence domestic policymakers' beliefs and domestic reforms as a result. Secondly, several recently proposed classifications of collective bargaining regimes show that countries with similar characteristics often follow the same trends (see Delahaie et al. (2015); Visser (2016) and OECD (2019)). It emerges that groups of countries with common features in their industrial relations and collective bargaining systems are generally geographically close.

These instrumental variables (IVs) seem to meet the two requirements for being good instruments. Firstly, their changes are associated with changes in $CBR$ – i.e. reforms in a given country are often associated with those in bordering countries, because of the similarity of social dialogue regimes (see first stage in Table 7 (a) - (b)) – but do not directly lead to changes in $y$ – i.e. in the (un)-employment rate of the country. Secondly, collective bargaining reforms in neighboring countries are unlikely to directly affect domestic employment. I argue that they are orthogonal to any country-specific characteristics that may simultaneously drive both the employment rate and collective bargaining reform, and should be distributed independently of the error process.

Unfortunately, these instruments do not provide good first stage estimates of category 3 reforms, i.e. restrictions of unions' capacity to represent workers. I therefore turned to a categorical variable representing how the minimum wage is set in a given country, as defined by the variable "NMS" in the ICTWSS Codebook. The variable can take unit values from 0 to 9.[16]. As explained in the codebook: *"This coding reflects the*

[16] 0 = No statutory minimum wage, no sectoral or national agreements; 1 = Minimum wages set by (sectoral) collective agreements or tripartite wage boards in (some) sectors; 2 = Minimum wages are set by national (cross-sectoral or inter-occupational) agreements ("autonomous agreements") between unions and employers; 3 = the national minimum wage is set by agreements (as in 1 or 2) but extended and made binding by laws or Ministerial decrees; 4 = the national minimum wage is set through tripartite negotiations; 5 = the national minimum wage is set by the government after (non-binding) tripartite consultations; 6 = The minimum wage is set by judges or expert committees, as in the award system;

*(increasing) degree of government intervention and discretion in setting the minimum wage, or – reversely – the degree to which the government is bound in its decisions by unions and employers, and/or a fixed or pre-determined rule"*. This variable can be seen as a proxy for the way in which unions are involved in the determination of the national minimum wage or industrial minimum wages, and therefore partly reflects the ability of unions to represent workers in setting wages. The highly descriptive nature of this variable suggests that it is not directly related to changes in the employment rate and can therefore be used as an instrument.

I use IV estimation with a binary endogenous regressor. This implies that the first stage is a probit model and this is similar to a linear regression with endogenous treatment effects allowed to run as an IV estimation with a binary endogenous regressor. Although the standard IV method is valid under the assumption that the conditional moment restriction is verified, my choice here adds more structure to account for the binary nature of the endogenous regressor (Cameron and Trivedi, 2010). Note that it delivers maximum likelihood estimates, which outperform both two-stage-least-squares and GMM estimators in finite samples (Cameron and Trivedi, 2010). For information, I present the first stage tables of a standard IV analysis in Table 12, with all the usual tests on the relevance and strength of the instruments as well as endogeneity tests. It is clear that not taking into account the binary nature of the suspected endogenous $CBR$ variable makes first stage estimates unsuitable, especially for category 2 and category 3 reforms.

*Results* — Table 7 presents LP-IV estimates with a binary endogenous regressor for aggregate employment [Tab. 7a] and aggregate unemployment [Tab. 7b]. The negative estimated effects on aggregate employment in the short term of reforms that reduce bargaining coverage *(category 1)* are always significant. Moreover, a significant positive effect appears five years after the reform. Reforms that reduce unions' capacity to represent workers *(category 2)* have positive effects on employment that appear with a longer delay, i.e. from the fourth year after the reform's implementation. Similarly, the coefficient of reforms that decentralize bargaining *(category 3)* becomes positive and significant in the fifth year after the reform.

Regarding effects on aggregate unemployment, there is still a significant short-term negative effect (an increase in the unemployment rate) associated with reforms that reduce bargaining coverage *(category 1)* . The positive effect (a lower unemployment rate) after four and five years is also still significant. However, the effects of reforms that weaken unions *(category 3)* differ from the OLS estimates, with a strong increase in unemployment followed by a strong decrease in the medium term. Finally, mirroring the effect on aggregate employment, reforms that decentralize bargaining *(category 2)* are associated

7 = the minimum wage is set by the government, bound by a fixed rule (index-based minimum wage); 8 = the minimum wage is set by the government based on a fixed rule (index-based minimum wage) or target (growth, employment, poverty), but the government can (and sometimes does) take discretionary decisions; 9 = the minimum wage is set by the government, without a fixed rule

with a fall in unemployment five years after the reform.

There are two important points to be made about these IV estimates. They are up to three times larger than the OLS estimates, although the signs are mostly the same, suggesting that the OLS estimates may be biased toward the origin and should be regarded as lower bounds. However, the Wald test p-values reported in Table 7 confirm that the endogeneity of the collective bargaining reform variables is not obvious. This is confirmed by standard endogeneity tests whose p-values do not reject the null hypothesis that the regressor is exogenous (see Table 12). Associated with the above argument tempering the problems of endogeneity, these results indicate that the OLS estimates are more reliable than the IV estimates.

# Table 7 – Effects of CB Reforms on Employment and Unemployment - IV Estimates

(a) Aggregate Employment

| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Category 1** | **Reduction in bargaining coverage** | -1.28*** | -2.23** | 0.21 | 2.60 | 4.48*** |
| | | (0.30) | (1.06) | (2.18) | (2.35) | (0.58) |
| | Wald test (p-value) | 0.05 | 0.25 | 0.67 | 0.32 | 0.00 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | First stage | | | | | |
| | IV | 1.79*** | 1.90*** | 1.82*** | 1.56** | 1.22*** |
| | | (0.48) | (0.52) | (0.54) | (0.71) | (0.24) |
| | Likelihood-ratio test (p-value) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Category 2** | **Decentralization of bargaining** | 0.86 | 0.60 | 0.58 | 1.63 | 2.39** |
| | | (0.54) | (1.72) | (1.10) | (1.57) | (1.20) |
| | Wald test (p-value) | 0.06 | 0.60 | 0.33 | 0.28 | 0.08 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | First stage | | | | | |
| | IV | 0.74** | 0.87** | 1.01*** | 1.01*** | 1.01*** |
| | | (0.30) | (0.36) | (0.36) | (0.35) | (0.35) |
| | Likelihood-ratio test (p-value) | 0.04 | 0.02 | 0.01 | 0.02 | 0.03 |
| **Category 3** | **Weakening of unions** | -0.12 | -0.90 | 3.18 | 4.77* | 3.92 |
| | | (0.34) | (0.90) | (3.13) | (2.52) | (2.48) |
| | Wald test (p-value) | 0.12 | 0.12 | 0.49 | 0.32 | 0.38 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | First stage | | | | | |
| | IV | 0.12*** | 0.11** | 0.09** | 0.10** | 0.10*** |
| | | (0.04) | (0.04) | (0.04) | (0.05) | (0.04) |
| | Likelihood-ratio test (p-value) | 0.00 | 0.01 | 0.03 | 0.05 | 0.04 |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the coefficient estimates. Coefficient estimates of control variables and fixed effects are not reported. The dependent variable is the change in the employment rate (15–64-year-olds). The control variables include the twice-lagged values of *(i)* the change in the employment rate; *(ii)* the reforms variables (category 1, category 2, category 3, national change); and the contemporaneous and twice-lagged values of *(iii)* the output gap; *(iv)* the yield curve; *(v)* the short-term interest rate; *(vi)* real total government expenditure excluding interest; and the contemporaneous value of *(vii)* euro zone membership. The p-value of the Wald test is an indication of the endogeneity of $CBR$: $CBR$ can be considered endogenous if the null hypothesis is rejected. The p-value of the likelihood-ratio test is an indication of the joint significance of the regressors in the first stage.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

(b) Aggregate Unemployment

| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Category 1** | **Reduction in bargaining coverage** | 1.00* | 1.28 | -1.86 | -6.26*** | -7.34*** |
| | | (0.59) | (2.51) | (1.40) | (0.40) | (0.41) |
| | Wald test (p-value) | 0.41 | 0.71 | 0.23 | 0.00 | 0.00 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | First stage | | | | | |
| | IV | 1.71*** | 1.87*** | 1.79*** | 1.59*** | 2.01*** |
| | | (0.49) | (0.56) | (0.54) | (0.23) | (0.24) |
| | Likelihood-ratio test (p-value) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Category 2** | **Decentralization of bargaining** | -0.18 | 0.08 | 0.11 | -1.21 | -3.66** |
| | | (0.39) | (0.57) | (0.75) | (1.57) | (1.66) |
| | Wald test (p-value) | 0.13 | 0.28 | 0.27 | 0.37 | 0.10 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | First stage | | | | | |
| | IV | 0.82** | 0.90** | 1.01*** | 0.97*** | 0.97*** |
| | | (0.35) | (0.36) | (0.37) | (0.36) | (0.31) |
| | Likelihood-ratio test (p-value) | 0.04 | 0.02 | 0.01 | 0.02 | 0.03 |
| **Category 3** | **Weakening of unions** | 0.63 | 2.18*** | 3.31*** | -4.79*** | -5.33*** |
| | | (0.42) | (0.66) | (1.09) | (0.56) | (0.51) |
| | Wald test (p-value) | 0.04 | 0.00 | 0.01 | 0.00 | 0.00 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | First stage | | | | | |
| | IV | 0.12*** | 0.12** | 0.10** | 0.17*** | 0.20*** |
| | | (0.05) | (0.05) | (0.05) | (0.05) | (0.06) |
| | Likelihood-ratio test (p-value) | 0.00 | 0.01 | 0.03 | 0.05 | 0.04 |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the coefficient estimates. Coefficient estimates of control variables and fixed effects are not reported. The dependent variable is the change in the unemployment rate (15–74-year-olds). The control variables include the twice-lagged values of *(i)* the change in the unemployment rate; *(ii)* the reforms variables (category 1, category 2, category 3, national change); and the contemporaneous and twice-lagged values of *(iii)* the output gap; *(iv)* the yield curve; *(v)* the short-term interest rate; *(vi)* real total government expenditure excluding interest; and the contemporaneous value of *(vii)* euro zone membership. The p-value of the Wald test is an indication of the endogeneity of $CBR$: $CBR$ can be considered endogenous if the null hypothesis is rejected. The p-value of the likelihood-ratio test is an indication of the joint significance of the regressors in the first stage.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# 7 Concluding Remarks

In this paper, I have investigated the impact of collective bargaining reforms on aggregate employment and unemployment rates as well as on the employment rates of subgroups of workers (with permanent vs temporary contracts and by age group and education level). In keeping with the recent literature, I used local projections (Jordà, 2005) to estimate the effect of structural reforms on the economy and evaluate their success depending on the initial economic conditions. I identified a set of reforms of collective bargaining institutions in EU countries between 2000 and 2018 and classified the reforms into three categories – changes (1) in the coverage of bargaining, (2) in the centralization of bargaining, and (3) in the capacity of trade unions to represent workers – to allow a refined analysis of their effects.

The empirical analysis focuses on reforms that reduce the institutional wedge and results suggest that reforms that reduce bargaining coverage have a detrimental effect on the aggregate employment rate in the very short term, i.e. in the first two years after the reform is implemented. They also increase the unemployment rate in the first year after the reform, but lead to a fall in unemployment in the medium term. On the other hand, reforms that decentralize negotiations closer to the firm level do not have a significant effect on employment or unemployment in the short term. On the contrary, reforms that reduce the capacity of trade unions to represent workers have a short-term positive effect on employment. The timing of the reforms is important; for instance, reductions in bargaining coverage only have a negative effect when carried out during a recession, while weakening unions is only beneficial when the reform is implemented outside of a recession.

The analysis in terms of subgroups shows that the intensity of these effects differs between classes of workers. The negative effect of a reduction in bargaining coverage is particularly strong for young workers and workers with a low level of education. The decline in the ratio of temporary employment to total dependent employment also suggests that workers on temporary contracts are more affected. Young and low educated workers are also those who benefit most in terms of employment from reforms that weaken unions, provided these reforms are implemented outside periods of recession.

I conducted several robustness tests. Some results proved sensitive, while those for aggregate employment, youth employment and employment of workers with low levels of education, held under all tests. I also used an instrumentation strategy to obtain IV estimates to investigate a potential endogeneity problem related to the variable representing the reforms. The main results are unchanged, but there are several indications that the OLS estimates are more reliable.

The overall result of this paper suggest that flexibility-enhancing reforms of collective bargaining systems should not be introduced in the midst of an economic downturn, since they do not have a positive effect on employment in the short term. While increasing the flexibility of collective bargaining may have some positive macroeconomic outcomes,

governments need to consider the timing of institutional changes to achieve their goals. From an economic policy perspective, the results of this paper add evidence in support of Boeri and Jimeno (2016)' proposal that UE supranational authorities should encourage countries to carry out institutional reforms under good macroeconomic conditions, via a "positive conditionality" mechanism for instance.

# A Reforms' details

Table 8 – Categories of reform by country and year

| | Wedge-increasing | Wedge-decreasing |
|---|---|---|
| Category 1.<br><br>Modification of bargaining coverage | Austria (2006, 2015, 2016); Belgium (2013); Bulgaria (2001, 2010); Cyprus (2016); Czech Republic (2000, 2005); Germany (2008, 2010, 2012, 2013, 2015, 2017); Spain (2005, 2016); Finland (2001, 2010); France (2010, 2013); Greece (2001); Ireland (2017); Italy (2005); Lithuania (2004); Latvia (2002); Luxembourg (2007); Netherlands (2015, 2016); Portugal (2004, 2017); Slovakia (2014); Slovenia (2012, 2015) | Cyprus (2012); Czech Republic (2004); Spain (2011, 2012); Estonia (2012); France (2017); Greece (2011); Croatia (2014); Ireland (2013); Lithuania (2017); Netherlands (2001); Portugal (2011, 2012, 2014); Romania (2011); Slovakia (2003, 2004, 2010, 2016); Slovenia (2006, 2010) |
| Category 2.<br><br>Modification of bargaining centralization | Austria (2010, 2013); Belgium (2017); Germany (2007); Finland (2001, 2011); Ireland (2015); Luxembourg (2014); Netherlands (2002, 2009); Poland (2005) | Austria (2005, 2009, 2011); Belgium (2009); Bulgaria (2013); Denmark (2004); Spain (2001, 2003, 2006, 2010, 2011, 2012); Finland (2000, 2008, 2016); France (2016, 2017, 2018); Greece (2010, 2017); Hungary (2011); Italy (2009, 2011, 2013); Luxembourg (2012); Netherlands (2005, 2010); Poland (2002, 2009); Portugal (2003, 2009, 2012); Romania (2011); Slovakia (2001, 2010) |
| Category 3.<br><br>Modification of union strength | Austria (2007); Cyprus (2000, 2001, 2002, 2003, 2015); Czech Republic (2008); Germany (2002); France (2013); Greece (2014); Ireland (2014, 2015); Lithuania (2003, 2005, 2008, 2013, 2014), Latvia (2007, 2017); Luxembourg (2015); Netherlands (2013); Poland (2001, 2015); Romania (2003, 2016); Slovakia (2013); Sweden (2011) | Belgium (2011); Bulgaria (2012); Czech Republic (2011); France (2007, 2009, 2012, 2015, 2016, 2017, 2018); United Kingdom (2016); Greece (2008, 2011, 2017); Croatia (2012, 2014); Hungary (2011, 2012); Ireland (2009, 2012); Italy (2013, 2014); Lithuania (2012); Latvia (2014); Malta (2011); Poland (2002); Slovakia (2007, 2011) |

# B Data details

Table 9 – Description of macroeconomic variables

| Variable name | Detailed description | Source |
|---|---|---|
| Employment rate of 15–64-year-olds | Proportion of 15- to 64-year-olds in employment - in % | Eurostat |
| Unemployment rate of 15–74-year-olds | Proportion of 15- to 74-year-olds out of employment based on the International Labour Office (ILO) definition - in % | Eurostat |
| Temporary employment rate | Proportion of wage and salary workers whose job has a pre-determined termination date - in % | OECD |
| Employment rate of 15–24-year-olds | Proportion of 15- to 24-year-olds in employment - in % | OECD |
| Employment rate of 25–54-year-olds | Proportion of 25- to 54-year-olds in employment - in % | OECD |
| Employment rate of 55–64-year-olds | Proportion of 55- to 64-year-olds in employment - in % | OECD |
| Employment rate of low-educated adults | Proportion of adults without upper-secondary education in employment - in %<br>Note: This ratio only considers 25–64-year-olds . | OECD |
| Employment rate of secondary-educated adults | Proportion of adults with upper-secondary (but not tertiary) education in employment - in %<br>Note: This ratio only considers 25–64-year-olds. | OECD |
| Employment rate of tertiary-educated adults | Proportion of adults with tertiary education in employment - in %<br>Note: This ratio only considers 25–64-year-olds. | OECD |
| Output gap | Difference between actual and potential gross domestic product (at 2010 reference levels) divided by the potential GDP - in % | AMECO |
| Yield Curve | Difference between nominal long-term interest rates and nominal short-term interest rates - in % | AMECO |
| Change in government expenditure (excluding interest) | Change in real total government expenditure excluding interest, deflator GDP (ESA 2010) - in % | AMECO |
| Short-term interest rate | Real short-term interest rate, deflator GDP - in % | AMECO |
| Strictness of employment protection – Regular contracts | Index of the strictness of employment protection relating to individual and collective dismissals for workers with regular contracts. | OECD |
| Strictness of employment protection – Temporary contracts | Index of the strictness of employment protection relating to temporary contracts. | OECD |
| Labor market policy expenditures | Total public expenditure on labor market policies as a proportion of GDP - in %. Including expenditures in the following areas: public employment services and administration, training, employment incentives, sheltered and supported employment, direct job creation, start-up incentives, early retirement, and out-of-work income maintenance and support. | OECD |

## Table 10 – Effects of CB Reforms on Employment and Unemployment - OLS Estimates

(a) Aggregate Employment

| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Category 1** | **Reduction in bargaining coverage** | | | | | |
| | No interaction with business cycle | -0.65*** | -0.94** | -0.74 | -0.16 | 0.13 |
| | | (0.22) | (0.44) | (0.68) | (0.71) | (0.68) |
| | $R^2$ | 0.606 | 0.597 | 0.611 | 0.636 | 0.666 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | Bad times | -0.91*** | -1.16** | -0.93 | -0.30 | 0.18 |
| | | (0.31) | (0.53) | (0.77) | (0.83) | (0.77) |
| | Good times | -0.07 | -0.08 | 0.35 | 0.63 | -0.10 |
| | | (0.18) | (0.68) | (1.52) | (1.75) | (1.75) |
| | $R^2$ | 0.608 | 0.598 | 0.612 | 0.636 | 0.667 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| **Category 2** | **Decentralization of bargaining** | | | | | |
| | No interaction with business cycle | -0.24 | -0.36 | -0.49 | -0.27 | -0.04 |
| | | (0.15) | (0.30) | (0.46) | (0.62) | (0.60) |
| | $R^2$ | 0.600 | 0.593 | 0.611 | 0.636 | 0.666 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | Bad times | -0.26 | -0.57 | -0.73 | -0.65 | -0.31 |
| | | (0.17) | (0.39) | (0.57) | (0.66) | (0.68) |
| | Good times | -0.16 | 0.27 | 0.11 | 0.71 | 0.65 |
| | | (0.39) | (0.67) | (0.70) | (0.95) | (0.89) |
| | $R^2$ | 0.600 | 0.595 | 0.612 | 0.638 | 0.667 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| **Category 3** | **Weakening of unions** | | | | | |
| | No interaction with business cycle | 0.37** | 0.59* | 0.73 | 0.87 | 1.39 |
| | | (0.17) | (0.34) | (0.54) | (0.82) | (1.16) |
| | $R^2$ | 0.601 | 0.595 | 0.612 | 0.638 | 0.672 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | Bad times | 0.23 | 0.44 | 0.75 | 1.41 | 2.23* |
| | | (0.21) | (0.50) | (0.65) | (0.90) | (1.19) |
| | Good times | 0.56** | 0.82* | 0.69 | 0.10 | 0.16 |
| | | (0.26) | (0.40) | (0.70) | (1.09) | (1.47) |
| | $R^2$ | 0.602 | 0.595 | 0.612 | 0.640 | 0.675 |
| | Observations | 396 | 369 | 342 | 315 | 288 |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the coefficient estimates. Coefficient estimates of control variables and fixed effects are not reported. The dependent variable is the change in the employment rate (15–64-year-olds). The control variables include the twice-lagged values of *(i)* the change in the employment rate; *(ii)* the reforms variables (category 1, category 2, category 3, national change); and the contemporaneous and twice-lagged values of *(iii)* the output gap; *(iv)* the yield curve; *(v)* the short-term interest rate; *(vi)* real total government expenditure excluding interest; and the contemporaneous value of *(vii)* euro zone membership. "Bad times" means implementation of the reform when the output gap is $< -1$. "Good times" means implementation of the reform when the output gap is $> -1$.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

(b) Aggregate Unemployment

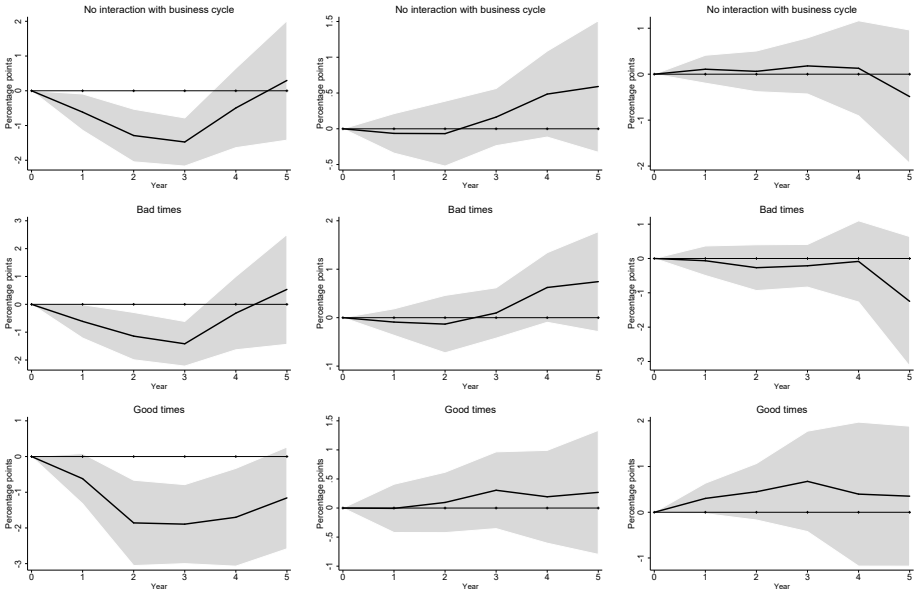
| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Category 1** | **Reduction in bargaining coverage** | | | | | |
| | No interaction with business cycle | 0.46* | 0.31 | -0.3 | -1.35** | -2.22** |
| | | (0.25) | (0.45) | (0.59) | (0.53) | (0.80) |
| | $R^2$ | 0.686 | 0.671 | 0.685 | 0.711 | 0.732 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | Bad times | 0.65* | 0.49 | -0.08 | -1.33** | -2.58*** |
| | | (0.32) | (0.52) | (0.68) | (0.63) | (0.88) |
| | Good times | 0.02 | -0.39 | -1.48** | -1.50** | -0.48 |
| | | (0.17) | (0.41) | (0.70) | (0.57) | (0.59) |
| | $R^2$ | 0.687 | 0.671 | 0.685 | 0.711 | 0.733 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| **Category 2** | **Decentralization of bargaining** | | | | | |
| | No interaction with business cycle | 0.25 | 0.53 | 0.68 | 0.17 | -0.16 |
| | | (0.17) | (0.39) | (0.59) | (0.78) | (0.79) |
| | $R^2$ | 0.685 | 0.672 | 0.686 | 0.708 | 0.724 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | Bad times | 0.29 | 0.68 | 0.86 | 0.48 | -0.03 |
| | | (0.19) | (0.47) | (0.69) | (0.78) | (0.85) |
| | Good times | 0.16 | 0.08 | 0.20 | -0.62 | -0.50 |
| | | (0.50) | (0.79) | (0.73) | (0.98) | (0.76) |
| | $R^2$ | 0.685 | 0.673 | 0.687 | 0.709 | 0.725 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| **Category 3** | **Weakening of unions** | | | | | |
| | No interaction with business cycle | -0.30* | -0.23 | -0.12 | -0.11 | -0.16 |
| | | (0.15) | (0.31) | (0.58) | (0.88) | (1.24) |
| | $R^2$ | 0.685 | 0.67 | 0.685 | 0.708 | 0.724 |
| | Observations | 396 | 369 | 342 | 315 | 288 |
| | Bad times | -0.27 | -0.26 | -0.29 | -0.58 | -0.95 |
| | | (0.18) | (0.42) | (0.54) | (0.74) | (1.09) |
| | Good times | -0.34 | -0.19 | 0.13 | 0.57 | 1.01 |
| | | (0.30) | (0.41) | (0.92) | (1.54) | (1.90) |
| | $R^2$ | 0.685 | 0.670 | 0.685 | 0.709 | 0.727 |
| | Observations | 396 | 369 | 342 | 315 | 288 |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the coefficient estimates. Coefficient estimates of control variables and fixed effects are not reported. The dependent variable is the change in the unemployment rate (15–74-year-olds). The control variables include the twice-lagged values of *(i)* the change in the unemployment rate; *(ii)* the reforms variables (category 1, category 2, category 3, national change); and the contemporaneous and twice-lagged values of *(iii)* the output gap; *(iv)* the yield curve; *(v)* the short-term interest rate; *(vi)* real total government expenditure excluding interest; and the contemporaneous value of *(vii)* euro zone membership. "Bad times" means implementation of the reform when the output gap is $< -1$. "Good times" means implementation of the reform when the output gap is $> -1$.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# D OLS - IRFs

Figure 3 – Impact of CB Reforms That Decrease the Institutional Wedge on Temporary Employment

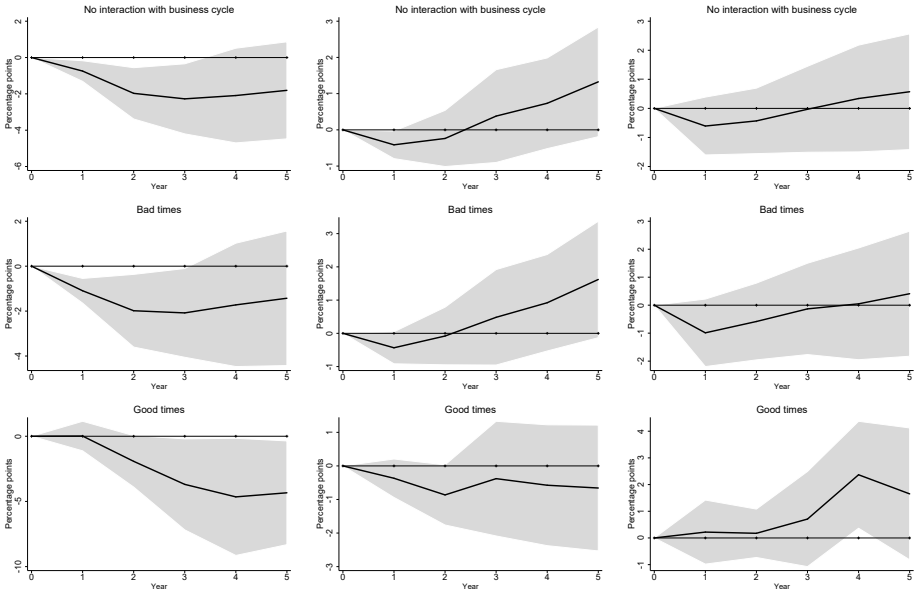
(a) Reduction in bargaining coverage (b) Decentralization of bargaining (c) Weakening of unions




**Notes**: The figures show the cumulative impulse responses of the temporary employment rate (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on temporary employment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on temporary employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 4 – Impact of CB Reforms That Reduce Bargaining Coverage on Employment - By Age Group

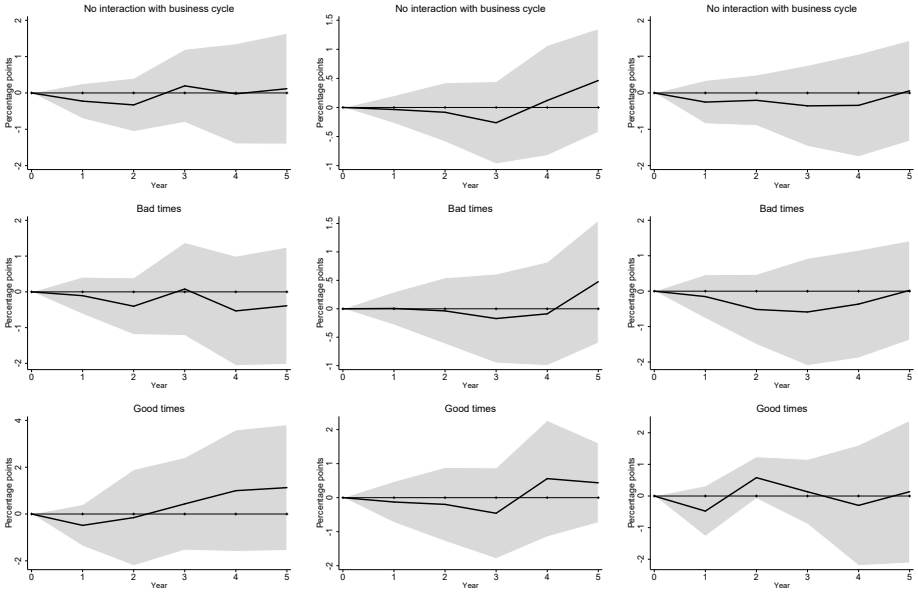
(a) Employment Rate of 15–24-year-olds (b) Employment Rate of 25–54-year-olds (c) Employment Rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that reduces bargaining coverage. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 5 – Impact of CB Reforms That Decentralize Bargaining on Employment - By Age Group

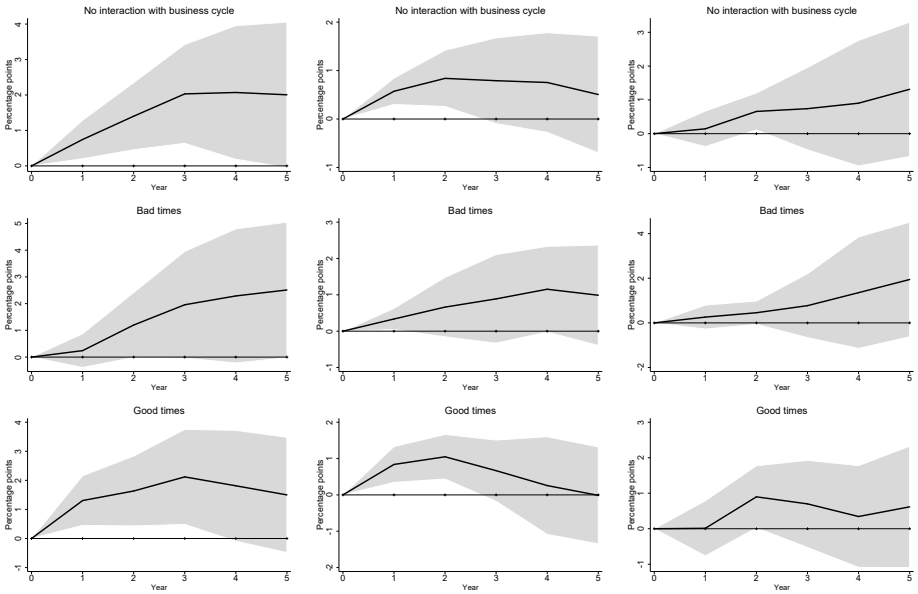
(a) Employment Rate of 15–24-year-olds (b) Employment Rate of 25–54-year-olds (c) Employment Rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that decentralizes bargaining. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 6 – Impact of CB Reforms That Weaken Unions on Employment - By Age Group

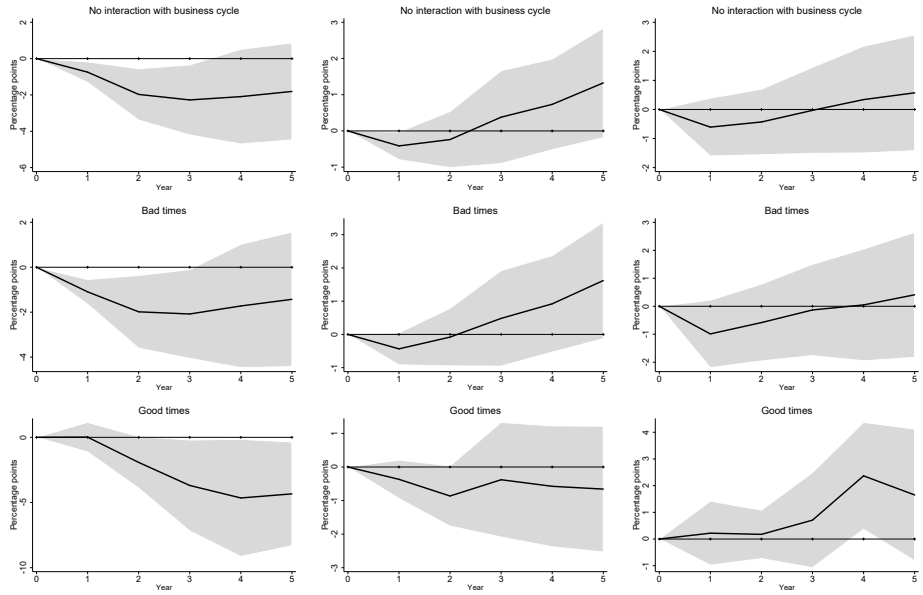
(a) Employment Rate of 15–24-year-olds (b) Employment Rate of 25–54-year-olds (c) Employment Rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that weakens unions. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 7 – Impact of CB Reforms That Reduce Bargaining Coverage on Employment - By Education Level

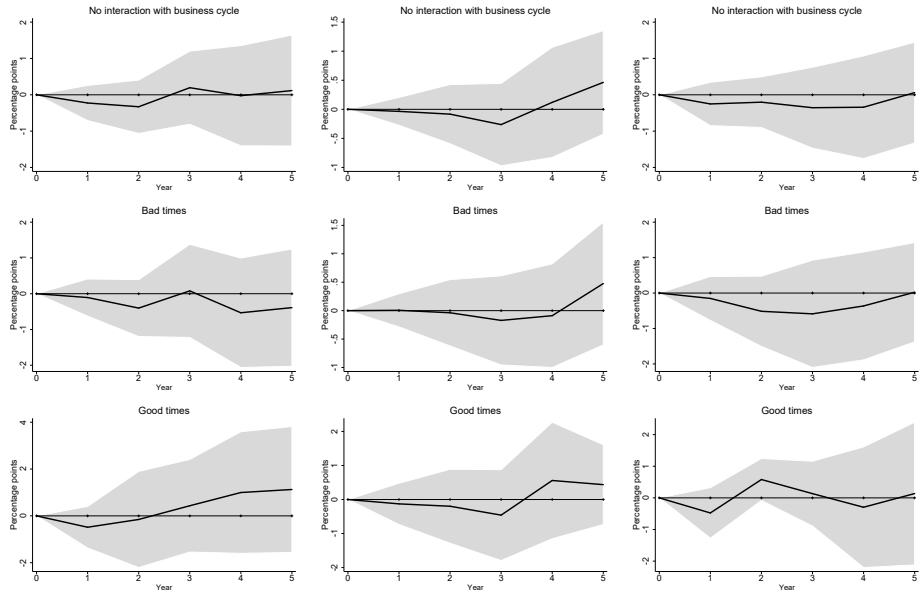
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education level groups to a reform of the collective bargaining system that reduces bargaining coverage. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 8 – Impact of CB Reforms That Decentralize Bargaining on Employment - By Education Level

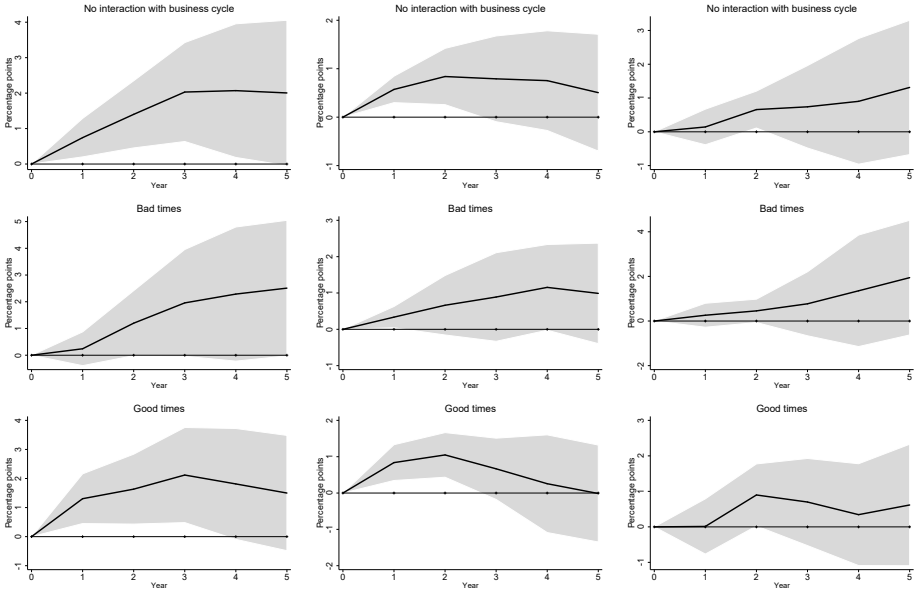
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education level groups to a reform of the collective bargaining system that decentralizes bargaining. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 9 – Impact of CB Reforms That Weaken Unions on Employment - By Education Level

(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults

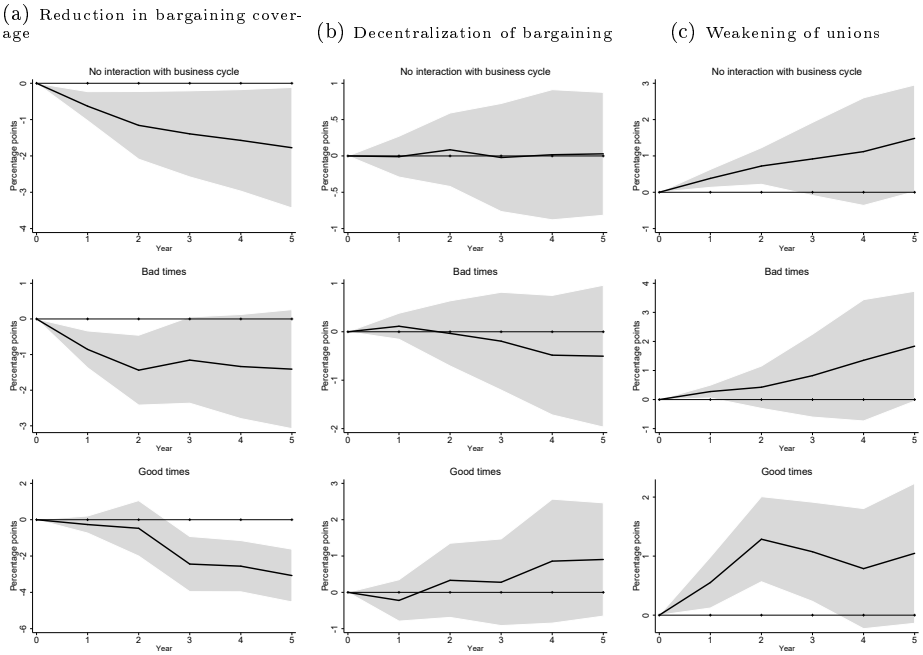



**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that weakens unions. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

# E OLS - Robustness

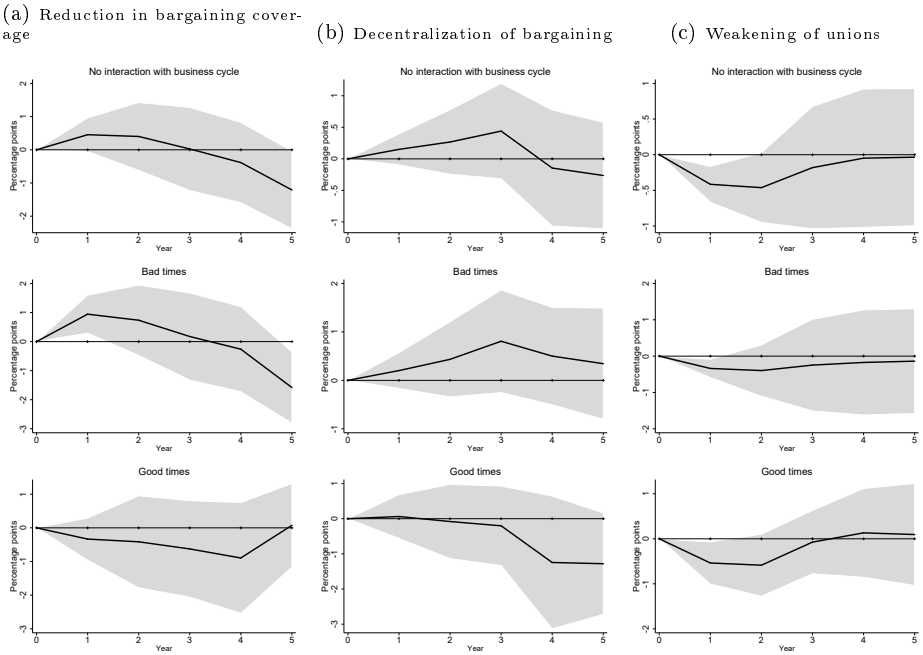
## E.1 Additional controls

Figure 10 – Impact of CB Reforms That Decrease the Institutional Wedge on Aggregate Employment - Additional controls



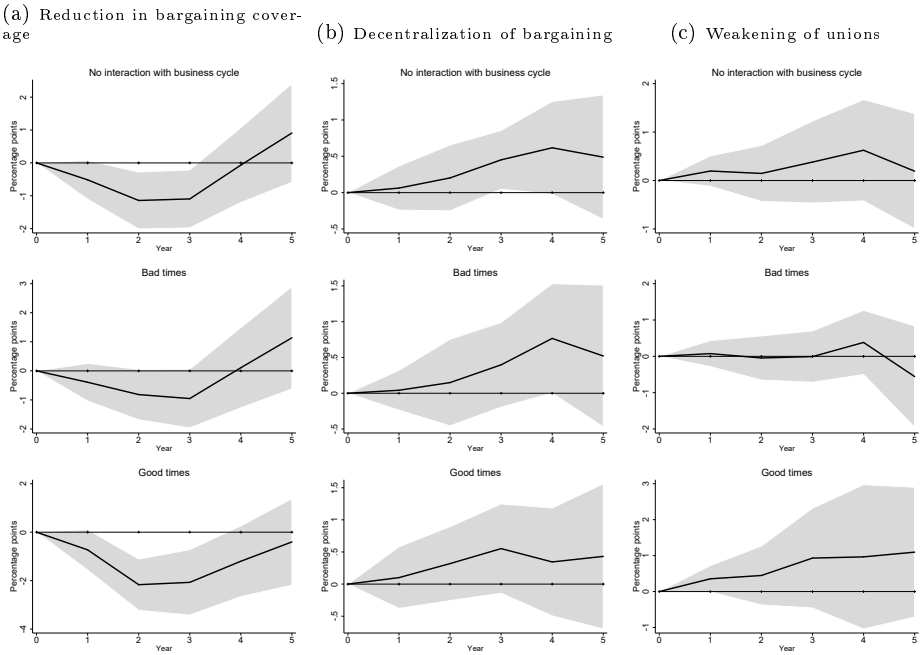

**Notes**: The figures show the cumulative impulse responses of the employment rate of 15–64-year-olds (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The estimates are based on the main specification plus three additional control variables: (1) the strictness of employment protection for permanent jobs, (2) the strictness of employment protection regarding the use of temporary contracts, and (3) total expenditure on labor market policies. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on employment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 11 – Impact of CB Reforms That Decrease the Institutional Wedge on Aggregate Unemployment - Additional controls




**Notes**: The figures show the cumulative impulse responses of the unemployment rate of 15–74-year-olds (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The estimates are based on the main specification plus three additional control variables: (1) the strictness of employment protection for permanent jobs, (2) the strictness of employment protection regarding the use of temporary contracts, and (3) total expenditure on labor market policies. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on unemployment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on unemployment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

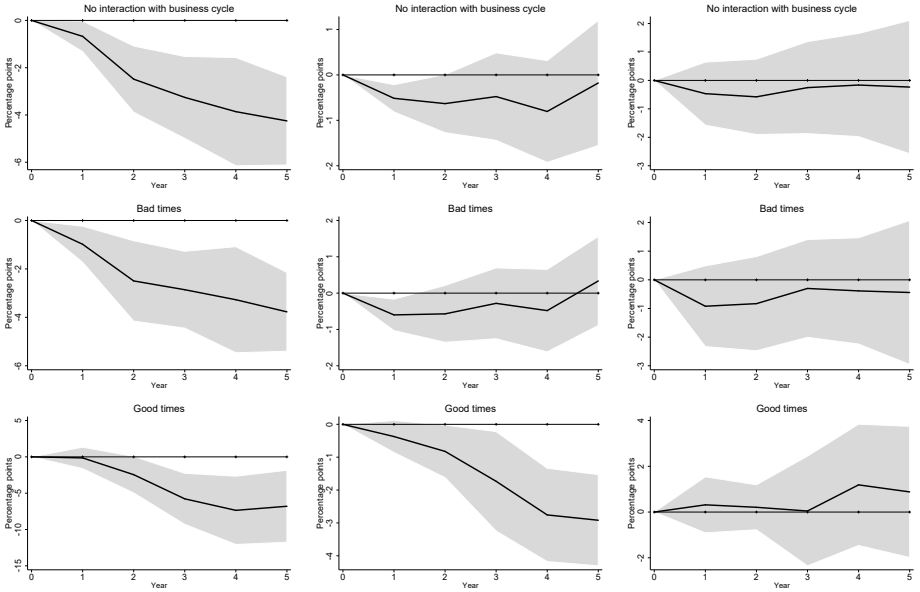
Figure 12 – Impact of CB Reforms That Decrease the Institutional Wedge on Temporary Employment - Additional controls




**Notes**: The figures show the cumulative impulse responses of the temporary employment rate (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The estimates are based on the subgroup specification for temporary employment plus an additional control variable: total expenditure on labor market policies. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on temporary employment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on temporary employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 13 – Impact of CB Reforms That Reduce Bargaining Coverage on Employment - By Age Group - Additional controls

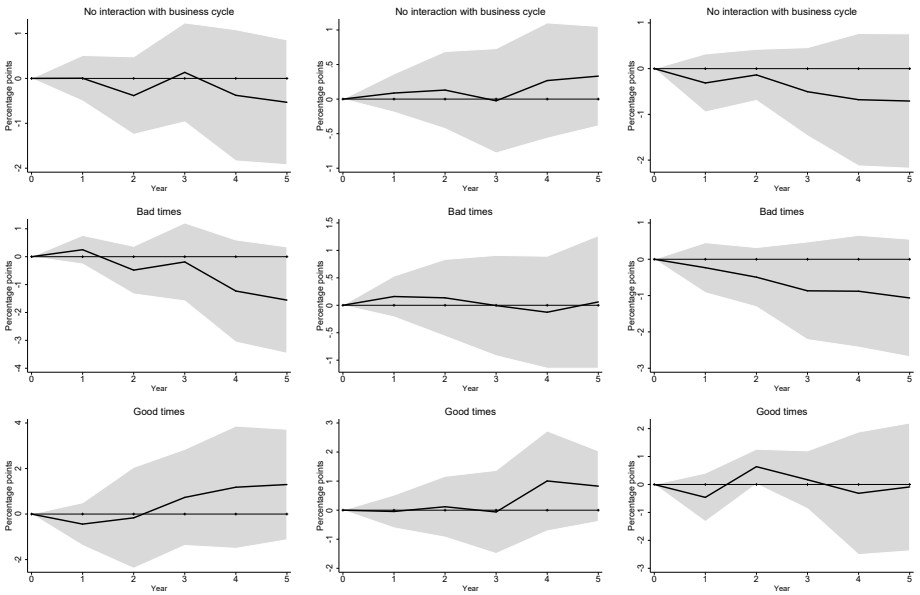
(a) Employment rate of 15–24-year-olds (b) Employment rate of 25–54-year-olds (c) Employment rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that reduces bargaining coverage. The estimates are based on the subgroup specification for employment by age group plus an additional control variable: total expenditure on labor market policies. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 14 – Impact of CB Reforms That Decentralize Bargaining on Employment - By Age Group - Additional controls

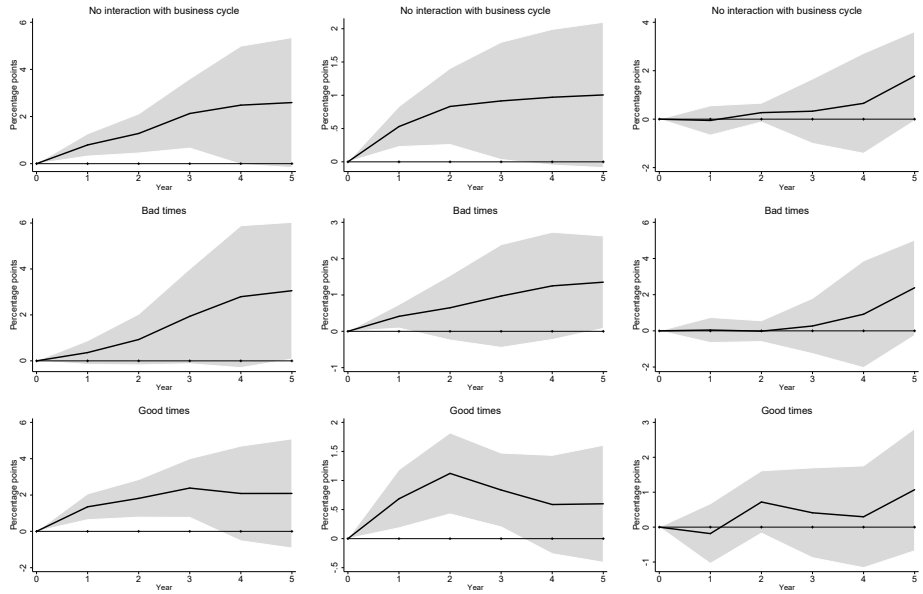
(a) Employment rate of 15–24-year-olds (b) Employment rate of 25–54-year-olds (c) Employment rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that decentralizes bargaining. The estimates are based on the subgroup specification for employment by age group plus an additional control variable: total expenditure on labor market policies. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 15 – Impact of CB Reforms That Weaken Unions on Employment - By Age Group - Additional controls

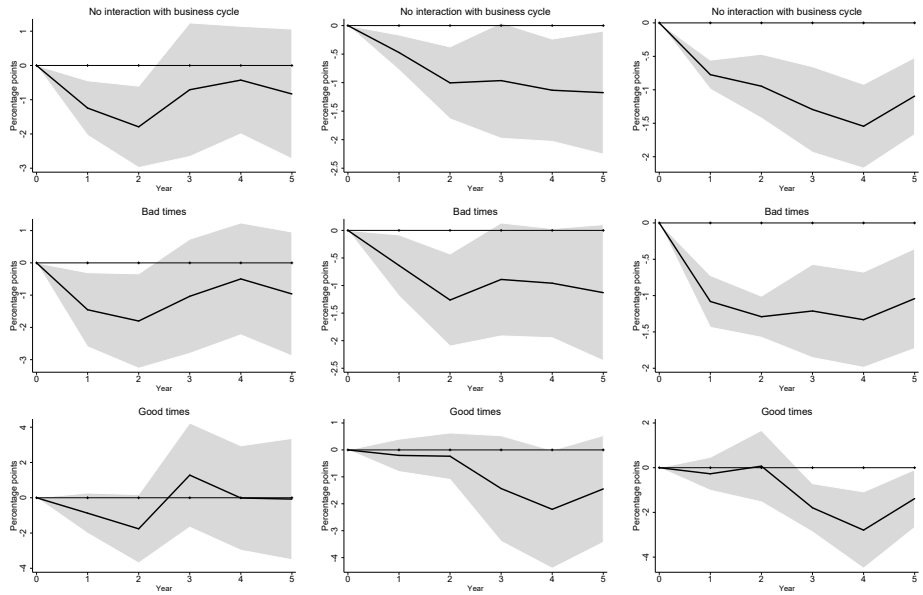
(a) Employment rate of 15–24-year-olds (b) Employment rate of 25–54-year-olds (c) Employment rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that weakens unions. The estimates are based on the subgroup specification for employment by age group plus an additional control variable: total expenditure on labor market policies. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 16 – Impact of CB Reforms That Reduce Bargaining Coverage on Employment - By Education Level - Additional controls

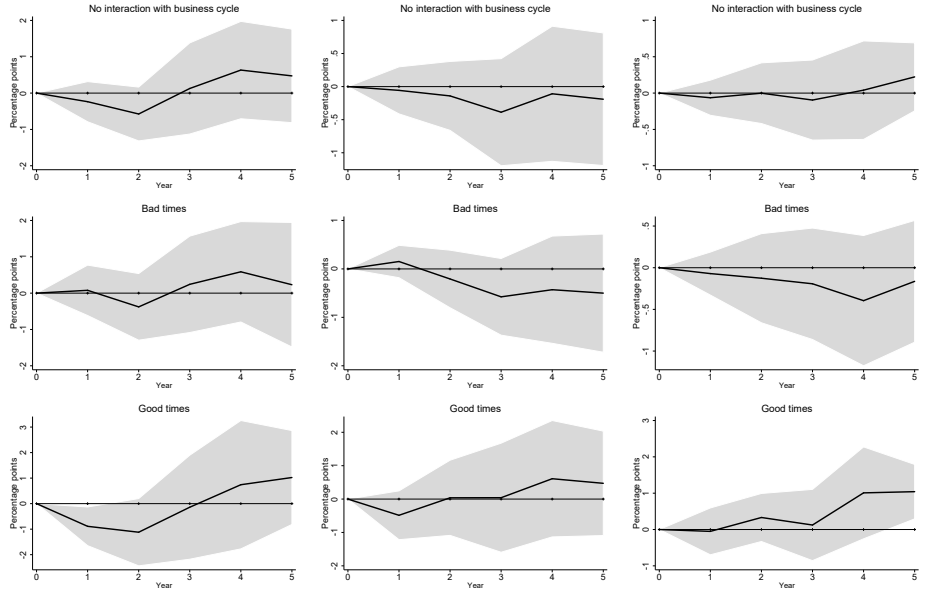
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that reduces bargaining coverage. The estimates are based on the subgroup specification for employment by age group plus an additional control variable: total expenditure on labor market policies. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 17 – Impact of CB Reforms That Decentralize Bargaining on Employment - By Education Level - Additional controls

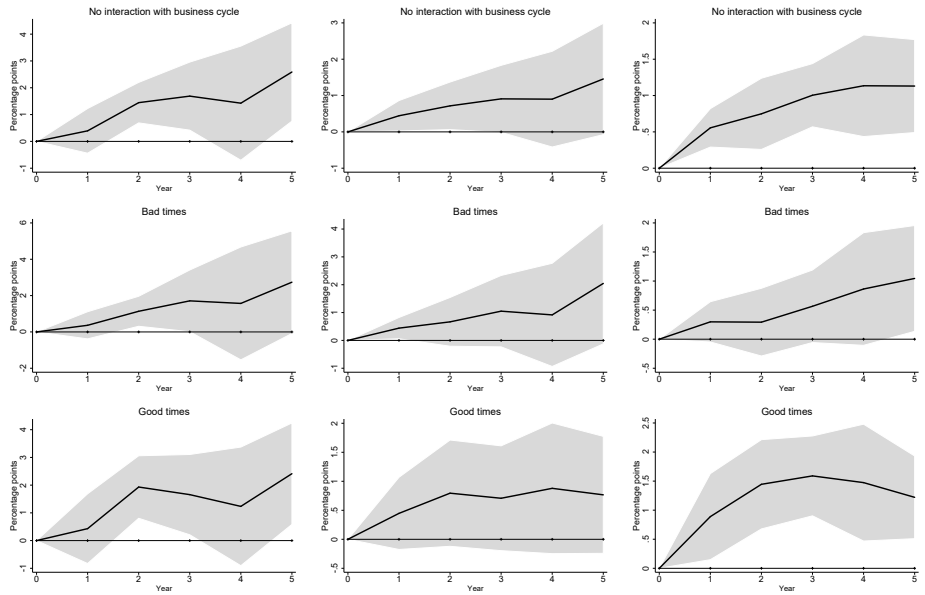
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that decentralizes bargaining. The estimates are based on the subgroup specification for employment by age group plus an additional control variable: total expenditure on labor market policies. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 18 – Impact of CB Reforms That Weaken Unions On Employment - By Education Level - Additional controls

(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults

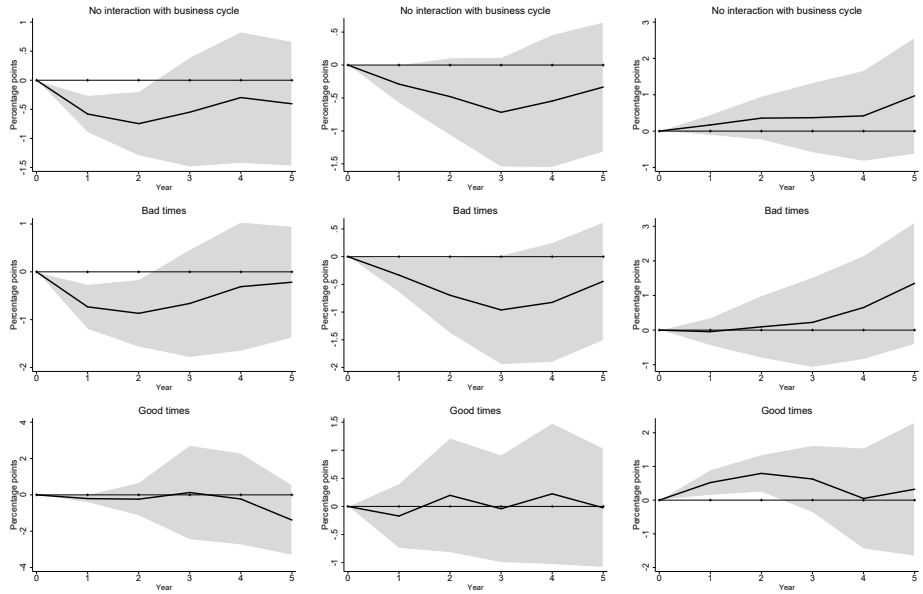



**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that weakens unions. The estimates are based on the subgroup specification for employment by age group plus an additional control variable: total expenditure on labor market policies. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

## E.2 Sensitivity to the number of lags

Figure 19 – Impact of CB Reforms That Decrease the Institutional Wedge on Aggregate Employment - 1 lag

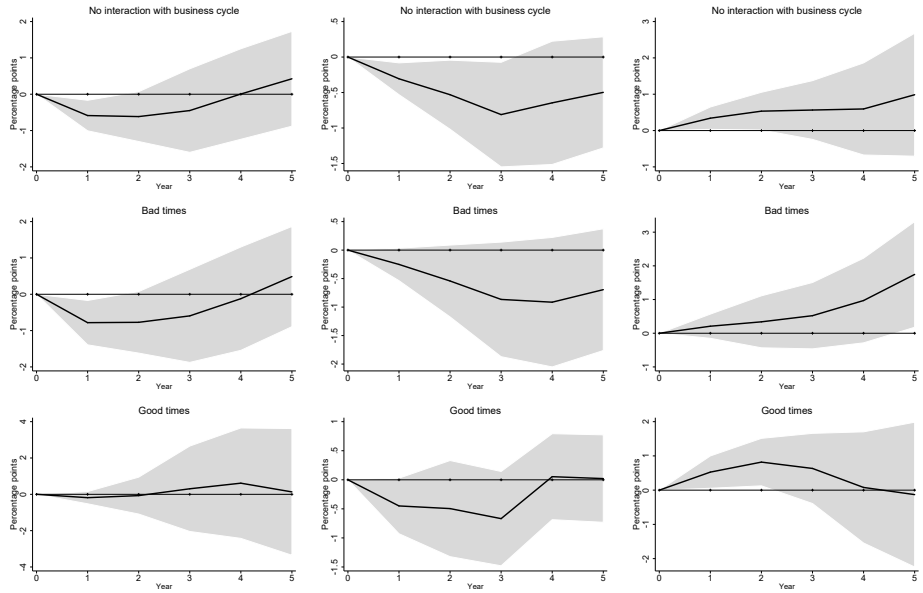
(a) Reduction in bargaining coverage (b) Decentralization of bargaining (c) Weakening of unions




**Notes**: The figures show the cumulative impulse responses of the employment rate of 15–64-year-olds (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The estimates are based on the main specification but with only 1 lag. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on employment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

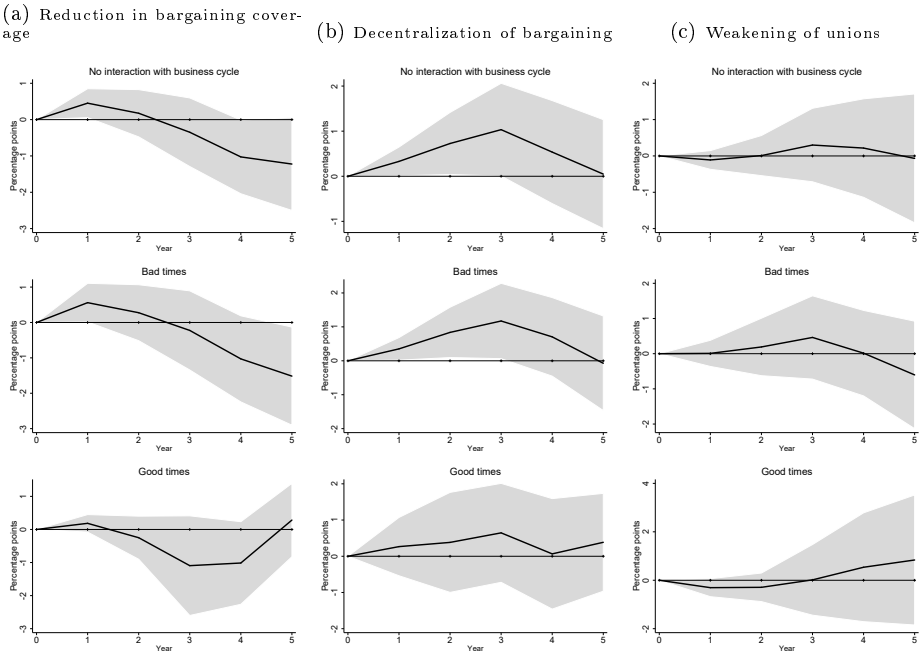
Figure 20 – Impact of CB Reforms That Decrease the Institutional Wedge on Aggregate Employment - 3 lags

(a) Reduction in bargaining coverage (b) Decentralization of bargaining (c) Weakening of unions



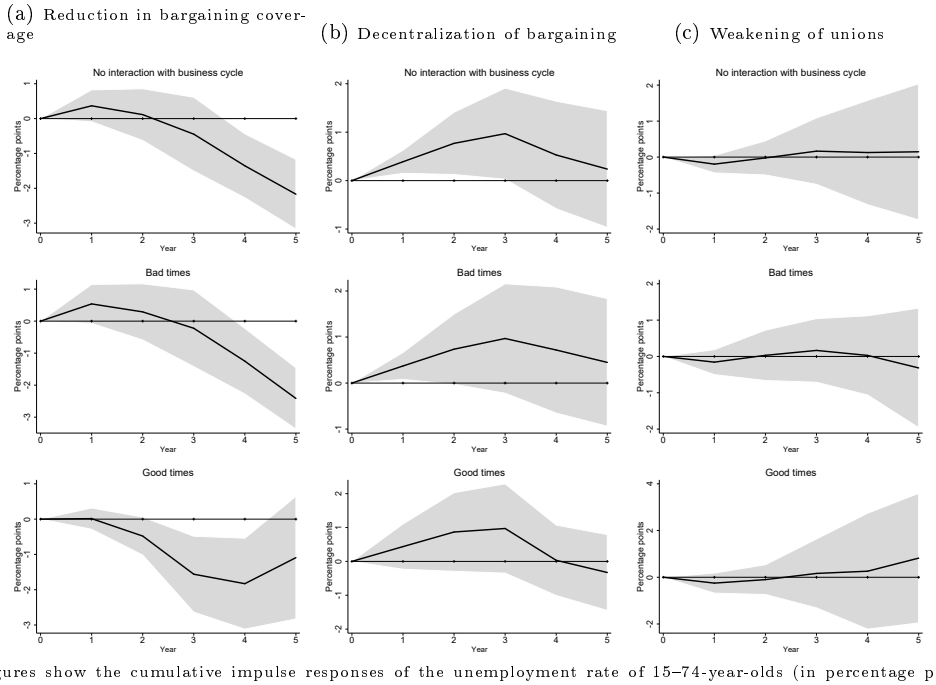

**Notes**: The figures show the cumulative impulse responses of the employment rate of 15–64-year-olds (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The estimates are based on the main specification but with 3 lags. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on employment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 21 – Impact of CB Reforms That Decrease the Institutional Wedge on Aggregate Unemployment - 1 lag



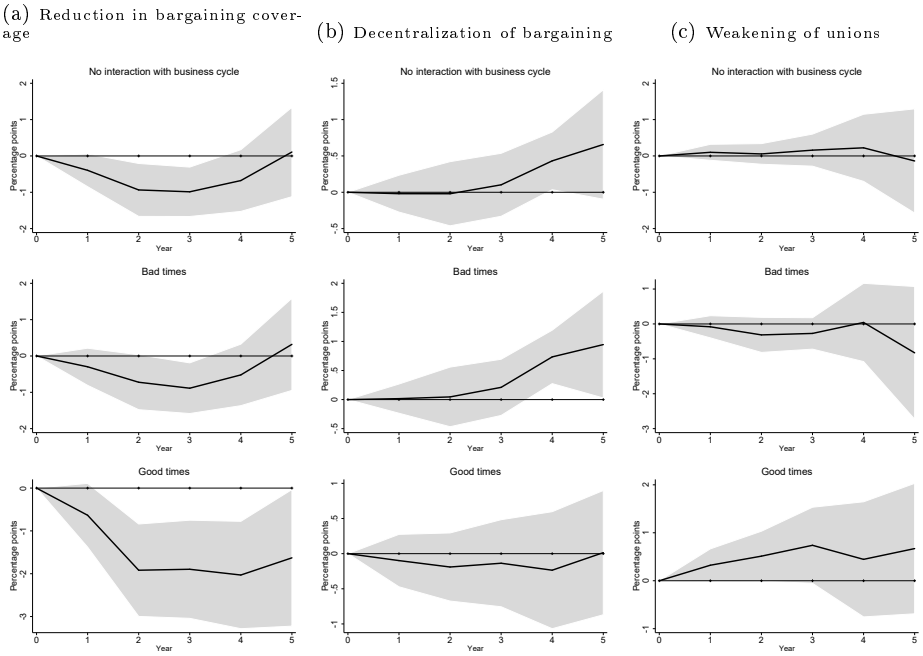

**Notes**: The figures show the cumulative impulse responses of the unemployment rate of 15–74-year-olds (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The estimates are based on the main specification but with only 1 lag. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on unemployment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on unemployment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 22 – Impact of CB Reforms That Decrease the Institutional Wedge on Aggregate Unemployment - 3 lags



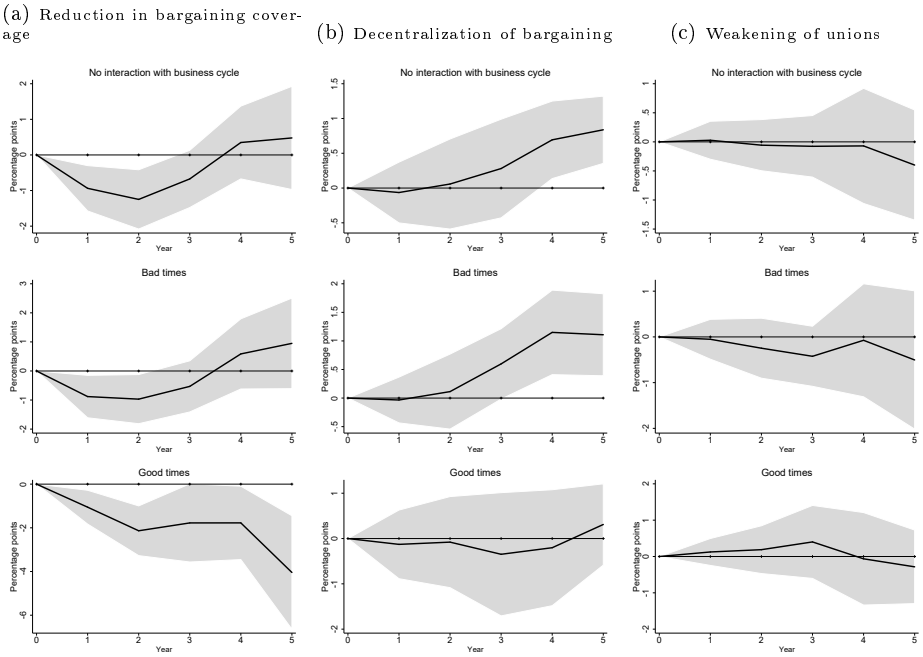

**Notes**: The figures show the cumulative impulse responses of the unemployment rate of 15–74-year-olds (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The estimates are based on the main specification but with 3 lags. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on unemployment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on unemployment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 23 – Impact of CB Reforms That Decrease the Institutional Wedge on Temporary Employment - 1 lag




**Notes**: The figures show the cumulative impulse responses of the temporary employment rate (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The estimates are based on the main specification but with only 1 lag. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on temporary employment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on temporary employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

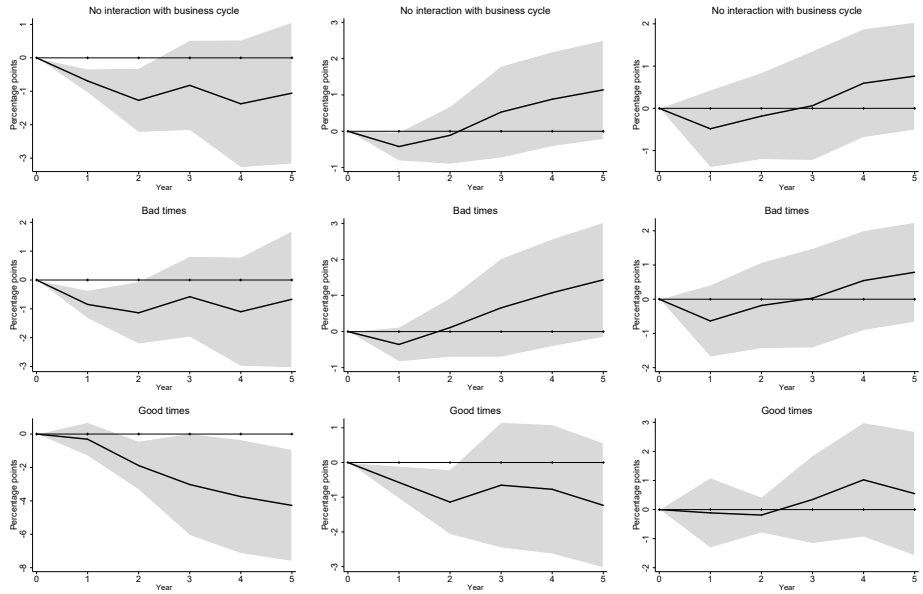
Figure 24 – Impact of CB Reforms That Decrease the Institutional Wedge on Temporary Employment - 3 lags




**Notes**: The figures show the cumulative impulse responses of the temporary employment rate (in percentage points) to a reform of the collective bargaining system that decreases the institutional wedge. The estimates are based on the main specification but with 3 lags. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on temporary employment (a) of reforms that reduce bargaining coverage, (b) of reforms that decentralize bargaining, and (c) of reforms that weaken unions. Each part of the figure contains three subpanels, showing the effects on temporary employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 25 – Impact of CB Reforms That Reduce Bargaining Coverage on Employment - By Age Group - 1 lag

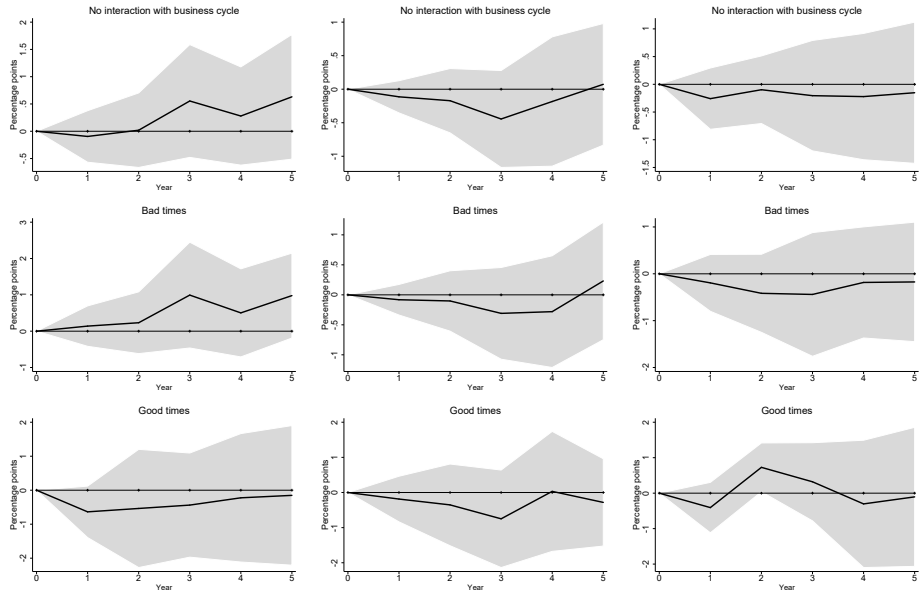
(a) Employment rate of 15–24-year-olds (b) Employment rate of 25–54-year-olds (c) Employment rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that reduces bargaining coverage. The estimates are based on the main specification but with only 1 lag. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 26 – Impact of CB Reforms That Decentralize Bargaining on Employment - By Age Group - 1 lag

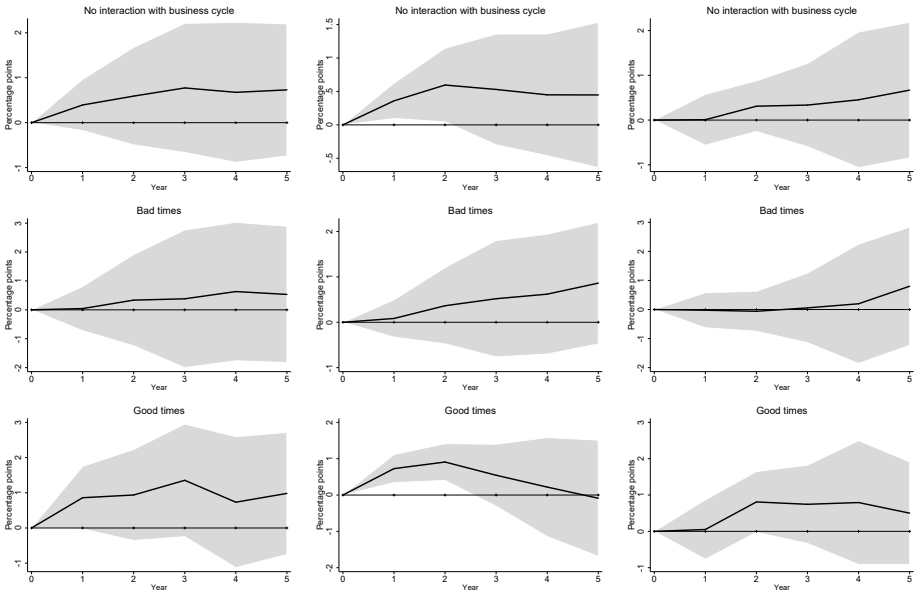
(a) Employment rate of 15–24-year-olds (b) Employment rate of 25–54-year-olds (c) Employment rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that decentralizes bargaining. The estimates are based on the main specification but with only 1 lag. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 27 – Impact of CB Reforms That Weaken Unions on Employment - By Age Group - 1 lag

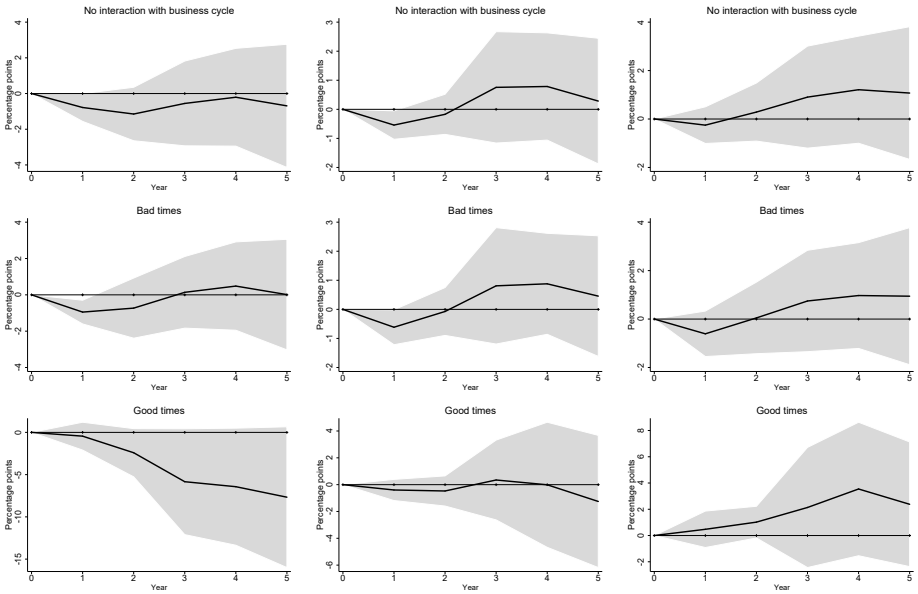
(a) Employment rate of 15–24-year-olds (b) Employment rate of 25–54-year-olds (c) Employment rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that weakens unions. The estimates are based on the main specification but with only 1 lag. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 28 – Impact of CB Reforms That Reduce Bargaining Coverage on Employment - By Age Group - 3 lags

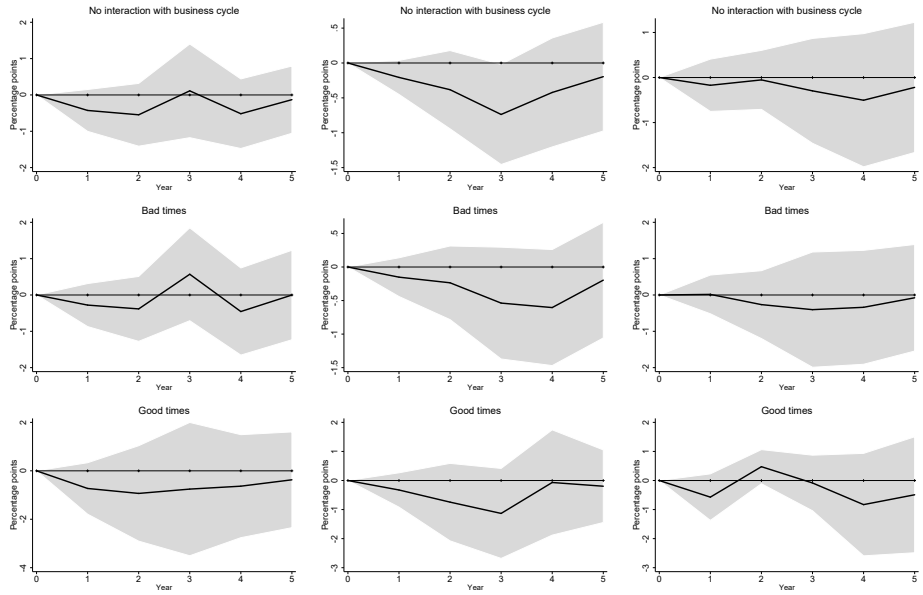
(a) Employment rate of 15–24-year-olds (b) Employment rate of 25–54-year-olds (c) Employment rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that reduces bargaining coverage. The estimates are based on the main specification but with 3 lags. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 29 – Impact of CB Reforms That Decentralize Bargaining on Employment - By Age Group - 3 lags

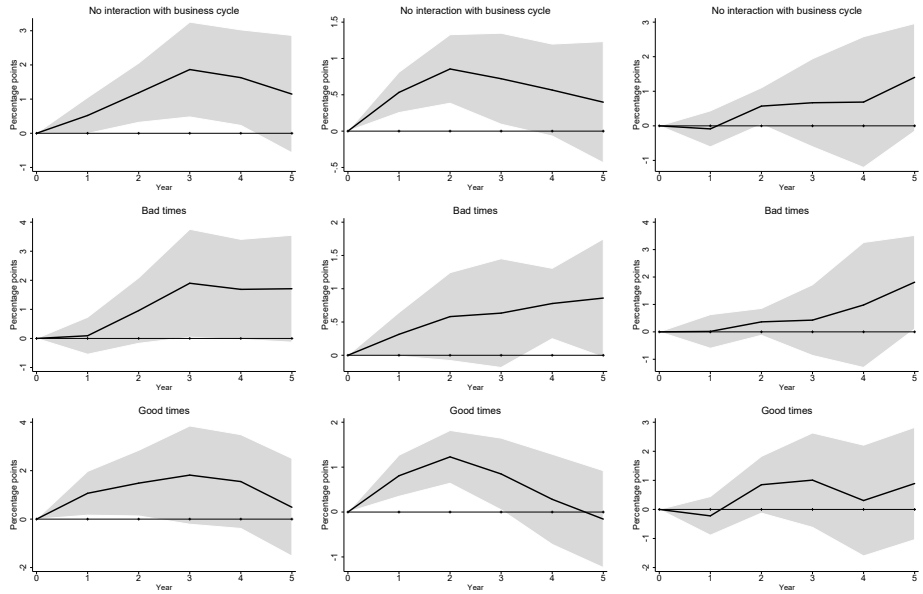
(a) Employment rate of 15–24-year-olds (b) Employment rate of 25–54-year-olds (c) Employment rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that decentralizes bargaining. The estimates are based on the main specification but with 3 lags. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 30 – Impact of CB Reforms That Weaken Unions on Employment - By Age Group - 3 lags

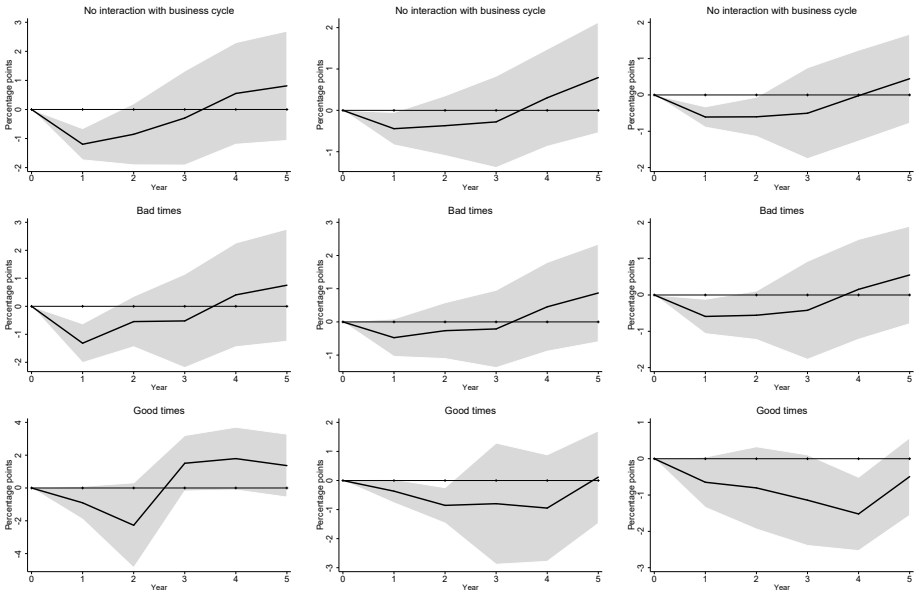
(a) Employment rate of 15–24-year-olds (b) Employment rate of 25–54-year-olds (c) Employment rate of 55–64-year-olds




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to a reform of the collective bargaining system that weakens unions. The estimates are based on the main specification but with 3 lags. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of 15–24-year-olds, (b) of 25–54-year-olds, and (c) of 55–64-year-olds. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 31 – Impact of CB Reforms That Reduce Bargaining Coverage on Employment - By Education Level - 1 lag

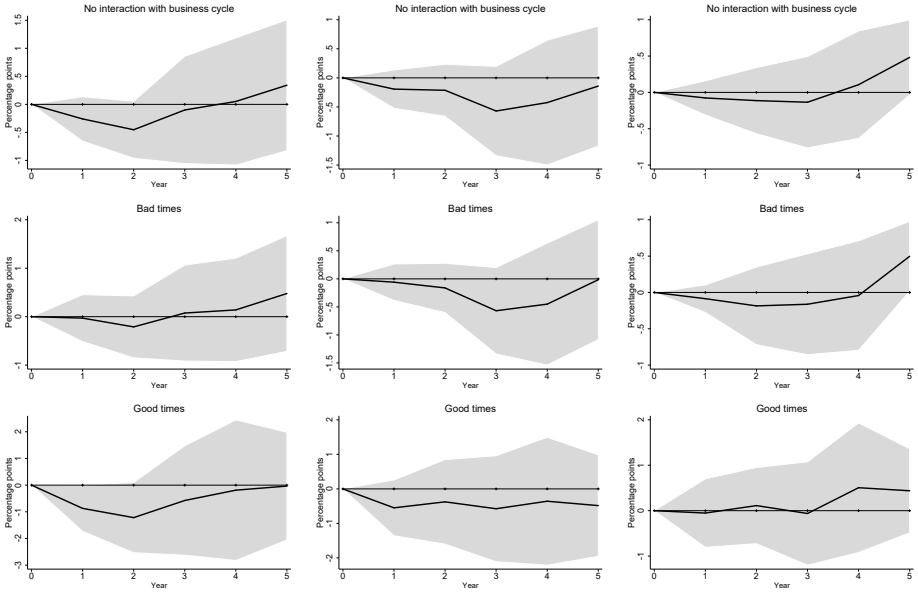
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that reduces bargaining coverage. The estimates are based on the main specification but with only 1 lag. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 32 – Impact of CB Reforms That Decentralize Bargaining on Employment - By Education Level - 1 lag

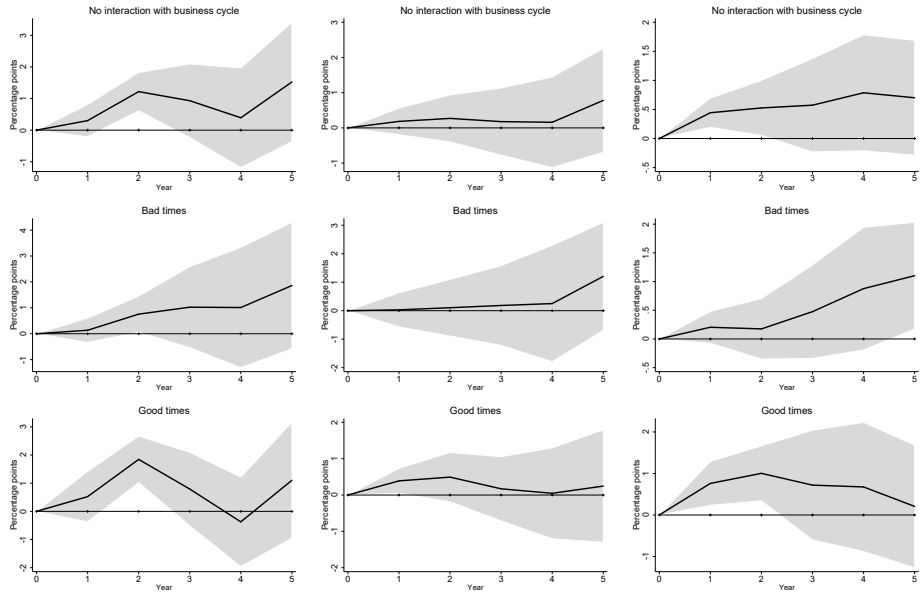
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that decentralizes bargaining. The estimates are based on the main specification but with only 1 lag. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 33 – Impact of CB Reforms That Weaken Unions on Employment - By Education Level - 1 lag

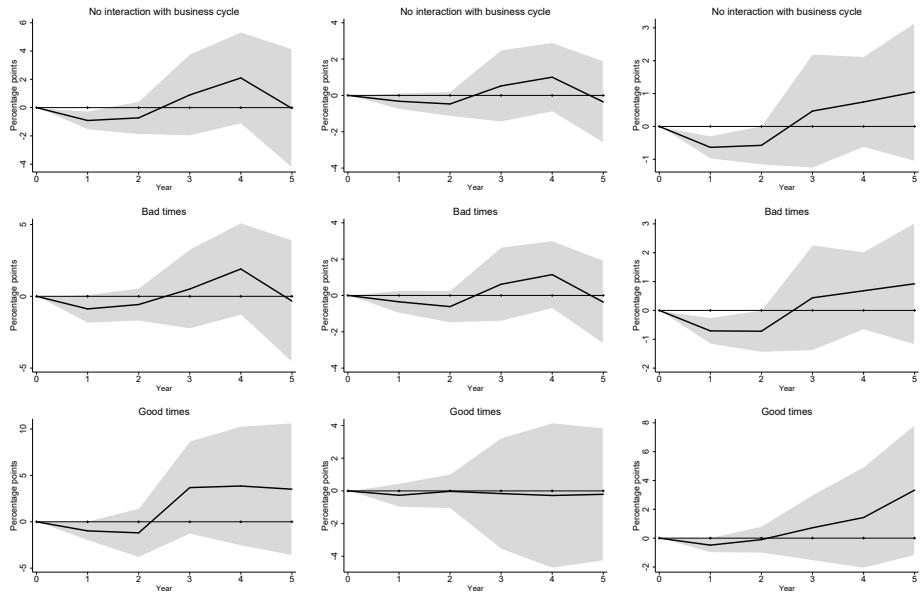
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that weakens unions. The estimates are based on the main specification but with only 1 lag. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 34 – Impact of CB Reforms That Reduce Bargaining Coverage on Employment - By Education Level - 3 lags

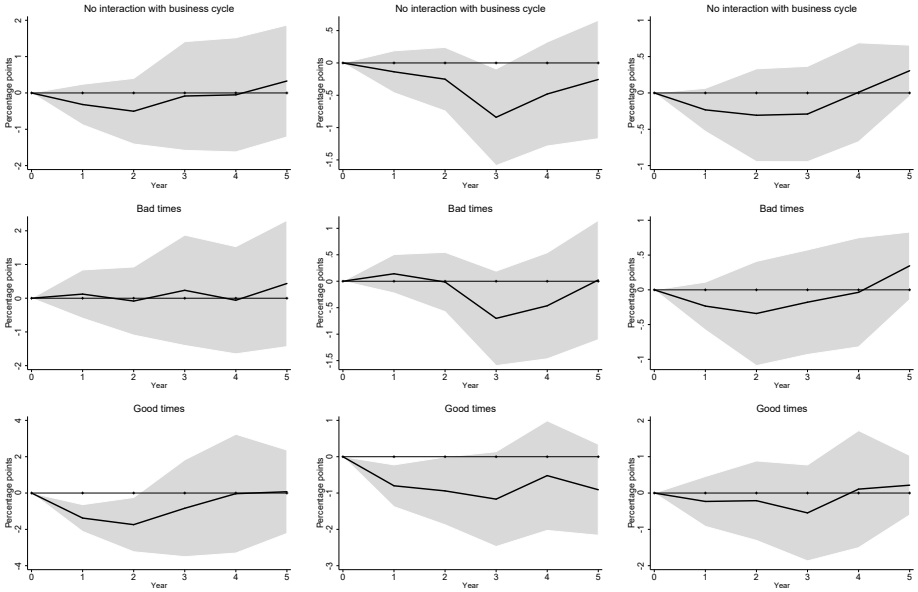
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that reduces bargaining coverage. The estimates are based on the main specification but with 3 lags. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 35 – Impact of CB Reforms That Decentralize Bargaining on Employment - By Education Level - 3 lags

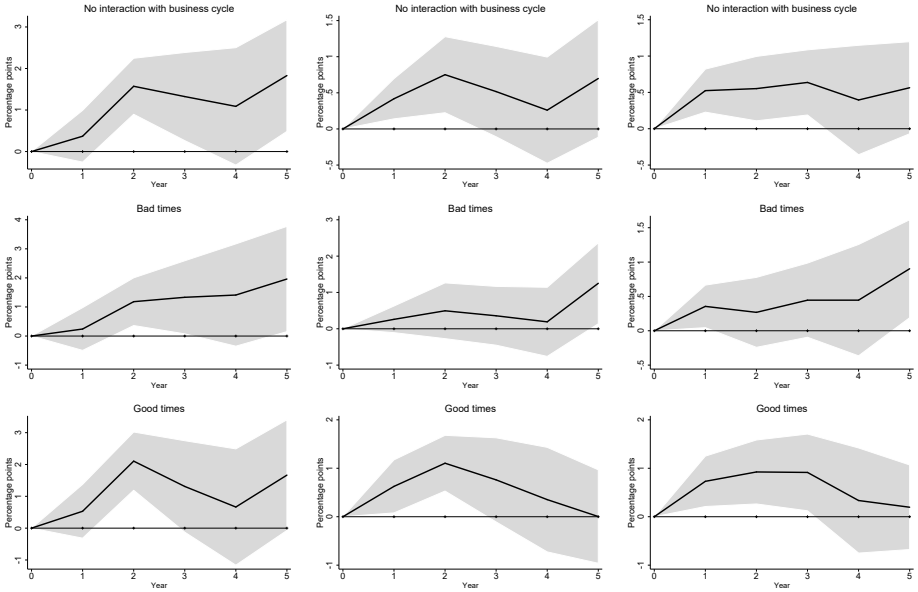
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that decentralizes bargaining. The estimates are based on the main specification but with 3 lags. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

Figure 36 – Impact of CB Reforms That Weaken Unions on Employment - By Education Level - 3 lags

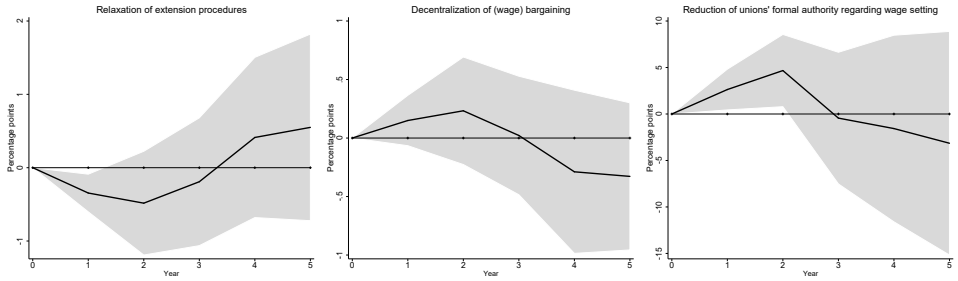
(a) Employment Rate of Low-educated Adults (b) Employment Rate of Secondary-educated Adults (c) Employment Rate of Tertiary-educated Adults




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to a reform of the collective bargaining system that weakens unions. The estimates are based on the main specification but with 3 lags. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the employment rates (a) of low-educated adults, (b) of secondary-educated adults, and (c) of tertiary-educated adults. Each part of the figure contains three subpanels, showing the effects on employment (i) regardless of the timing of the reform in the business cycle, (ii) in "bad times" (output gap $< -1$) and (iii) in "good times" (output gap $\geq -1$).

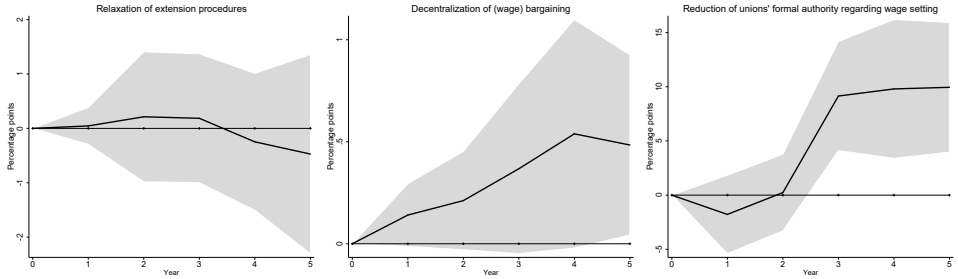
## E.3 Using ICTWSS variables

Figure 37 – Impact of CB Reforms on Aggregate Employment - ICTWSS variables



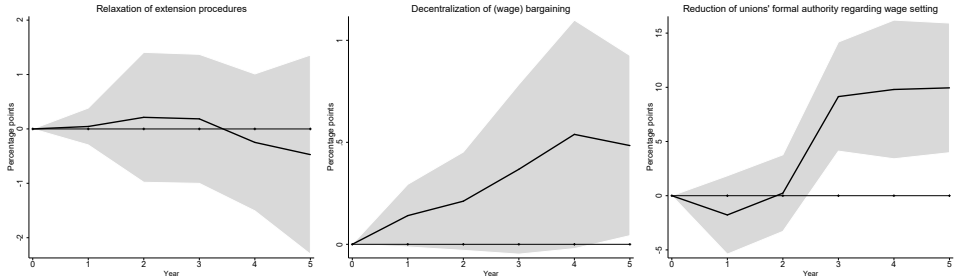

**Notes**: The figures show the cumulative impulse responses of the employment rate of 15–64-year-olds (in percentage points) to variations in collective bargaining system indicators in the ICTWSS database. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on employment (a) of a relaxation of extension procedures (as a proxy for reforms that reduce bargaining coverage), (b) of decentralization of (wage) bargaining (as a proxy for reforms that decentralize bargaining), and (c) of a reduction in the formal authority of unions in setting wages (as a proxy for reforms that weaken unions).

Figure 38 – Impact of CB Reforms on Aggregate Unemployment - ICTWSS variables




**Notes**: The figures show the cumulative impulse responses of the unemployment rate of 15–74-year-olds (in percentage points) to variations in collective bargaining system indicators in the ICTWSS database. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on unemployment (a) of a relaxation of extension procedures (as a proxy for reforms that reduce bargaining coverage), (b) of decentralization of (wage) bargaining (as a proxy for reforms that decentralize bargaining), and (c) of a reduction in the formal authority of unions in setting wages (as a proxy for reforms that weaken unions).

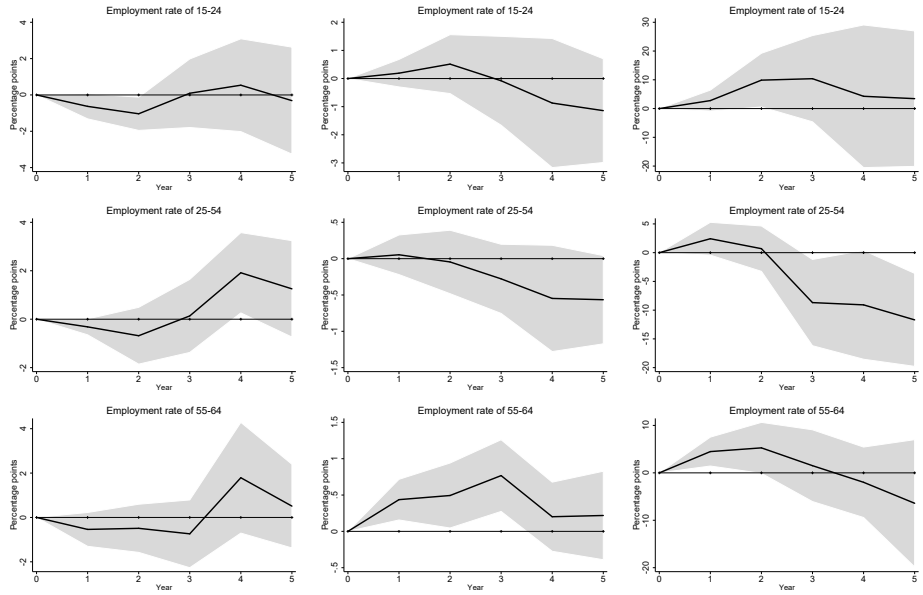
Figure 39 – Impact of CB Reforms on Temporary Employment - ICTWSS variables




**Notes**: The figures show the cumulative impulse responses of the temporary employment rate (in percentage points) to variations in collective bargaining system indicators in the ICTWSS database. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on temporary employment (a) of a relaxation of extension procedures (as a proxy for reforms that reduce bargaining coverage), (b) of decentralization of (wage) bargaining (as a proxy for reforms that decentralize bargaining), and (c) of a reduction in the formal authority of unions in setting wages (as a proxy for reforms that weaken unions).

Figure 40 – Impact of CB Reforms on Employment - By Age Group - ICTWSS variables

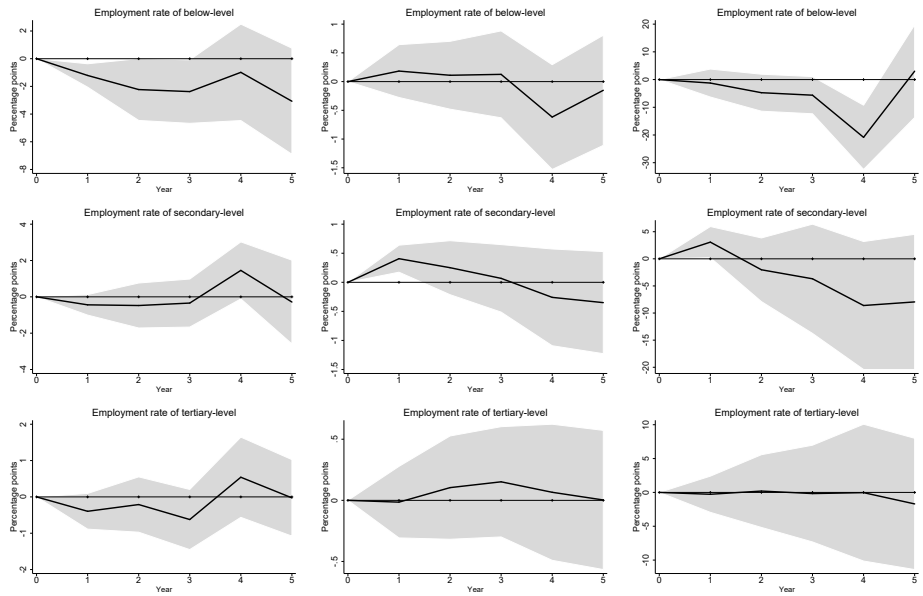
(a) Relaxation of extension procedures (b) Decentralization of (wage) bargaining (c) Reduction of unions' formal authority regarding wage setting




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different age groups to variations in collective bargaining system indicators in the ICTWSS database. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on employment (a) of a relaxation of extension procedures (as a proxy for reforms that reduce bargaining coverage), (b) of decentralization of (wage) bargaining (as a proxy for reforms that decentralize bargaining), and (c) of a reduction in the formal authority of unions in setting wages (as a proxy for reforms that weaken unions).

Figure 41 – Impact of CB Reforms on Employment - By Education Level - ICTWSS variables

(a) Relaxation of extension procedures (b) Decentralization of (wage) bargaining (c) Reduction of unions' formal authority regarding wage setting




**Notes**: The figures show the cumulative impulse responses of the employment rate (in percentage points) in different education-level groups to variations in collective bargaining system indicators in the ICTWSS database. The contemporaneous effect of the reform is set to 0. The grey bands represent 90% confidence intervals. Parts (a–c) show the effects on employment (a) of a relaxation of extension procedures (as a proxy for reforms that reduce bargaining coverage), (b) of decentralization of (wage) bargaining (as a proxy for reforms that decentralize bargaining), and (c) of a reduction in the formal authority of unions in setting wages (as a proxy for reforms that weaken unions).

## E.4 Forward Terms

Table 11 – OLS Estimates Including Forward Terms of Collective Bargaining Reforms

| Dependent: change in employment rate of 15–64-year-olds | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Reduction in bargaining coverage $t$ | -0.52** | -0.57** | -0.58** | -0.61** |
| | (0.23) | (0.24) | (0.24) | (0.24) |
| Reduction in bargaining coverage $t-1$ | | -0.43** | -0.43** | -0.52** |
| | | (0.19) | (0.19) | (0.23) |
| Reduction in bargaining coverage $t-2$ | | | -0.07 | -0.09 |
| | | | (0.21) | (0.22) |
| Decentralization of bargaining $t$ | 0.01 | -0.01 | -0.01 | 0.02 |
| | (0.21) | (0.23) | (0.24) | (0.23) |
| Decentralization of bargaining $t-1$ | | -0.09 | -0.07 | -0.05 |
| | | (0.16) | (0.17) | (0.17) |
| Decentralization of bargaining $t-2$ | | | 0.16 | 0.10 |
| | | | (0.14) | (0.15) |
| Weakening of unions $t$ | 0.04 | 0.01 | 0.00 | -0.03 |
| | (0.18) | (0.19) | (0.19) | (0.19) |
| Weakening of unions $t-1$ | | 0.23* | 0.24** | 0.25* |
| | | (0.11) | (0.11) | (0.14) |
| Weakening of unions $t-2$ | | | 0.23 | 0.24 |
| | | | (0.15) | (0.19) |
| Reduction in bargaining coverage $t+1$ | | | | -0.09 |
| | | | | (0.20) |
| Decentralization of bargaining $t+1$ | | | | 0.05 |
| | | | | (0.19) |
| Weakening of unions $t+1$ | | | | -0.30* |
| | | | | (0.15) |
| $R^2$ | 0.691 | 0.699 | 0.702 | 0.708 |
| Observations | 420 | 420 | 420 | 396 |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the coefficient estimates. Coefficient estimates of control variables and fixed effects are not reported. The dependent variable is the change in the employment rate (15–64-year-olds). The control variables include the twice-lagged values of *(i)* the change in the employment rate; *(ii)* national change; and the contemporaneous and twice-lagged values of *(iii)* the output gap; *(iv)* the yield curve; *(v)* the short-term interest rate; *(vi)* real total government expenditure excluding interest; and the contemporaneous value of *(vii)* euro zone membership. The forward terms are denoted $t+1$ and are shown in column (4).
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# Table 12 – Effects of CB Reforms on Employment and Unemployment - First stage (OLS)

(a) Aggregate Employment

| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Category 1** | **Reduction in bargaining coverage** | | | | | |
| | IV | 0.29** | 0.31** | 0.32** | 0.31** | 0.37** |
| | | (0.14) | (0.15) | (0.15) | (0.15) | (0.17) |
| | Observations | 396 | 369 | 342 | 315 | 287 |
| | *Instrument relevance test* | | | | | |
| | *H0: Excluded instruments are irrelevant (under-identification)* | | | | | |
| | Kleibergen–Paap rk LM statistic | 5.03 (0.02) | 5.48 (0.02) | 5.51 (0.02) | 5.58 (0.02) | 6.32 (0.01) |
| | *Instrument weakness tests* | | | | | |
| | *H0: Excluded instruments are weak (weak identification)* | | | | | |
| | Cragg-Donald Wald Statistic | 13.10 | 14.88 | 14.94 | 13.10 | 18.72 |
| | Kleibergen-Paap Wald rk F statistic | 4.38 | 4.41 | 4.39 | 4.23 | 4.44 |
| | *Endogeneity tests* | | | | | |
| | *H0: Endogenous regressor is exogenous* | | | | | |
| | Durbin-Wu-Hausman F statistic | 2.48 (0.12) | 1.20 (0.28) | 0.15 (0.70) | 0.03 (0.87) | 0.07 (0.79) |
| | Difference-in Sargan C statistic | 0.88 (0.35) | 0.83 (0.36) | 0.03 (0.87) | 0.00 (0.99) | 0.02 (0.89) |
| **Category 2** | **Decentralization of bargaining** | | | | | |
| | IV | -0.01 | 0.00 | 0.02 | 0.02 | 0.02 |
| | | (0.09) | (0.09) | (0.10) | (0.10) | (0.10) |
| | Observations | 396 | 369 | 342 | 315 | 287 |
| | *Instrument relevance test* | | | | | |
| | *H0: Excluded instruments are irrelevant (under-identification)* | | | | | |
| | Kleibergen–Paap rk LM statistic | 0.03 (0.86) | 0.00 (1.00) | 0.07 (0.80) | 0.07 (0.80) | 0.06 (0.80) |
| | *Instrument weakness tests* | | | | | |
| | *H0: Excluded instruments are weak (weak identification)* | | | | | |
| | Cragg-Donald Wald Statistic | 0.04 | 0.00 | 0.09 | 0.08 | 0.07 |
| | Kleibergen-Paap Wald rk F statistic | 0.03 | 0.00 | 0.06 | 0.06 | 0.05 |
| | *Endogeneity tests* | | | | | |
| | *H0: Endogenous regressor is exogenous* | | | | | |
| | Durbin-Wu-Hausman F statistic | 0.89 (0.35) | 0.75 (0.39) | 0.06 (0.81) | 0.18 (0.68) | 0.64 (0.42) |
| | Difference-in Sargan C statistic | 1.13 (0.29) | 0.33 (0.56) | 0.56 (0.46) | 0.01 (0.93) | 0.01 (0.93) |
| **Category 3** | **Weakening of unions** | | | | | |
| | IV | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| | Observations | 396 | 369 | 342 | 315 | 287 |
| | *Instrument relevance test* | | | | | |
| | *H0: Excluded instruments are irrelevant (under-identification)* | | | | | |
| | Kleibergen–Paap rk LM statistic | 0.04 (0.84) | 0.02 (0.89) | 0.06 (0.81) | 0.05 (0.82) | 0.02 (0.89) |
| | *Instrument weakness tests* | | | | | |
| | *H0: Excluded instruments are weak (weak identification)* | | | | | |
| | Cragg-Donald Wald Statistic | 0.03 | 0.01 | 0.03 | 0.03 | 0.01 |
| | Kleibergen-Paap Wald rk F statistic | 0.04 | 0.02 | 0.05 | 0.04 | 0.02 |
| | *Endogeneity tests* | | | | | |
| | *H0: Endogenous regressor is exogenous* | | | | | |
| | Durbin-Wu-Hausman F statistic | 1.51 (0.22) | 2.68 (0.10) | 1.55 (0.21) | 0.31 (0.58) | 0.03 (0.86) |
| | Difference-in Sargan C statistic | 1.01 (0.31) | 1.28 (0.26) | 1.30 (0.25) | 1.32 (0.25) | 3.05 (0.08) |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the first stage coefficient estimates. P-values for LM, DWH F and Sargan C tests are shown in parentheses. The Stock–Yogo critical values for weak identification tests (used in the Cragg–Donald Wald test) are 16.38 for 10% and 8.96 for 15% maximal relative bias. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

(b) Aggregate Unemployment

| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Category 1** | **Reduction in bargaining coverage** | | | | | |
| | IV | 0.29** | 0.31** | 0.31** | 0.30** | 0.36** |
| | | (0.14) | (0.15) | (0.15) | (0.15) | (0.17) |
| | Observations | 396 | 369 | 342 | 315 | 287 |
| | *Instrument relevance test* | | | | | |
| | *H0: Excluded instruments are irrelevant (under-identification)* | | | | | |
| | Kleibergen–Paap rk LM statistic | 5.06 (0.02) | 5.50 (0.02) | 5.43 (0.02) | 5.57 (0.02) | 6.46 (0.01) |
| | *Instrument weakness tests* | | | | | |
| | *H0: Excluded instruments are weak (weak identification)* | | | | | |
| | Cragg-Donald Wald Statistic | 13.19 | 14.92 | 14.72 | 12.57 | 18.30 |
| | Kleibergen-Paap Wald rk F statistic | 4.38 | 4.41 | 4.32 | 4.17 | 4.44 |
| | *Endogeneity tests* | | | | | |
| | *H0: Endogenous regressor is exogenous* | | | | | |
| | Durbin-Wu-Hausman F statistic | 0.87 (0.35) | 0.69 (0.41) | 0.01 (0.92) | 0.42 (0.52) | 1.18 (0.28) |
| | Difference-in Sargan C statistic | 0.88 (0.35) | 0.71 (0.39) | 0.01 (0.92) | 0.54 (0.46) | 1.53 (0.22) |
| **Category 2** | **Decentralization of bargaining** | | | | | |
| | IV | -0.02 | -0.01 | 0.01 | 0.01 | 0.01 |
| | | (0.09) | (0.09) | (0.10) | (0.10) | (0.10) |
| | Observations | 396 | 369 | 342 | 315 | 287 |
| | *Instrument relevance test* | | | | | |
| | *H0: Excluded instruments are irrelevant (under-identification)* | | | | | |
| | Kleibergen–Paap rk LM statistic | 0.08 (0.78) | 0.01 (0.94) | 0.02 (0.89) | 0.02 (0.90) | 0.01 (0.92) |
| | *Instrument weakness tests* | | | | | |
| | *H0: Excluded instruments are weak (weak identification)* | | | | | |
| | Cragg-Donald Wald Statistic | 0.10 | 0.01 | 0.03 | 0.02 | 0.01 |
| | Kleibergen-Paap Wald rk F statistic | 0.07 | 0.00 | 0.02 | 0.01 | 0.01 |
| | *Endogeneity tests* | | | | | |
| | *H0: Endogenous regressor is exogenous* | | | | | |
| | Durbin-Wu-Hausman F statistic | 0.00 (0.99) | 0.19 (0.66) | 0.03 (0.87) | 0.03 (0.87) | 0.19 (0.66) |
| | Difference-in Sargan C statistic | 0.00 (0.99) | 0.22 (0.64) | 0.03 (0.86) | 0.03 (0.86) | 0.23 (0.63) |
| **Category 3** | **Weakening of unions** | | | | | |
| | IV | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 |
| | | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| | Observations | 396 | 369 | 342 | 315 | 287 |
| | *Instrument relevance test* | | | | | |
| | *H0: Excluded instruments are irrelevant (under-identification)* | | | | | |
| | Kleibergen–Paap rk LM statistic | 0.16 (0.69) | 0.02 (0.88) | 0.05 (0.82) | 0.43 (0.51) | 0.32 (0.57) |
| | *Instrument weakness tests* | | | | | |
| | *H0: Excluded instruments are weak (weak identification)* | | | | | |
| | Cragg-Donald Wald Statistic | 0.11 | 0.01 | 0.03 | 0.27 | 0.17 |
| | Kleibergen-Paap Wald rk F statistic | 0.14 | 0.02 | 0.04 | 0.37 | 0.27 |
| | *Endogeneity tests* | | | | | |
| | *H0: Endogenous regressor is exogenous* | | | | | |
| | Durbin-Wu-Hausman F statistic | 1.46 (0.23) | 1.25 (0.27) | 0.25 (0.62) | 0.02 (0.89) | 0.37 (0.55) |
| | Difference-in Sargan C statistic | 1.61 (0.20) | 1.38 (0.24) | 0.28 (0.59) | 0.02 (0.88) | 0.42 (0.52) |

**Notes:** Country-based cluster-robust standard errors are shown in parentheses below the first stage coefficient estimates. P-values for LM, DWH F and Sargan C tests are shown in parentheses. The Stock–Yogo critical values for weak identification tests (used in the Cragg–Donald Wald test) are 16.38 for 10% and 8.96 for 15% maximal relative bias. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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