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Article

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António Afonso^{1,2,*†}, João Tovar Jalles^{1,2,3,4,5} and Zoe Venter⁶

Minimum wage and collective bargaining shocks: a narrative database for advanced economies

Abstract

This paper presents and describes a new database of major minimum wage and collective bargaining (CB) shocks covering 26 advanced economies over the period 1970–2020. The main advantage of this dataset is the precise identification of the nature and date of major shocks, which is valuable in many empirical applications. Based on the dataset, we observe that major changes in minimum wages have been more frequent than in CB in the last decades, and the majority of these were implemented during the 1980s and 1990s. In our empirical application, we find that minimum wage policy reductions have a medium-run positive impact on labor productivity and they lead to a fall in the unemployment rate. CB policy liberalizations do not seem to affect either productivity or capital formation, but they have a clear medium-term effect on the labor market. Moreover, CB policy liberalizations are characterized by a greater sensitivity to the prevailing business cycle conditions at the time of the shock (vis-à-vis minimum wage reforms).

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1 Introduction

A new cross-country time-series database of major historical policy actions in the minimum wage and collective bargaining (CB) could be of use to researchers and practitioners alike. Hence, this should be particularly the case in those areas where measuring the policy stance is most challenging and existing information on major wage reforms is currently scarce, incomplete, or even non-existent. Prime candidates such as product market regulation, employment protection legislation, or unemployment benefits have been covered for advanced economies by Duval et al. (2018). However, minimum wage and CB remain to be addressed.

For the relevance and contextualization of the topic at hand, we can recall notably the early discussion about the so-called Okun Law linking unemployment and economic growth (Okun, 1962). On the other hand, Levine (1991) mentions that policies affecting, for instance, minimum wage, can increase efficiency in economies. Akerlof (1982) discussed the idea that workers become more motivated and more productive in response to higher wages (efficiency wage). Dickens et al. (1999) mention that, for the UK, in the period 1975–1992, minimum wages significantly compress the distribution of earnings, although they do not find negative effects on employment.

In addition, existing literature also has addressed such issues as inclusivity in the labor market (El-Ganainy et al., 2021) and the design of labor market institutions that matter for workers, notably minimum wages and CB (Duval and Loungani, 2019). National minimum wage hikes induce productivity growth, as reported by Rizov et al. (2016) for the UK, while Sabia (2015) finds for the US that an increase in the minimum wage is associated with a decline in GDP generated by lower-skilled industries when compared with higher-skilled industries. In the case of Germany, Caliendo et al. (2019) indicate that 2 years after the minimum wage introduction (in 2015), hourly wages increased for low-wage earners while they also report small negative employment effects.

Therefore, this paper presents a new database on major shocks in the areas of minimum wage and CB for 26 countries over the period 1970–2020.¹ The dataset is built in two steps. First, for each of the 26 advanced economies and each of the aforementioned policy areas, we record all legislative actions mentioned in all past *OECD Economic Surveys* – the regular country surveys published by the OECD – published over the period 1970–2020. Second, among all those actions, we identify major measures (liberalizing/easing and tightening reforms) as those that meet at least one of three alternative criteria: (i) a narrative criterion based on OECD staff's judgment on the significance of the reform at the time of adoption; (ii) whether the reform is mentioned again in subsequent *Economic Surveys*, as opposed to only once when the measure is adopted; and (iii) the magnitude of the change in the corresponding OECD minimum wage indicator.

The main advantage of this dataset concerns the fact that it can be used to identify, document, and provide the implementation date of major shocks in the areas of minimum wage and CB. As flagged above, this is highly valuable in many empirical applications. For example, in an application to the cross-country time-series estimation of the macroeconomic effects of major minimum wage reforms, we illustrate the gains from using our database rather than others

¹ For the former transition economies in the dataset, namely the Czech Republic and the Slovak Republic, data are available from 1990 to 2020.

typically used in this strand of the literature on reforms (such as the simple annual change in the level of the minimum wage variable available, e.g., from the OECD database).

At the same time, it should be acknowledged that the criteria we apply to identify major shocks, transparent as they are, do not constitute the only possible option. Furthermore, we do not distinguish among different major shocks – all of them are treated equally, even though some have likely been more important than others in practice. This dataset should be regarded as a work in progress, for researchers to build on and improve upon. Furthermore, the approach taken here could, in principle, be extended to other relevant areas not covered here.

Based on the dataset, major shocks in the areas covered in this paper appear to have been more frequent in minimum wages than in CB in the last decades, and the majority of them were implemented during the 1980s and 1990s.

Minimum wage liberalization or pro-competitive shocks (reductions) have a statistically significant positive impact on labor productivity over the medium term and they lead to a medium-run fall in the unemployment rate. In addition, CB policy liberalizations do not seem to influence either productivity or capital formation but have a clear medium-term effect on the labor market. Moreover, CB policy liberalizations are more sensitive to the business cycle positioning of the economy at the time of the reform than are minimum wage reductions.

The remainder of the paper is organized as follows. Section 2 presents the methodology. Section 3 discusses some stylized facts on reform patterns. Section 4 provides an empirical application. Section 5 is the conclusion.

2 Methodology

2.1 Database construction

The database currently covers four main areas within minimum wage (MW) and CB. For the first, two categories are considered, namely broad and targeted MW reforms. For the second, too, two categories are considered, namely moves to CB and extensions of the CB agreement.

In the first step, we identify all legislative and regulatory actions related to minimum wage and CB mentioned in any *OECD Economic Survey* for any of the 26 countries over the entire sample.² Several hundred such actions are identified overall.³ In a second step, for any of these actions to qualify as a major liberalizing (+1) or tightening (−1) reform, one of the following three alternative criteria has to be met⁴:

- (1) The *OECD Economic Survey* uses strong normative language to define the action at the time it is taken, suggestive of an important measure (for example, “major reform,” “major steps,” “important measures,” and “commendable elements”). In this respect,

2 The 26 countries covered are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom, and the United States. For the Czech Republic and the Slovak Republic, policy actions are recorded starting from 1990. For Korea, while data are collected starting from 1970, the information is drawn from OECD Surveys published starting from 1994. Hence, the quality of the information collected for the years before 1994 is generally poorer for Korea than it is for the other countries.

3 Data collection was carried out by hand, not automatically. As with all narrative-based datasets, there is an element of judgement associated with the collection process. The data were verified by the authors using different checks.

4 Most of the times, at least two criteria are met. As described, for the case of minimum wage reforms, if only the quantitative criteria 3 is used, an extensive web search was conducted to corroborate the change in the indicator of reference.

the methodology is related to the “narrative approach” used by Romer and Romer (2010 and 2017), Devries et al. (2011), and Duval et al. (2018) to identify monetary and fiscal shocks, periods of high financial distress, and product and labor market reforms, respectively.

- (2) The policy action is mentioned repeatedly across different editions of the *OECD Economic Survey* for the country considered, and/or in the retrospective summaries of key past reforms that are featured in some editions, which is also indicative of a major action.
- (3) For the minimum wage reform area only, when available, the existing OECD minimum wage continuous variable displays a very large change (in the 5th percentile of the distribution [top and bottom] of the cumulative change in the indicator over 3 years – to accommodate possibly gradual phasing-in of otherwise major reforms). The OECD minimum wage indicator is available publicly in *OECD.stat* at current prices in national currency. When only this third condition is met, an extensive search through other available domestic and national sources, including through the internet, is performed to identify the policy action underpinning the change in the minimum wage. For CB, no continuous counterpart or proxy is available, and so the reform coding is solely based on criteria (1) and (2).

As noted above, the approach considers both liberalizing and tightening shocks from a competitive market point of view. That is, from this standpoint, minimum wage reductions are market friendly and liberalizing; the same goes with liberalizing policies in CB. Therefore, for each country, the shock variable in each area (MW or CB) takes value 0 in non-reform years, 1 in liberalizing years, and -1 in tightening years. In the absence of fully comprehensive information on reform announcement dates, the database focuses on implementation dates. Given its annual frequency, as a rule, major shocks that are implemented during the first half of a given year t are assigned to year t , while those implemented during the second half of year t are assigned to year $t+1$. Judgement calls are made when a major reform results from two or more measures taken at different points during a given year or are spread across 2 years. This is the case when a major shock results from the combination of two distinct policy actions taken at different but close dates.

2.2 Strengths and weaknesses

Table 1 provides an illustrative example on how the three criteria mentioned above guide the identification of major shocks and “counter-shocks” in the area of MW and CB. For us a “shock” is the $+1$ in our coding system and means a pro-competitive policy action in any given area; in contrast, the “counter-shock” is a tightening policy-action or an anti-competitive legislative change. In some cases, the available OECD indicator does not capture the full scope of the measure (1984 Denmark minimum wage change). In other cases, the qualitative information drawn from the *Country Surveys* coincides, and is fully consistent with, the observed change in the value of the corresponding OECD indicator (1984 Greek CB change).

More broadly, compared to indirect methods that would infer major shocks in the area of minimum wage only from changes in the OECD variable, our approach: identifies the exact

Table 1 Country examples of reforms identified according to different criteria

Shock (+) or counter-shock (-)	Implementation year	Area	Country	Content	Normative language featured in OECD Country Survey	Mention in later Surveys	Large change in OECD indicator
-	1975	Minimum Wages	Australia	The decision provides an immediate increase of 3.6% in all wages under Federal award and an increase of \$ 4 per week in the minimum wage, effective from the first period on or after May 15.		1976, 1980	No
+	1984	Minimum Wages	Denmark	Agreement on additional budget improvements, amounting to Kr. 1 ½ billion in 1984 and some Kr. 5 billion in 1985.	(..) Major steps to improve the wage formation process were taken already in 1979/80 by first excluding energy prices from the index regulating wage increases and then partially suppressing automatic wage adjustments. After a 2-year pause, efforts to break the wage-price spiral were intensified by the present Government, which, in 1982, decided to suspend the automatic indexation scheme until 1985. (..)	1986	No
+	1993	CB	Australia	Industrial Relations Reform Bill 1993	(p. 89, 1994): The Federal Government has introduced the Industrial Relations Reform Bill 1993 in order to provide an effective bargaining framework for the further spread of enterprise bargaining throughout the Australian economy. A major part of the Reform Bill is the introduction of more effective arrangements for direct bargaining, including the establishment of a new stream of enterprise flexibility agreements to be made directly between employers and employees. These agreements will be of particular relevance to non-unionized and lightly unionized enterprises. (..)	1994, 1995, 1997, 1998	No
+	1984	CB	Greece	The 1984 national collective agreement.	The 1984 national collective agreement is signed, providing for full indexation of minimum salaries and wages.	No	Yes

CB, collective bargaining.

timing of major legislative and regulatory actions; identifies the precise shocks that underpin what otherwise looks like a gradual increase or decrease in the OECD minimum wage variable without any obvious break; and documents the nature and timing of the legislative and regulatory actions that underpin observed large changes in the OECD minimum wage variable – in cases where the latter are the main, or even the only, source of identification of a major shock. It also captures reforms in areas for which OECD indicators do not exist, such as CB.

These important strengths of the database come with limitations, some conceptual and others practical. On a conceptual level, as transparent as they are, the criteria we apply to identify major shocks are only one amongst several possible options – there is no single, objective way to distinguish between major and minor reforms. Furthermore, we do not distinguish among different major reforms – all of them are treated equally, even though, in practice, some have likely been more important than others. Yet, two large shocks in a given area (for example, broad and targeted minimum wage reforms) can involve widely different specific actions in practice. Finally, by design, the shock database provides no information regarding the *stance* of minimum wage or CB regulations.

The dataset is preliminary and should be regarded as such. In cases where extensive web search had to be performed to identify the nature of the shocks – primarily in the case of the minimum wage area when changes were not mentioned in any OECD *Economic Survey* and instead were inferred only from a large change in the corresponding OECD minimum wage variable – the quality and accuracy of the information gathered sometimes varied, and in a handful of cases no relevant information could be found altogether at this stage. The focus and quality of the information featured in OECD *Economic Surveys* has also varied across areas, countries, and, perhaps most importantly, over the years – typically becoming more detailed over time. This implies that the quality of the current database is likely to be stronger for the recent decades (1990s, 2000s, and 2010s) than for the older ones (1970s and 1980s).

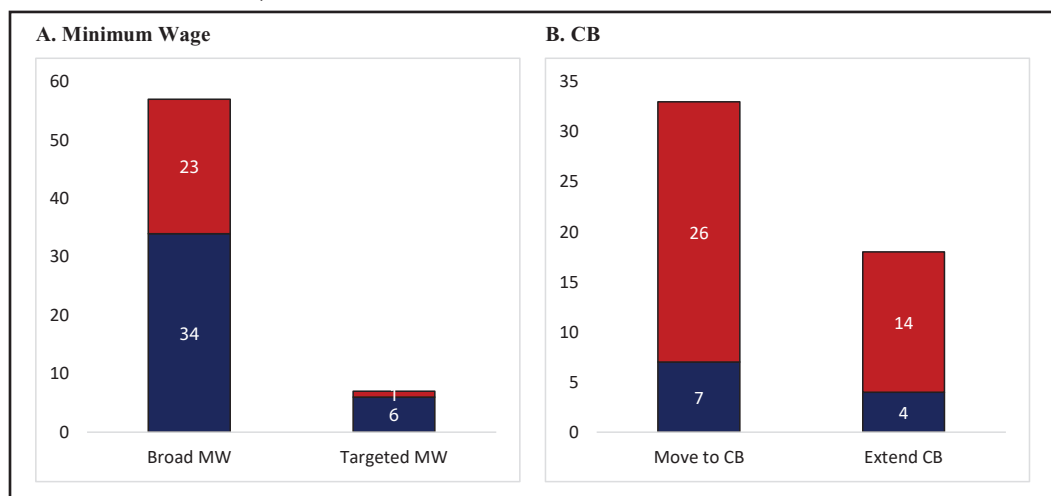
3 A Few Stylized Facts on Policy-Action Patterns

All major shocks in the database are documented and cover each of the minimum wage and CB areas highlighted above. Figures 1–3 present stylized facts on reforms – that is, shocks or “+1” that correspond to decreases in regulation or liberalizing measures that are pro-competition – and counter-shocks or “–1” – that is, increases in regulation/tightening measures that are anti-competition.

Major shocks appear to have been more frequent in CB than in the area of minimum wages in the last decades. Figures 1A and 1B, which provide the total number of shocks and counter-shocks identified in the sample, illustrate this heterogeneity of shocks (and counter-shocks) across the two areas. In the area of minimum wage, major shocks have been most frequently applied in a broader sense. In addition, tightening shocks have been less frequent in CB than in the minimum wage area over the last five decades; there have been only 11 tightening-shocks cases in CB – that is, less than 10% of the total number of major actions, while in minimum wage over one-third of the total number of major actions were tightening shocks.

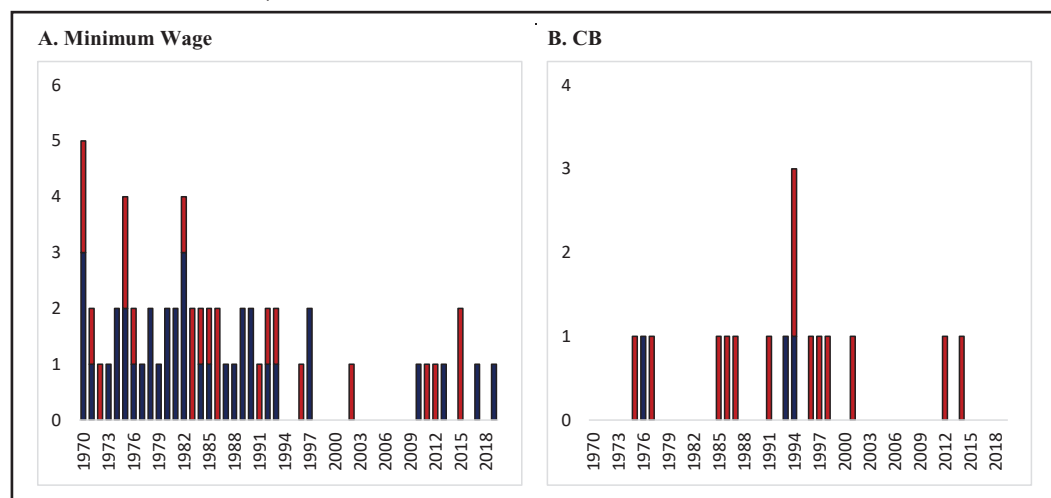
Over time, no clear pattern emerges across any of the two areas covered (Figures 2A and 2B).

Figure 1 Number of Major Shocks and Counter-shocks (26 advanced economies, 1970–2020).



Note: In blue are pro-competitive shocks; in red are anti-competitive counter-shocks. CB, collective bargaining; MW, minimum wage.

Figure 2 Distribution of Major Shocks and Counter-Shocks across Time (26 advanced economies).



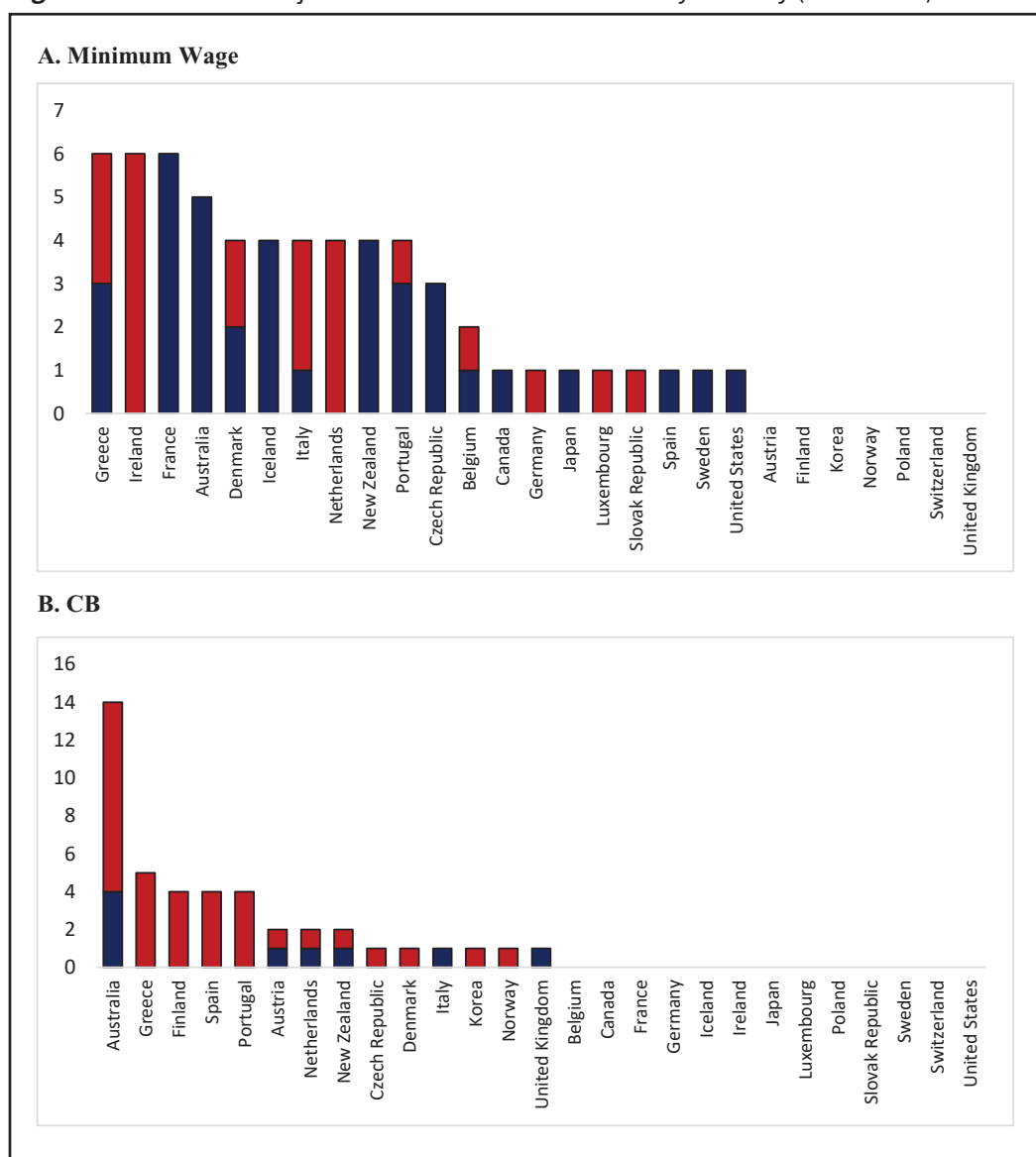
Note: In blue are pro-competitive shocks; in red are anti-competitive counter-shocks. CB, collective bargaining; MW, minimum wage.

In geographical terms, in the area of minimum wage, southern European countries (e.g., Portugal, Greece, and Spain) took many counter-shocks that are more significant; this is also true outside Europe in the cases of Australia and New Zealand. Concerning CB, several countries – including southern European ones – liberalized the system (Figures 3A and 3B).

Finally, while minimum wage shocks have been more frequently implemented during periods of positive economic growth (with differences in sub-categories), the opposite is true for CB (Table 2). At the same time, recessions being rare events, the frequency of CB shocks carried out in bad times was actually substantially higher than the frequency of bad times in the sample.

Finally, before moving on to the empirical application, we mention a note on identification. Indeed, a source of uncertainty for empirical economists trying to analyze structural

Figure 3 Number of Major Shocks and Counter-shocks by Country (1970–2020).



Note: In blue are pro-competitive shocks; in red are anti-competitive counter-shocks. CB, collective bargaining; MW, minimum wage.

Table 2 Percentage of shocks by area in good and bad times

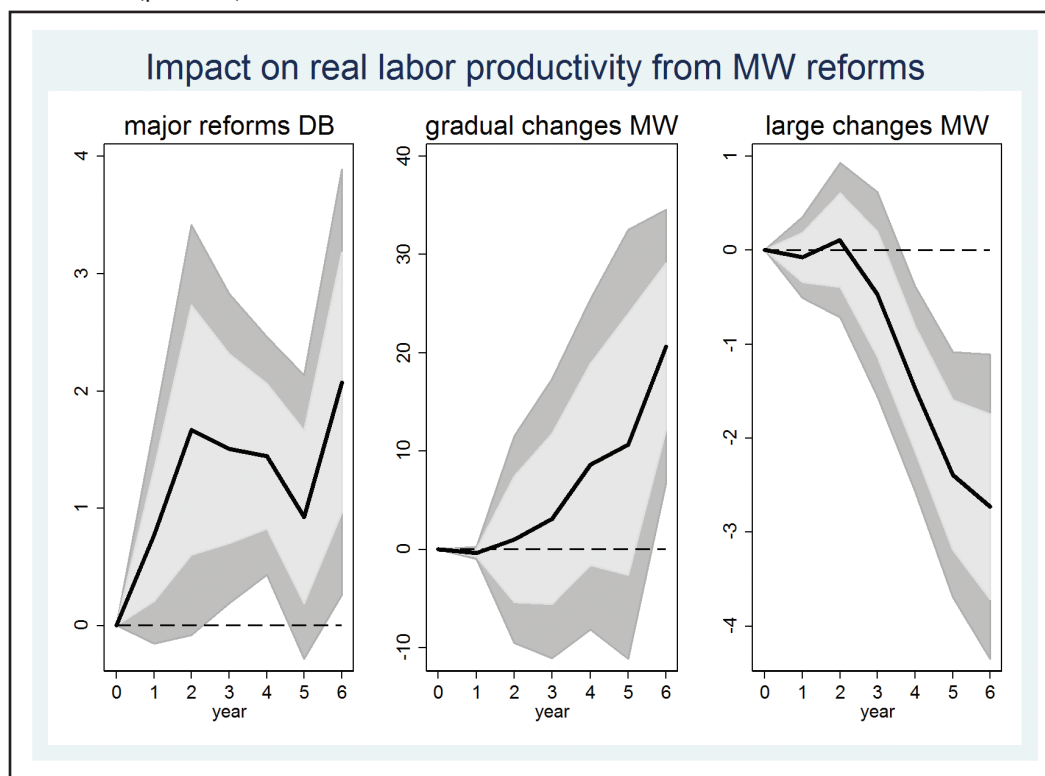
	Good times	Bad times
Minimum wage	57	43
<i>Broad</i>	59	41
<i>Targeted</i>	0	100
CB	27	73
<i>Move to facilitate firm level bargaining</i>	21	79
<i>Extensions to collective wage agreements</i>	32	68

Source: Authors’ calculations.

Note: Good and bad times are defined simply as positive and negative real output gaps in a given year, respectively.

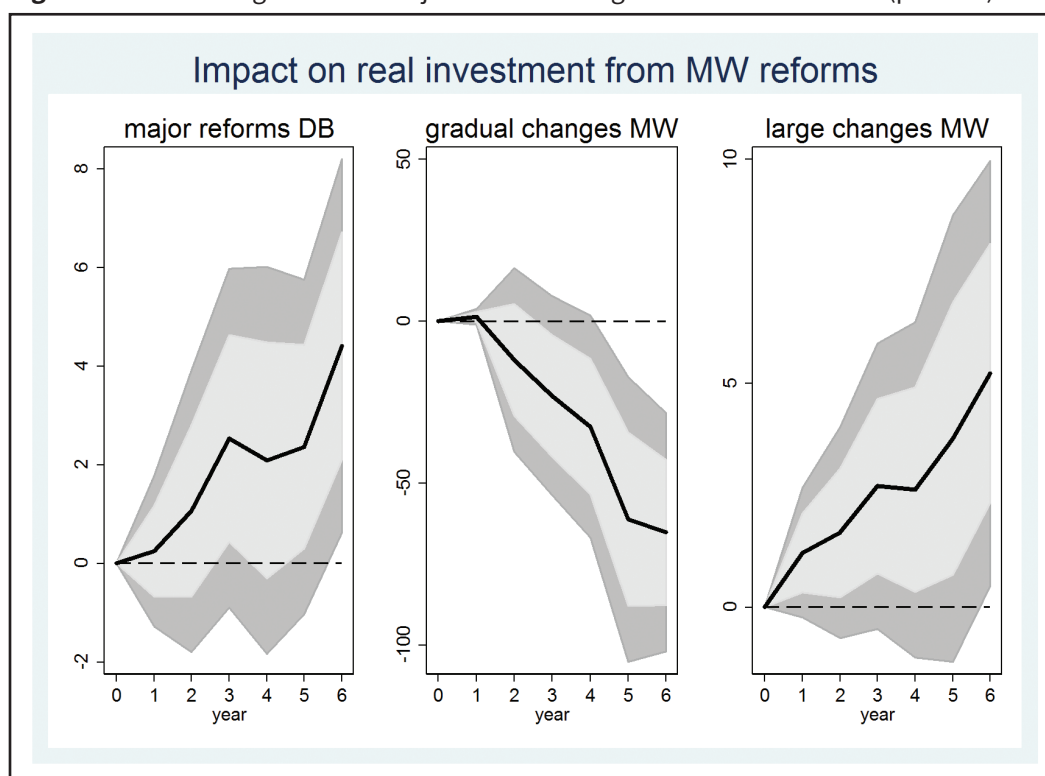
CB, collective bargaining.

Figure 4 The Average Effect of Major Minimum Wage Shocks on real labor productivity (percent).



Note: “DB” stands for “database” and refers to the new narrative data created. “Gradual changes” are yearly changes in the indicator. “Large changes” are those associated with a change in the OECD indicator in the top 5th percentile of the sample distribution of annual changes in the indicator. The x-axis indicates the number of years; $t = 0$ is the year of the reform shock; and $t = 1$ is the first year of impact. The solid black lines denote the response to a reform shock, the dark gray area denotes 90% confidence bands, and the light gray area denotes 68% confidence bands, based on standard errors clustered at the country level. MW, minimum wage.

reforms or major policy actions is reform or shock identification. Early papers inferred major reforms indirectly from outcomes; for example, a collapse in inflation was supposed to indicate a significant shift in the macroeconomic policy framework (Bruno and Easterly 1996; Drazen and Easterly, 2001). Subsequent papers have typically relied on structural policy indicators produced by international organizations such as the international monetary fund (IMF), organisation for economic co-operation and development (OECD), and World Bank, or by independent institutions such as the Fraser Institute (see, to give just a few examples across various reform areas, Abiad and Mody, 2005; Alesina et al., 2006; Hoj et al., 2007; Duval, 2008; Wiese, 2014; and Agnello et al., 2015). In these previous studies, the inability to identify the exact timing of reform implementation is likely to increase measurement errors, and lead to misleading results. In the current paper, we attempt to minimize value judgements and measurement error by employing a newly constructed “narrative” dataset of major minimum wage and CB policy actions or shocks. As with the Duval et al. (2018) data, and since the same method of dataset construction was employed, the same virtues and strengths apply regarding the identification. As mentioned above, the main advantage of this database is that it identifies the exact timing and nature of reforms, and therefore eliminates the need for assumptions on the relation between structural reforms and other indicators.

Figure 5 The Average Effect of Major Minimum Wage Shocks on real GFCF (percent).

Note: “DB” stands for “database” and refers to the new narrative data created. “Gradual changes” are yearly changes in the indicator. “Large changes” are those associated with a change in the OECD indicator in the top 5th percentile of the sample distribution of annual changes in the indicator. The x -axis indicates the number of years; $t = 0$ is the year of the reform shock; and $t = 1$ is the first year of impact. The solid black lines denote the response to a reform shock, the dark grey area denotes 90% confidence bands, and the light gray area denotes 68% confidence bands, based on standard errors clustered at the country level. MW, minimum wage; GFCF, gross fixed capital formation.

4 An Empirical Application

As previously discussed, one important advantage of this dataset is the precise identification of major MW and CB reforms and their implementation date. This is particularly valuable in many empirical applications, including assessing the dynamic (short- and medium-term) effects of reforms.

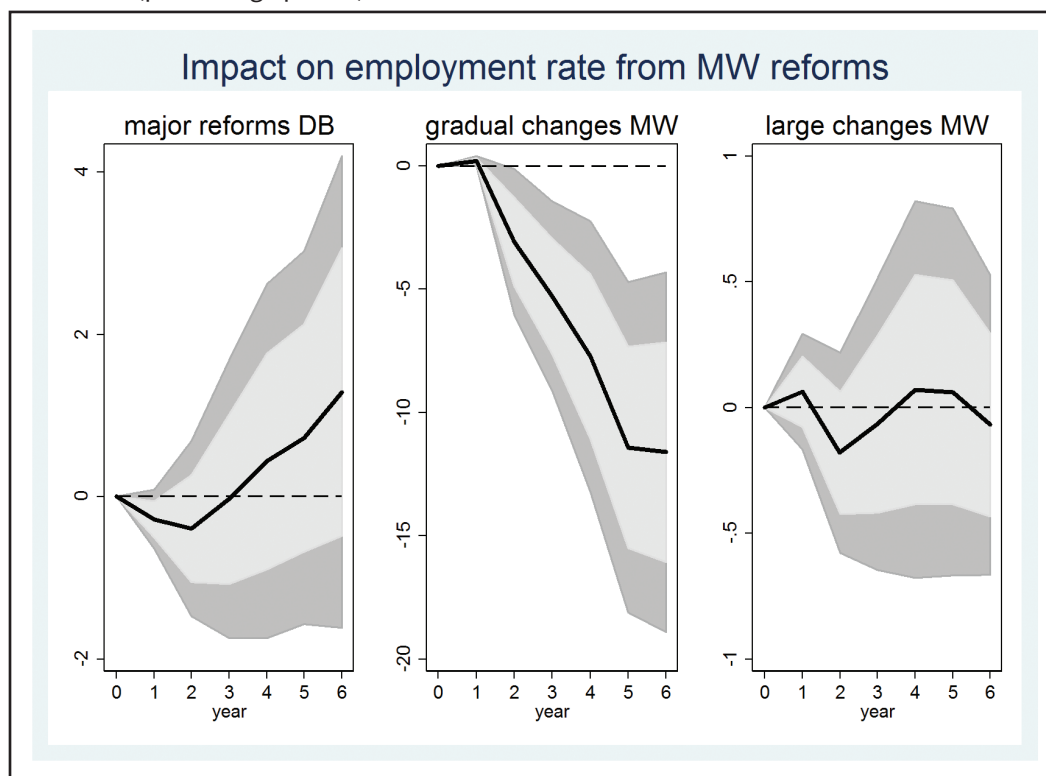
To illustrate the usefulness of the dataset for such empirical analysis, we compare the productivity, investment, employment, and unemployment effects of the minimum wage reforms identified in the database with those obtained using: (i) “gradual” changes in the OECD minimum wage variable, that is, annual changes or the first yearly difference in the indicator; and (ii) “large” jumps in the OECD minimum wage variable, which aim to indirectly capture major shocks.⁵

To empirically evaluate the dynamic effects of these shocks on the four macroeconomic outcomes identified above,⁶ we rely on the local projection method of Jordà (2005) to estimate

⁵ To maintain comparability with our database, we classify large jumps as those associated with a change in the OECD indicator in the top 5th percentile of the sample distribution of annual changes in the indicator.

⁶ Productivity is obtained as real GDP divided by employment; investment is proxied by real gross fixed capital formation; employment rate refers to the total number of employed people over the entire population; and unemployment rate refers to the total number of unemployment over the labor force. These parameter definitions are retrieved from the World Bank World Development Indicators.

Figure 6 The Average Effect of Major Minimum Wage Shocks on employment rate (percentage points).



Note: “DB” stands for “database” and refers to the new narrative data created. “Gradual changes” are yearly changes in the indicator. “Large changes” are those associated with a change in the OECD indicator in the top 5th percentile of the sample distribution of annual changes in the indicator. The *x*-axis indicates the number of years; *t* = 0 is the year of the reform shock; and *t* = 1 is the first year of impact. The solid black lines denote the response to a reform shock, the dark grey area denotes 90% confidence bands, and the light gray area denotes 68% confidence bands, based on standard errors clustered at country level. MW, minimum wage.

impulse response functions (IRFs). This approach has been advocated by Auerbach and Gorodnichenko (2013) and Romer and Romer (2019) as a flexible alternative, better suited to estimating a dynamic response – such as, in our context, interactions between shocks and macroeconomic conditions. The baseline specification is:

$$y_{t+k,i} - y_{t-1,i} = \alpha_i + \tau_{t+\beta k} + R_{i,t} + \theta' X_{i,t+\epsilon i,t} \tag{1}$$

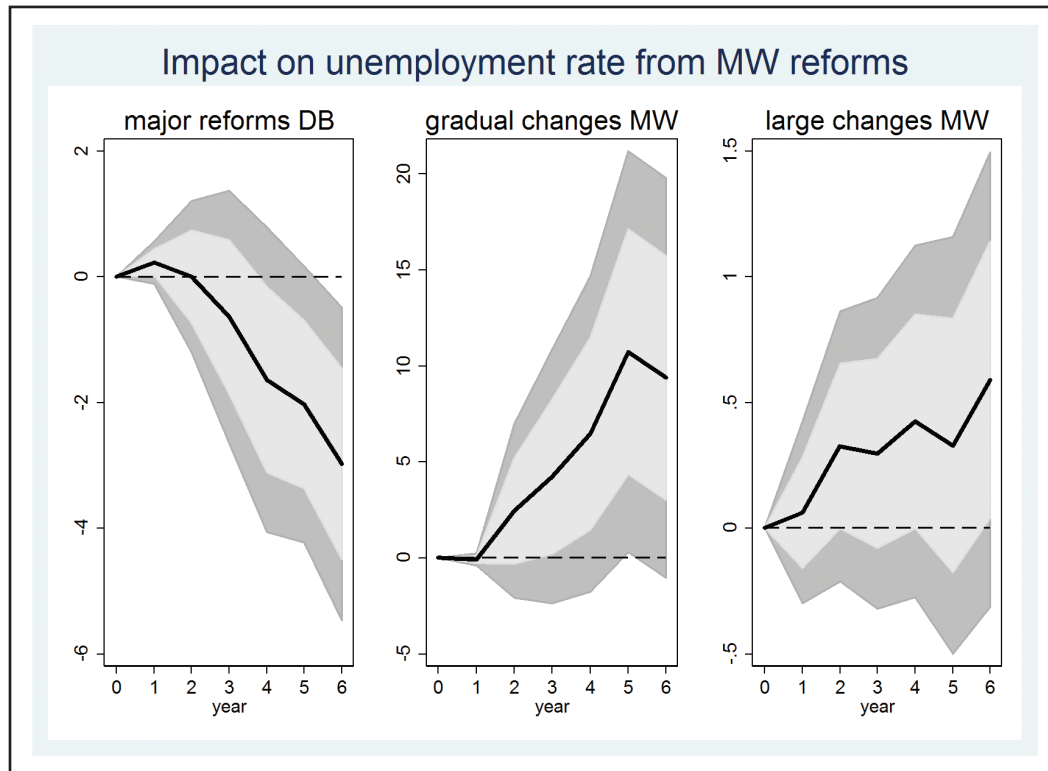
where *y* is the dependent macroeconomic variable of interest; β_k denotes the (cumulative) response of the variable of interest *k* years after the shock; α_i and τ_t are country and time fixed effects, respectively, included to take account for cross-country heterogeneity and global shocks; $R_{i,t}$ denotes the reform shock⁷; and $X_{i,t}$ is a vector of control variables including two lags of the shocks, two lags of real gross domestic product (GDP) growth, two lags of consumer price index (CPI)-based inflation rate, and two lags of the relevant dependent variable.

Eq. (1) is estimated using ordinary least squares (OLS).⁸ IRFs are then obtained by plotting the estimated β_k for *k* = 0, 1, ..., 6 with 90 (68) percent confidence bands computed using the

⁷ All shocks featured in our analysis are country-wide shocks.

⁸ Another advantage of the local projection method compared to vector autoregression (autoregressive distributed lag) specifications is that the computation of confidence bands does not require Monte Carlo simulations or asymptotic approximations. One limitation, however, is that confidence bands at longer horizons tend to be wider than those estimated in vector autoregression specifications.

Figure 7 The Average Effect of Major Minimum Wage Reforms on unemployment rate (percentage points).



Note: “DB” stands for “database” and refers to the new narrative data created. “Gradual changes” are yearly changes in the indicator. “Large changes” are those associated with a change in the OECD indicator in the top 5th percentile of the sample distribution of annual changes in the indicator. The x-axis indicates the number of years; $t = 0$ is the year of the reform shock; and $t = 1$ is the first year of impact. The solid black lines denote the response to a reform shock, the dark grey area denotes 90% confidence bands, and the light gray area denotes 68% confidence bands, based on standard errors clustered at country level. MW, minimum wage.

standard deviations associated with the estimated coefficients β_k – based on robust standard errors clustered at the country level.

We also explore whether initial economic conditions at the time of the shock influence its effect on macroeconomic outcomes. We implement this by allowing the response to vary as follows:

$$y_{i,t+k} - y_{i,t-1} = \alpha_i + \tau_i + \beta_k^L F(z_{i,t}) R_{i,t} + \beta_k^H (1 - F(z_{i,t})) R_{i,t} + \theta' X_{i,t} + \varepsilon_{i,t} \tag{2}$$

$$\text{with } F(z_{it}) = \frac{\exp(-\gamma z_{it})}{1 + \exp(-\gamma z_{it})}, \gamma > 0$$

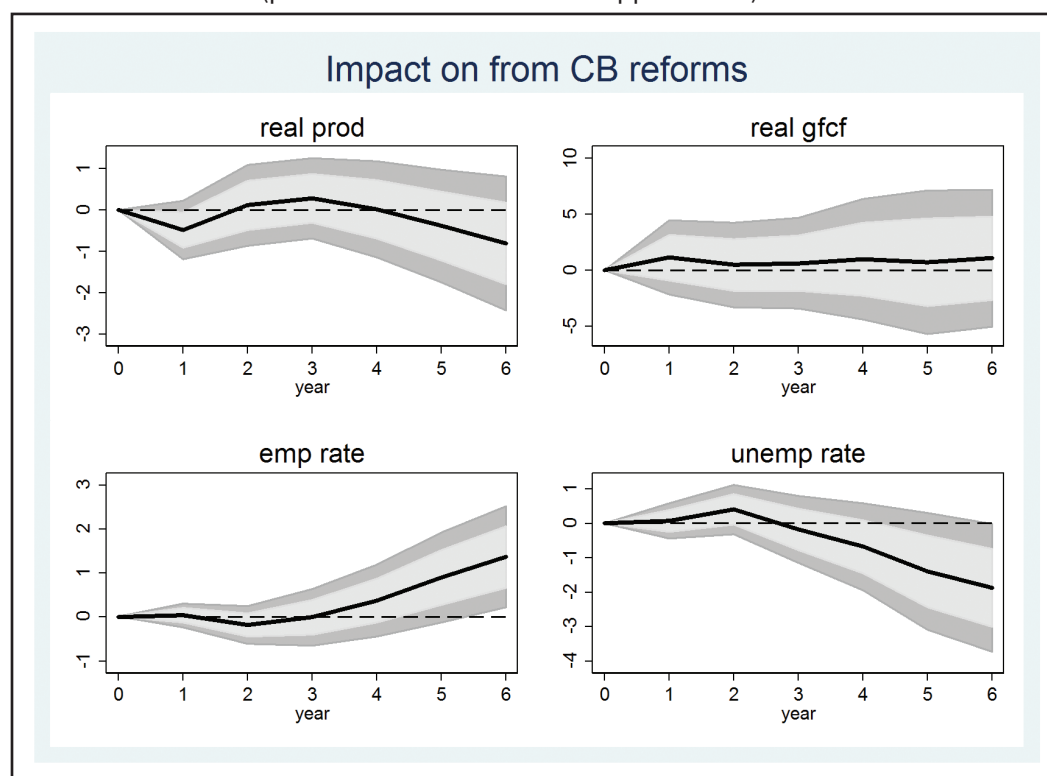
where z_{it} is an indicator of economic activity (proxied by real GDP growth) normalized to have zero mean and unit variance.⁹ The coefficients β_L^k and β_H^k capture the trade impact of reform shocks at each horizon k in cases of recessions ($F(z_{it}) \approx 1$ when z goes to $-\infty$) and expansions ($1 - F(z_{it}) \approx 1$ when z goes to $+\infty$), respectively. We choose $\gamma = 1.5$.¹⁰

As discussed in Auerbach and Gorodnichenko (2012, 2013), the local projection approach to estimating non-linear effects is equivalent to the smooth transition autoregressive (STAR)

9 The weights assigned to each regime vary between 0 and 1 according to the weighting function $F(\cdot)$, so that $F(z_{it})$ can be interpreted as the probability of being in a given economic space state, recession or boom.

10 Our results hardly change when using alternative values of the parameter γ , between 1 and 4.

Figure 8 The Average Effect of Major Collective Bargaining Shocks on macroeconomic outcomes (percent for real variables and pp for rates).



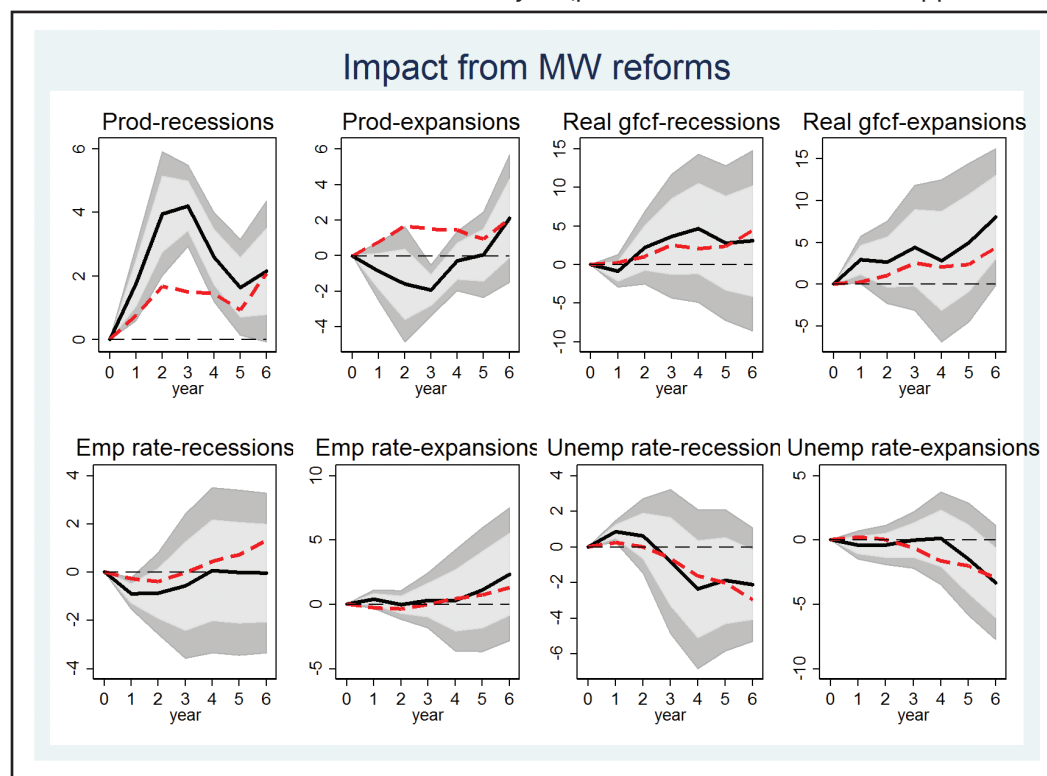
Note: The x-axis indicates the number of years; $t = 0$ is the year of the reform shock; and $t = 1$ is the first year of impact. The solid black lines denote the response to a reform shock, the dark gray area denotes 90% confidence bands, and light gray area denotes 68% confidence bands, based on standard errors clustered at country level.

model developed by Granger and Teräsvirta (1993). The advantage of this approach is twofold. First, compared with a model in which each dependent variable would be exposed to interaction with a measure of the business cycle position, it permits a direct test of whether the effect of shocks varies across different regimes such as recessions and expansions. Second, compared with estimating structural vector autoregressions for each regime, it allows the effect of shocks to change smoothly between recessions and expansions by considering a continuum of states to compute the IRFs, thus making the response more stable and precise.

The analysis shows that the minimum wage pro-competitive shocks or major policy actions identified in the dataset – “DB” stands for “database” and refers to the new narrative data created – have a statistically significant (at the 10% level) positive impact on labor productivity (Figure 4A). The cumulative effect reaches close to 3% after 6 years. Recall that a shock is a pro-competitive major legislative change, that is, a reduction in the MW in this case. This result is in line with the one reported by Rizov et al. (2016). In contrast, the estimated short-to-medium-term effect is not statistically significant when alternatively using the gradual change in the OECD’s minimum wage variable, and it is, in fact, negative and statistically significant when considering a dummy variable that takes a value of 1 for a large change in the same variable (Figures 4B and 4C).

Moreover, the minimum wage shocks identified in our dataset result in a positive and statistically significant impact on the real gross fixed capital formation (GFCF), while gradual

Figure 9 The Average Effect of Major Minimum Wage Shocks on macroeconomic outcomes: the role of the business cycle (percent for real variables and pp for rates).



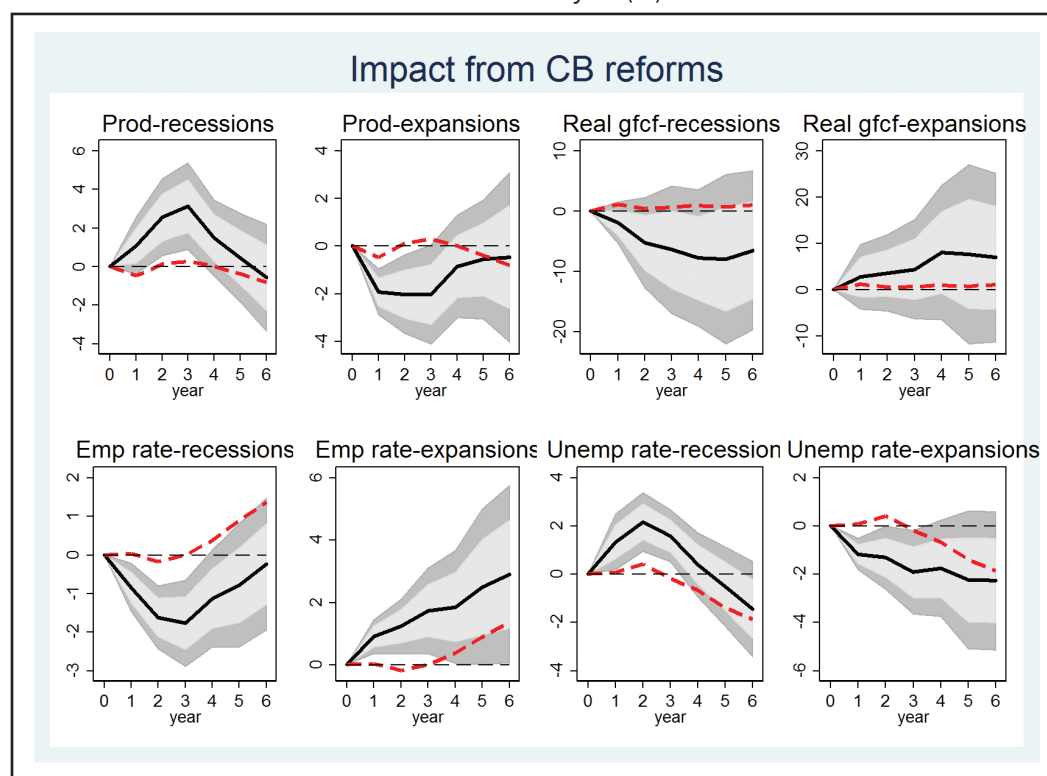
Note: The x-axis indicates the number of years; $t = 0$ is the year of the reform shock; and $t = 1$ is the first year of impact. The solid black lines denote the response to a reform shock, the dark gray area denotes 90% confidence bands, and the light gray area denotes 68% confidence bands, based on standard errors clustered at country level. The red line denotes the unconditional baseline result from estimating Eq. (1).

changes have the opposite (that is, a negative) impact (Figures 5A and 5B). A large change in the indicator at hand also yields a positive effect on GFCF.

Turning now to the effects on labor market variables, Figure 6 shows the effects of minimum wage shocks on the employment rate while Figure 7 plots the responses of the unemployment rate. We find that the set of pro-competitive shocks identified using our narrative methodology does not seem to statistically affect the employment rate, whereas they lead to a medium-run fall in the unemployment rate (reaching close to -3 pp after 6 years). On the other hand, gradual changes have a negative impact on the employment rate (Caliendo et al., 2019, found a similar result for the case of Germany after the introduction of the minimum wage in 2015) and no statistically significant effect on the unemployment rate.

To complement the previous analysis for which we are able to contrast against a continuous indicator, in the case of CB one has to limit to a new empirical analysis with no possible comparator. Figure 8 plots the responses of the same set of macroeconomic outcomes inspected before following a major CB shock narratively identified. While this class of shocks seems to impact neither productivity nor capital formation (in a statistically significant manner), it has a clear medium-term effect on the labor market. Specifically, such shocks lead to an increase in the employment rate up to 2 pp after 6 years and a fall in the unemployment rate of >2 pp, also after 6 years.

Figure 10 The Average Effect of Major Collective Bargaining Reforms on macroeconomic outcomes: the role of the business cycle (%).



Note: The x-axis indicates the number of years; $t = 0$ is the year of the reform shock; and $t = 1$ is the first year of impact. The solid black lines denote the response to a reform shock, the dark gray area denotes 90% confidence bands, and the light gray area denotes 68% confidence bands, based on standard errors clustered at country level. The red line denotes the unconditional baseline result from estimating Eq. (1).

The previous analysis considers the impact of structural reforms one at a time, raising potential concerns about omitted variables – reforms could be carried out across different areas at the same time. We re-estimate our main regression equation by including reforms in all areas simultaneously.¹¹ Figure A1 in Appendix shows the effects on productivity, investment, employment rate, and unemployment rate and confirms that such augmentation of the vector of controls does not change the basic thrust of our results.

Our final exercise consists in estimating Eq. (2). Results are plotted in Figures 9 and 10 for minimum wage and CB shocks, respectively. Major minimum wage pro-competitive policy actions have a particularly strong positive effect on productivity during bad times, while the effect is not statistically different from zero in the short-run during boom periods until after 6 years or 7 years, when the effect becomes positive but not statistically different from the baseline. In contrast, the prevailing business cycle conditions at the time of these shocks seem to matter for labor market outcomes in the very short run: following shocks, the employment rate drops, but then from year 2, it recovers and the statistically significant effect fades away. *Mutatis mutandis* for the unemployment rate. Turning to the CB, again the position of the economy in the cycle seems to matter for the responses. We obtain a positive (negative) productivity effect in recessions (expansions). Furthermore, the effect on employment rate (unemployment

¹¹ The vector $X_{i,t}$ in Eq. (1) was augmented to include up to two lags of all other reforms.

rate) is strongly negative (positive) and significant during bad times and strongly positive (negative) during good times. Overall, it seems that CB shocks are more sensitive to the business cycle positioning than are minimum wage shocks.

5 Conclusion

We contributed to the literature by presenting and describing a new database of major minimum wage and CB policy-actions covering 26 advanced economies over the period 1970–2020. The main advantage of our dataset is the precise identification of the nature and date of major shocks, which is valuable in many empirical applications. The dataset does not attempt to measure and compare policy settings across countries, and as such is no substitute for other publicly available continuous indicators produced, for example, by the OECD for minimum wages. Based on the dataset, we have ascertained that major changes in minimum wages have been more frequent than in CB in the last decades, and the majority of these were implemented during the 1980s and 1990s.

In our empirical application, we find that the minimum wage pro-competitive legislative policy changes identified in the dataset have a statistically significant (at 10%) positive impact on labor productivity over the medium term. These shocks do not seem to statistically affect the employment rate, whereas they lead to a medium-run fall in the unemployment rate. In addition, CB shocks do not seem to influence either productivity or capital formation but they have a clear medium-term effect on the labor market. Furthermore, our results suggest that CB shocks are more sensitive to the business cycle positioning of the economy at the time of the reform than are minimum wage shocks. Finally, the dataset does not attempt to measure and compare policy settings across countries, and as such is no substitute for other publicly available continuous indicators produced, for example, by the OECD for minimum wages. It is recommended that the results generated by the present study be seen as work in progress, for researchers to build on and improve upon.

Declarations

Availability of data and material

Data is made available online and upon request.

Competing interests

The authors do not have any conflicting interests.

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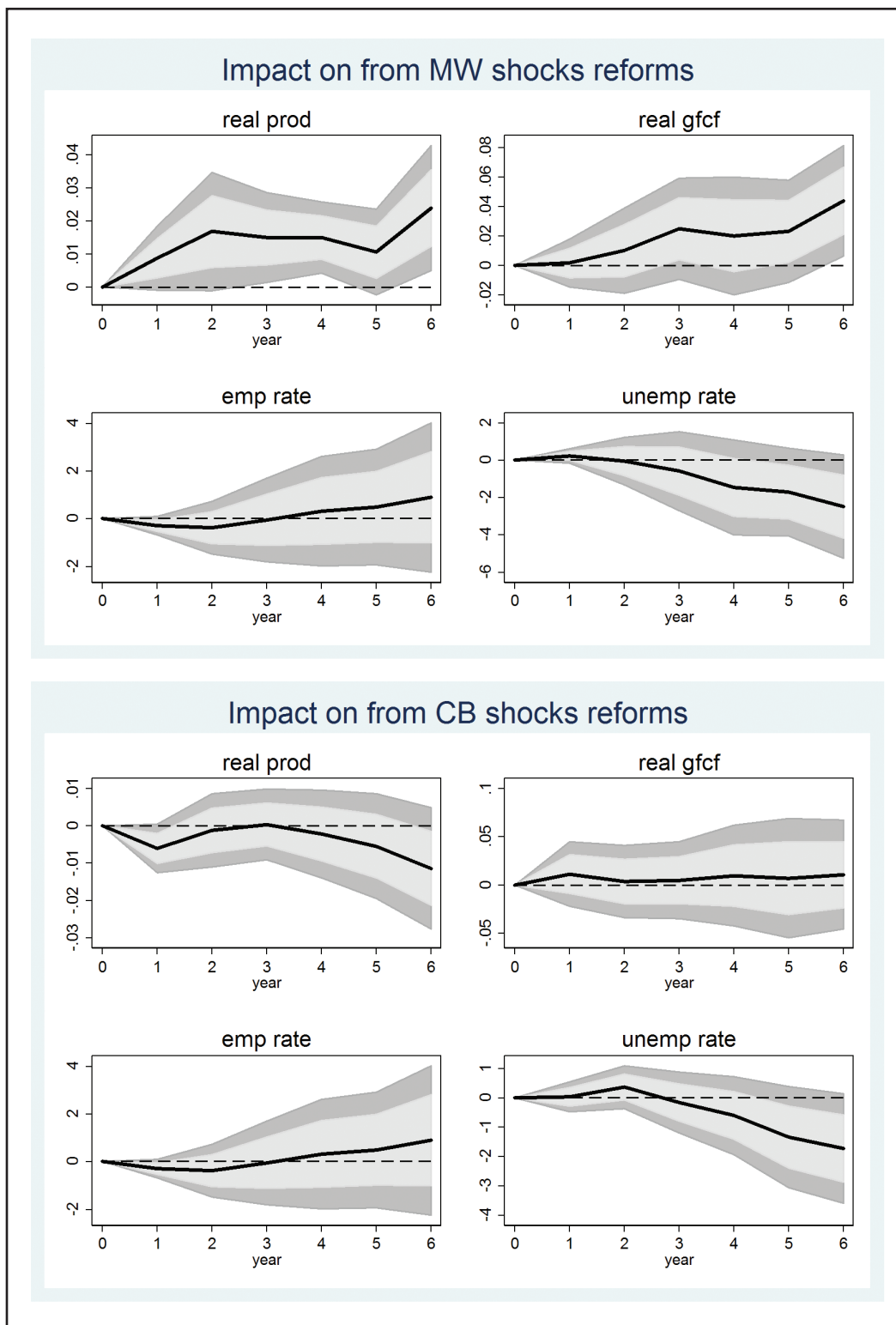
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APPENDIX

Figure A1 The Average Effect of Shocks on macroeconomic outcomes, controlling for shocks in all other areas (percent for real variables and pp for rates).



Note: The x-axis indicates the number of years; $t = 0$ is the year of the reform shock; and $t = 1$ is the first year of impact. The solid black lines denote the response to a reform shock, the dark grey area denotes 90% confidence bands, and the light gray area denotes 68% confidence bands, based on standard errors clustered at country level. CB, collective bargaining; MW, minimum wage.