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Document Version
Final published version

Published in:
Empirical Economics

DOI:
10.1007/s00181-023-02451-5

Publication date:
2024

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Citation for published version (APA):
Tafuro, A. (2024). Lagging behind: The Hysteresis of Austerity. *Empirical Economics*, *66*(1), 327-368. https://doi.org/10.1007/s00181-023-02451-5

Empirical Economics
https://doi.org/10.1007/s00181-023-02451-5

Lagging behind: the hysteresis of austerity

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Received: 3 October 2022 / Accepted: 2 June 2023

Abstract
This paper investigates the role of hysteresis in the long-term transmission of consolidations in a panel of 17 OECD countries. The evidence supports that the hysteresis of the labour market is the main driver of consolidations' long-term effects: an increase in the rigidity of the labour market exacerbates and prolongs the contraction following tax-based consolidations, while it mutes the expansion following expenditure-based consolidations. In contrast, the response of productivity is irrelevant to the presence of the long-term scars.

Keywords Consolidations · Fiscal policy · Hysteresis · Labour market rigidity · Potential growth

JEL Classification C23 · E24 · E62

1 Introduction

In the last decade, several contributions showed that the fiscal consolidations approved in 2010–2011 weakened persistently actual and potential growth in Europe (among others Blanchard and Leigh 2013; Fatás and Summers 2018; Gechert et al. 2019). These empirical results contrasted sharply with the dominant view that consolidations reduce aggregate demand in the short term but they produce long-term gains by increasing productivity and, therefore, potential output (Born et al. 2020). To explain the discrepancy between this empirical evidence and the dominant paradigm, Delong and Summers (2012) and Fatás and Summers (2018) suggest that the long-term gains

The author would like to thank Svend Erik Hougaard Jensen, Lorenzo Forni, Giovanni Caggiano, Efrem Castelnuovo, Giovanni Pellegrino, Antonio Paradiso, Oana Furtuna, Silvia DelRio, Roberto Golinelli, Paola Trevisan for their insightful comments and support. He also thanks PeRCent and the University of Southern California, where part of this paper has been developed.

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of consolidations were offset by the presence of hysteresis, which transformed into permanent the otherwise transitory depressive effects of consolidations plans.

The presence of hysteresis in specific economic environments was initially conjectured by Blanchard and Summers (1986) to explain the different behaviour of unemployment and inflation between Europe and the USA. In their seminal paper, the authors describe hysteresis as a phenomenon which operates through the labour market: when the labour market is rigid—sclerotic, according Blanchard and Summers (1986)'s original definition—frictional unemployment becomes structural and this transformation allows otherwise transitory shocks to affect potential output.

However, the literature on the long-term effects of consolidations does not explicitly investigate the role of the rigidity of labour markets in the transmission of these shocks. As a consequence, hysteresis might be neither the unique nor the main driver of consolidations' long-term scars, as instead Delong and Summers (2012) and Fatás and Summers (2018) claim. For example, Gali (2015) shows that several factors can lead shocks to have long-term effects, by generating a hysteresis-like behaviour. Similarly, Engler and Tervala (2018) demonstrate that a hysteresis-like effect can emerge if fiscal policy affects productivity.

This paper fills this gap in the literature by providing empirical evidence on the role of hysteresis in the transmission of consolidations for a panel of 17 countries in the period 1978–2013, where consolidations are identified with the narrative dataset of Alesina et al. (2015). The new evidence is based on the Interacted Panel VAR (IPVAR, Towbin and Weber 2013), where the responses of economic variables to consolidations vary deterministically with a synthetic measure of labour market rigidity, the Employment Protection Legislation (EPL). Therefore, this methodology allows to discuss which EPL groups display a larger effect of fiscal consolidations, more than analysing the magnitude of these effects.

The paper shows that countries with more sclerotic labour markets present negative long-term effects following consolidations and that the response of productivity is irrelevant to the presence of these scars. This evidence supports that hysteresis, in the form originally conjectured by Blanchard and Summers (1986), is the main driver of consolidations' long-term effects. At the same time, the irrelevance of productivity speaks against alternative explanations based on a link between fiscal policy and productivity, such as the ones described in Engler and Tervala (2018) and in Barro and Redlick (2011).

The paper shows that the unemployment rate responds more to expenditure-based consolidations when EPL is high. This is in contrast with Cacciatore et al. (2021), which conjecture that higher hiring-firing costs reduce the responsiveness of output to fiscal shocks because they lower the elasticity of job creation and destruction to shocks. This contrast suggests that the role of labour markets is potentially different in expansionary and contractionary fiscal policy.

The paper also finds that consolidations boost potential output in a low-EPL environment although output, productivity, and employment do not increase significantly. A possible explanation for this puzzle is that workers are more likely to change their effort as a response to shocks when employment is less protected, as suggested in Gnocchi et al. (2015). As a consequence, workers would increase effort when a contractionary fiscal policy is approved, thus raising potential output.

The paper builds on previous studies that empirically investigate the long-term effects of the consolidations approved in Europe during the aftermath of the 2008 crisis. These studies show that consolidations approved in 2010–2011 reduced actual and potential output persistently (Blanchard and Leigh 2013; Fatás and Summers 2018) and that this result is robust to the use of different measures of fiscal stance and perturbations of the model (Gechert et al. 2019).

Contrary to these studies, this paper verifies explicitly the role of hysteresis in the transmission of shocks. Thanks to the IPVAR, this can be achieved straightforwardly by comparing the impulse response functions for different levels of rigidity, thus assessing how they vary in both the short and the long term while keeping everything else equal. This approach has the additional strength to discuss dynamic effects, while previous research presents only static estimates. The strategy employed in this paper constitutes an advancement also compared to the empirical literature on hysteresis (for a review, see Furuoka 2017), which is based on unit-root tests and, therefore, overlooks almost completely the role of hysteresis in shock transmission.

The paper improves previous studies also because the evidence is based on more granular data. As a matter of facts, the disaggregation between expenditure- and tax-based consolidations consents to better dissect the transmission mechanism specific to each type of consolidation. In addition, the new data allow to generalize the previous evidence, which was based on a sample limited in both space (Europe) and time (2010–2011) dimensions.

The evidence in the paper supports that consolidations contributed to the subdued performance of potential and actual growth after 2010 in high-EPL countries, like the members of the European Union. This subdued performance of European economies was potentially driven by tax-based packages. The evidence corroborates previous results (Blanchard and Leigh 2013; Fatás and Summers 2018; Gechert et al. 2019), and it has clear policy implications: to minimize both the short- and the long-term costs, governments should evaluate not only the design of consolidation but also the structure of the labour market. In particular, labour markets should become more flexible ahead of large fiscal consolidations.

Finally, the paper complements the discussion on the effects and transmission of consolidations (Giavazzi and Pagano 1995; Giavazzi et al. 2000; Alesina and Ardagna 2013; Guajardo et al. 2014; Alesina et al. 2015, ?; Beetsma et al. 2015; Alesina et al. 2018, 2019; Beetsma et al. 2021). This literature focuses on the explanations for the different short-term effects of tax increases and expenditure cuts. This paper extends this literature by showing that the structure of the labour market also interacts with the transmission of consolidations and it represents a major amplifier of the long-term effects of consolidations.

The paper is organized as follows. The next section describes the dataset and tests whether hysteresis characterizes employment in the sample. Section 3 presents the identification methodology. Section 4 discusses the main PSVAR results, and it summarizes the robustness checks which are reported in "Appendix". In Sect. 5, conclusions are provided.

2 Dataset

The dataset contains yearly observations for a panel of 17 OECD countries,[1] covering the period 1978–2013. Data are gathered from various sources, and a detailed description of the dataset characteristics and the methodology adopted for data reconstruction is contained in "Appendix".

Data on fiscal consolidations are from Alesina et al. (2015).[2] The data report information on *consolidation plans* by identifying the announcement year and the implementation date of the various components of the plan. In addition, it distinguishes between *tax-* and *expenditure-based* plans: a plan is defined as *tax-* (*expenditure-*)*based* if more than half of the expected change of the primary balance is due to a tax hike (expenditure cut). Therefore, the two measures are orthogonal to one another by definition.

Data for macroeconomic variables come primarily from the OECD. It is worth noting how the OECD computes the potential values of output through a model approach based on the NAIRU and not with filtering techniques. This makes the measure less dependent on large short-term fluctuations but more dependent on the model assumptions. Data on CPI are from the AMECO database for all countries and report the national concept. The variables included to capture productivity are from the Long-Term Productivity Database (Bergeaud et al. 2016).[3] Missing data have been reconstructed with other sources: the AMECO database for labour market variables; the Macrohistory database (Jordà et al. 2017) for the GDP; and the IMF Historical Data on Public Finance (Mauro et al. 2015) for government deficit.[4]

The role of the labour market is investigated through the Employment Protection Legislation (EPL: CEP-OECD and OECD), which measures the stringency of hiring and firing regulation. As such, the EPL represents one of the many frictions that can affect the overall rigidity of the labour market, e.g. the centralization of the bargaining process, the strength of unionization, the presence of organizational constraints or asymmetric information, and so on. However, several reasons recommend using the EPL in this context.[5] First, as Babecký et al. (2010) shows, EPL is correlated with different types of rigidities in the labour market (e.g. employment rigidity, wage rigidity, and so on). This implies that EPL constitutes a natural candidate to quantify the overall labour market rigidity instead of approximating exclusively the employment rigidity. Second, Alesina et al. (2019a) excludes the presence of a significant correlation between changes in EPL and the consolidation episodes, thus excluding a

[1] Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, The Netherlands, Portugal, Spain, Sweden, the UK, the USA.

[2] This dataset builds on an original dataset by Guajardo et al. (2014).

[3] http://www.longtermproductivity.com/.

[4] Data on West Germany have been used to reconstruct series for Germany where necessary. See "Appendix" for further details.

[5] In addition, sclerotic labour markets can represent one aspect of sclerotic economies. Therefore, the inclusion of the EPL alone will capture the other economic rigidities that correlates with the EPL. The paper controls for this possibility in the robustness checks, by including in the interaction terms a measure of Product Market Rigidity (PMR). The results are reported in "Appendix" and to not show any significant difference compared to the baseline.

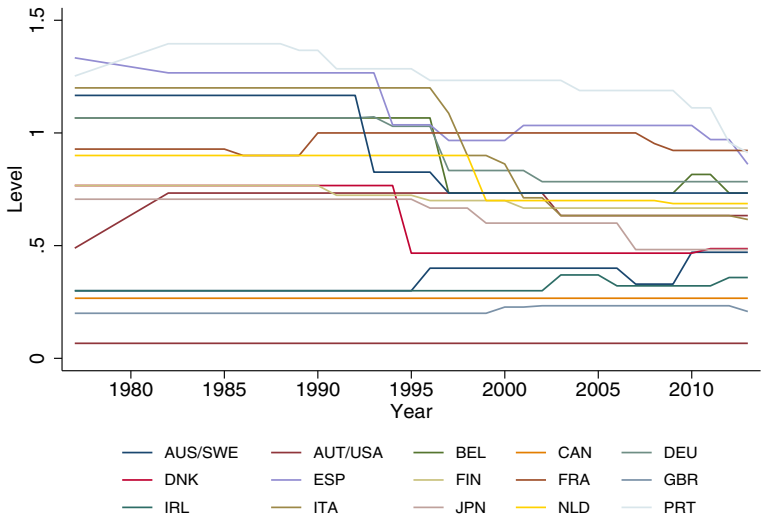

Fig. 1 EPL 1978–2013. *Notes*. The figure displays the values of EPL employed in the paper. "Appendix" details how the variable has been reconstructed

potential confoundedness between the effects of labour market reforms and the effects of consolidations. Third, it makes the result in this paper immediately comparable to the extant empirical research, which also focused on EPL (Auerbach and Gorodnichenko 2012; Turrini 2013; Cacciatore et al. 2021). Fourth, the EPL is a measure publicly available and that is maintained by a public organization, the OECD, which also assures a high degree of comparability across different countries.

Figure 1 plots the EPL. As the figure shows, EPL fluctuates in both cross-sectional and time series dimensions. The total standard deviation of EPL is 0.35, with a cross-sectional standard deviation of 0.33 and a time series standard deviation of 0.12. These values are reassuring on the fact that these variables display sufficient variation in all dimensions to provide robust estimates. Moreover, the EPL remains stable for long periods, thus being uncorrelated with business cycle fluctuation.

This is also corroborated in Table 1, which reports the number of years in which EPL has been above the median per country. As the table shows, EPL has been below the median for the entire period in 8 countries (Australia, Austria, Canada, Ireland, Japan, The Netherlands, the UK, and the USA), while it has been above its median for the entire period in 4 countries (France, Germany, Portugal, and Spain). In 5 countries, EPL shifted the median at least once. According to Table 1, low levels of EPL are less geographically concentrated than high level of EPL, which are mostly present in Europe. In addition, having almost the 30% of countries crossing the EPL median level confirms that there is a wide variation in the time series dimension that can be exploited for the parameter estimations.[6]

[6] It is worth noting that the methodology employed in this paper exploits the fact that the EPL is a continuous variable. However, the use of a threshold like the median is beneficial for the preliminary discussion of the characteristics of the dataset.

Table 1 Number of years with EPL above the median by country

Country	Years	Country	Years
AUS	0	GBR	0
AUT	0	IRL	0
BEL	21	ITA	23
CAN	0	JPN	0
DEU	36	NLD	0
DNK	17	PRT	36
ESP	36	SWE	19
FIN	13	USA	0
FRA	36		

The table reports the number of years in which the EPL has been above its median by country

2.1 EPL and consolidations

As aforementioned, one of the crucial strengths of EPL is that it is implausible that it can threaten the identification of consolidation effects. On the one hand, Alesina et al. (2019a) shows how changes in EPL cannot predict consolidations. As a matter of facts, I find that the correlation coefficient between consolidations and changes in EPL is generally low, being about -0.035 for expenditure-based plans and -0.13 for tax-based plans. On the other hand, changes in EPL do not have significant business cycle effects on average (Duval and Furceri 2018). This evidence excludes that the estimated effects of consolidation can be confounded by changes in EPL.

However, it might still be the case that the levels of EPL are correlated with the size of consolidations or with their type. For example, we might think that countries with higher EPL might be keener to approve larger consolidations because this generates milder fluctuations in unemployment, and thus smaller political costs, compared to low-EPL countries. Table (2) explores this issue, by evaluating how type–magnitude distributions change across the median of EPL. Broadly speaking, tax-based plans are evenly distributed across levels of EPL, while expenditure-based plans $> 0.75\%$ are slightly over-represented when EPL is above the median, where they represent about 67% of total plans against 48% when EPL is below the median. All in all, these results are reassuring about the absence of a systematic relation between the consolidations and EPL, with a small caveat about a "size effect" due to the distribution of expenditure-based consolidations.

A further evidence on the balancedness of my sample and absence of a systematic relationship between the consolidations and EPL is contained in Table 3, which reports the mean and standard deviation of tax-based, expenditure-based, and total plans above and below the median EPL. In addition, it also shows in the column "Diff" the coefficient of a simple regression of treatment status on the variable, with clustered standard errors at the country level, in order to evaluate if the consolidations' means systematically change across the EPL median. As shown in Table 3, the evidence does not support a systematic change, although the mean of total plans is higher when EPL is above the median, a result driven by expenditure-based consolidations—an evi-

Table 2 Number of consolidations by type, magnitude, and EPL

Change level	$>0.75\%$	$0.75\% \geq x > 0.25\%$	$\leq 0.25\%$	Total
EPL $\geq$ *the median*				
Tax	18	6	5	29
Expenditure	46	10	12	68
Total	64	16	17	97
EPL $<$ *the median*				
Tax	19	11	7	37
Expenditure	33	19	17	69
Total	52	30	24	106

The table reports the number of tax- and expenditure-based plans with a magnitude higher than 75%, between 75% and 25%, and lower or equal than 25% when EPL is above or below the median. The magnitude of consolidation plans is expressed in GDP percentages

Table 3 Balance of consolidations above and below EPL median

	n	Low EPL			High EPL		
		mean	SD	*n*	Mean	SD	Diff
Total	361	0.78	0.92	268	1.12	1.05	0.150
Tax	361	0.28	0.70	268	0.29	0.59	0.020
Expenditure	361	0.50	0.80	268	0.83	1.12	0.131

Table shows averages, standard deviations, and number of observations for the consolidation types above and below the EPL median. The Diff column is the coefficient of a simple regression of treatment status on the variable, with clustered standard errors at the country level. Stars indicate whether this difference is significant

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

dence potentially related to the aforementioned overrepresentation of plans $> 0.75\%$. Tax-based consolidations, instead, show only a negligible difference in mean.

3 Empirical strategy

To assess how the effects of consolidation plans vary along with labour market rigidities, the empirical investigation will employ the Interacted Panel VAR (IPVAR, Towbin and Weber 2013; Sa et al. 2014; Abbritti and Weber 2018). The IPVAR extends standard panel VARs by letting the coefficients vary deterministically with exogenous variables. In this way, it is possible to evaluate the response function of the endogenous variables for different levels of the structural characteristics we are interested in.

The reduced form of this model is described in Equation (1).[7]

$$
\begin{aligned}
Y_{i,t} = C_i + C_i^1 \cdot \text{epl}_{i,t} + \sum_{k=1}^{L} A_k \cdot Y_{i,t-k} + \sum_{k=1}^{L} A_k^1 \cdot \text{epl}_{i,t-k} \cdot Y_{i,t-k} \\
+ \sum_{k=0}^{L} \beta_k \text{glob}_{i,t-k} + u_{i,t} \\
t = 1; \ldots; T \quad i = 1; \ldots; N \quad u_{i,t} \sim N(0; \Sigma_{i,t})
\end{aligned} \tag{1}
$$

where the subscripts i and t indicate country and time. In Eq. (1), C is the vector of country-specific intercepts, Y is the vector of endogenous, and A_k is the matrix of autoregressive coefficients up to lag L, where I set $L = 2$ according to the AIC. u is the vector of residuals which is assumed to be uncorrelated across countries and normally distributed with a constant covariance matrix Σ. *epl* stands for the EPL, and it influences the dynamic relationship between the endogenous variables (A_k^1) and the level of the variables (via C^1). Therefore, changes in the plotted economic responses reflect the different levels of labour market rigidity.

The presence of interacted terms lets the estimated effects of consolidations vary with the county-year level of EPL. This is done by estimating an average effect that is the same for all units, captured by A_k, and an effect that changes with EPL, captured by A_k^1. In other words, the coefficients of tax- and expenditure-based consolidations are evaluated at specific percentiles of the EPL, epl^{P_i}; thereafter, impulse responses can be computed. Because EPL is defined over a continuous range, as a benchmark they are evaluated at a lower ($P_i = 10^{th}$) percentile and a higher ($P_i = 90^{th}$) percentile value. Similarly to Cacciatore et al. (2021), we can interpret a change in P_i as a change in the real cost of terminating a contract, represented by a pure loss for firms without any transfer to workers.

The discussed methodology constitutes a relevant advancement compared to previous studies on the role of the labour market in the transmission of fiscal policy (Auerbach and Gorodnichenko 2012; Turrini 2013; Cacciatore et al. 2021). These studies transformed the EPL from a continuous variable to a 0/1 dummy. While the continuous indicator imposes that the response changes along with the indicator value, the dummy determines a threshold effect relationship. This implies that the results might depend on the threshold chosen: the estimates will average the effects of fiscal policy at the extremes of the distribution, with the ones closer to the thresholds. This averaging reduces the distance between the effects above and below the threshold, thus potentially biasing the inference towards a smaller role of EPL compared to what emerges by looking at the entire distribution. The empirical methodology employed in the paper is, instead, robust to this problem because it averages the responses only of a small portion of the distribution.

The vector of endogenous variables is $Y = [g, r, def, output, lt\_r]$ in the baseline specification, where g and r are the expenditure- and tax-based consolidation plans,

[7] A thorough explanation of the characteristics of this model is contained in "Appendix", in Towbin and Weber (2013), and in Sa et al. (2014).

def is the government deficit over potential output, $output$ is GDP, and lt_r is the interest rate on the 10 years government bonds. glob is a measure of global output and is exogenous to both the VAR and the interaction part. These variables enter either in log-differences when they represent levels, and simple differences when they represent rates.

The inclusion of some of these variables is necessary to adequately control for the economic innovations that can affect consolidations other than government discretion. lt_r is necessary to purge the effect of changes in governments' refinancing rates.[8] The primary balance controls for previous fiscal policies, and it is scaled on trend GDP to reduce the role of GDP innovation in the ratio, as recommended by Ramey and Zubairy (2018). Finally, global output represents a parsimonious way to control for common shocks across units (Jordà et al. 2020).

Similarly to previous studies such as Guajardo et al. (2014), Beetsma et al. (2015), and Beetsma et al. (2021), structural fiscal shocks are retrieved with a recursive identification procedure. Narrative consolidations are ordered first in the PVAR with expenditure changes ordered first and taxation second.[9] Then, the covariance matrix of residuals is triangularized à la Cholesky, which is equivalent to assuming that the residuals of the two equations for consolidations approximate innovations to expenditure and taxation.[10]

Other studies assume consolidations to be purely exogenous (Alesina et al. 2015, 2017, 2018; Favero and Mei 2019). This consents to explicitate the relation between unexpected and announced components, thus increasing the precision of the simulations in a simple regression or VAR analysis. However, the explicitation of the links among the various components of consolidations increases largely the number of parameters to be estimated. This can be particularly detrimental to the precision of the estimates in a setting as the one described in Equation (1) as any additional variable requires estimating two different parameters. Moreover, the role of announced components is relatively small, therefore making the gains of the explicitation marginal. Therefore, separating the subcomponents of the announcements is not well suited to the setting proposed in this paper, and it will employ the announced plans as a whole maintaining only the distinction between tax- and expenditure-based.

In the VAR setting proposed in this paper, we should expect the effects of any transitory shock vanish after a few years. The rationale behind this is based on the presence of a balanced growth path: when a transitory negative shock hits the economy, output falls and then it recovers the pre-shock trend. Instead, when a shock has permanent effects, the opened gap does not close and the variables' response becomes persistent. However, in panel data, the intrinsic mean-reversion characterizing VARs can be off-

[8] Beetsma et al. (2021) demonstrates that movements in long-term rates can predict consolidations, and this drives the results in De Cos and Moral-Benito (2016) and Jordà and Taylor (2016) result.

[9] The ordering of the two types of consolidations is innocuous because they are uncorrelated by definition. I anyway tested the robustness of the results against a change in the variables' ordering.

[10] Given the high nonlinearity of the system, the confidence intervals are estimated with 1000 bootstrap replications of the model. In greater detail, I estimate the model, take the empirical residuals, generate new panel series for the dependent variable by resampling the residuals, and re-estimate the model. This is repeated 1000 times also accounting for the panel dimension. Finally, I extract the 90% confidence intervals and the median from the empirical distribution of simulated models.

set by the presence of cross-correlation (Assenmacher-Wesche and Gerlach 2008) or strongly autocorrelated variables. This can produce artificially persistent responses, thus biasing the results.

One possibility to circumvent this issue would be to use local projections (Jorda 2005). Local projections can achieve a more accurate estimation of long-run effects because they do not suffer from problems related to parameter persistence, as Jordà et al. (2020) shows. Moreover, local projections are generally considered a superior strategy in that they can accommodate nonlinearities more straightforwardly than VAR (see, for example, Ramey and Zubairy 2018). However, in local projections, any additional horizon included in the analysis generates a loss observation. Given the dataset employed here, this would imply that the estimated parameters of the last period (the 10th) would be based on 15 observations. This would dramatically reduce the precision of the estimates, therefore making local projections not well suited in this context.

Therefore, I opted for a different strategy. First, I corroborate the analysis on the persistence of the effects of consolidations with the response of the potential values. The rationale behind this is that if the response of the raw variable is persistent because of biased estimates, this should not reflect on the estimates for potential values. Second, the results for the interacted local projections will also be discussed because they represent the major robustness check of the results.

4 Results

4.1 The average effect of consolidations

To better dissect the role of EPL, it can be instructive to first discuss the response of output to consolidation obtained in a general panel VAR. This is equivalent to restrict to 0 the parameters for A_k^1 and C_i^1 in Eq. (1). Figure 2 reports the results for this experiment: upper panels shows the response of output (left) and potential output (right) to tax-based plans; bottom panels plot the same responses for expenditure-based plans. Figure 2 reports: (i) cumulated effects up to 10 years after the consolidation announcement; (ii) consolidations are normalized to be 1% of GDP; (iii) years as time measure; and (iv) point estimates with thick solid lines and 90% confidence intervals with thin dashed lines and shaded areas.

In line with a large literature (Romer and Romer 2010; Guajardo et al. 2014; Alesina et al. 2015; Beetsma et al. 2015; Alesina et al. 2018, 2019, a; Beetsma et al. 2021), the evidence suggests that tax-based consolidations depress economic activity persistently, while expenditure-based consolidations on economic activity are not statistically significant on impact becoming even mildly expansionary in the long term. In addition, potential output reduces for 2 years after tax-based consolidations, while expenditure-based episodes leave it unaffected. This is reassuring on the presence of long-term effects, at least for tax-based consolidations.

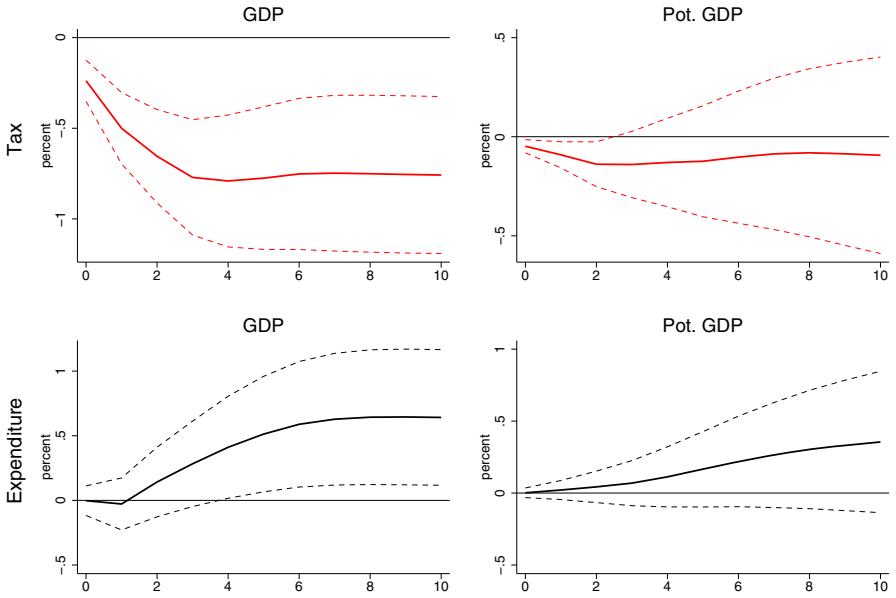

Fig. 2 Output response of output to consolidations. *Note*. Impulse responses from PVAR. Data are for all 17 countries, period 1978–2013. Response to tax-based (red) and expenditure-based consolidations is normalized to be 1% of output. Point estimates are the continuous line, and 90% confidence intervals are the dashed lines

4.2 The role of sclerotic labour markets

The question is, then, if—and to what extent—the labour market rigidity drives these long-term effects. To investigate this, Figs. 3 and 4 plot the responses for output and potential output to tax- and expenditure-based plans when EPL is high (90th percentile of the distributions) or low (10th percentile of the distributions) and the difference between these two responses. The panels on the first row report the impulse responses for actual GDP, while the panels on the second row report the impulse response for potential GDP. As before, responses are in percentage deviations (x-axis) over a horizon of 10 years (y-axis).

In the plots, the median of simulations (dashed lines) and 90% confidence intervals (shaded areas) is in red for low levels of rigidity, in blue for high levels of rigidity, and in green for the difference. To facilitate the comparison, the first column highlights the results for high EPL while leaving the low EPL in the background; the second column highlights the results for low EPL while leaving the high EPL in the background; and the third column reports only the difference. It is worth noting that this type of investigation has the aim to highlight which EPL groups display a larger effect of fiscal consolidations, but that little can be said about the magnitude of the difference.

As Fig. 3 shows, the response of output to tax-based consolidation depends on EPL. Higher levels of EPL produce larger and permanent output losses, thus determining a significant reduction of potential output for more than 5 years. On the contrary, low levels of EPL are associated with a mild contraction of economic activity which

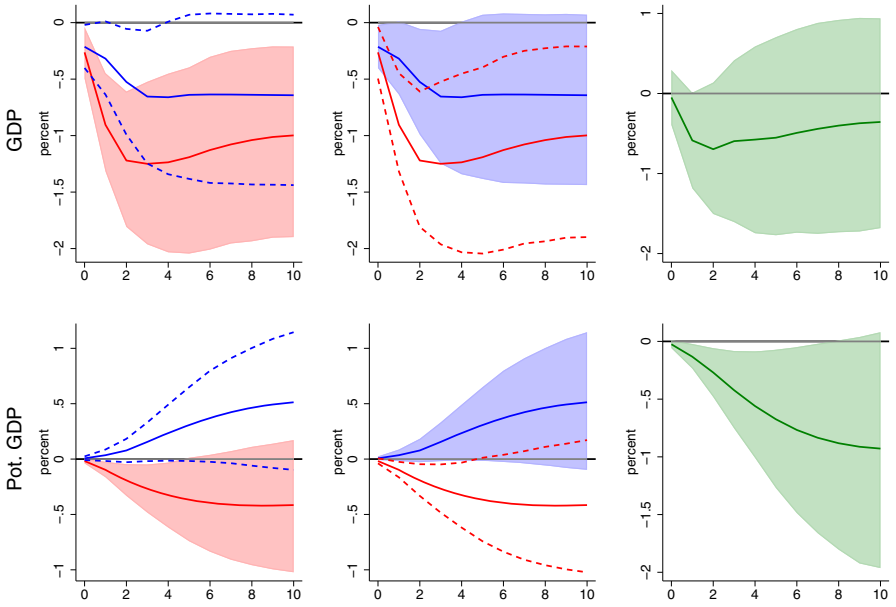

Fig. 3 Output responses to tax-based consolidation and EPL. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Tax-based consolidations are normalized to be 1% of output. The figure reports point estimates and 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries and blue for low-EPL countries. The difference is reported in green line (median) and shaded area (90% confidence intervals). To facilitate the comparison, the first column highlights the results for high EPL while leaving the low EPL in the background; the second column highlights the results for low EPL while leaving the high EPL in the background; and the third column reports only the difference. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2013

dissipates after 4 years. In addition, the sign of the response of potential output is positive, even if not significant, thus suggesting that the consolidations have a neutral long-term effect—or even moderately expansionary. This is a marked difference from the reduction in potential GDP observed for average response (Fig. 2).

The rigidity of the labour market affects also the transmission of expenditure-based consolidations, see Fig. 4. In a flexible labour market (low EPL), output increases permanently after the approval of expenditure-based consolidations and an increase in EPL mutes this expansionary effect. The response of potential output changes accordingly: potential output expands significantly in low-EPL markets and remains unaffected when EPL increases. It is worth noting how also in this case the response of potential GDP in low countries is largely different from what has been estimated for the panel average.

Therefore, labour market rigidity is pivotal in prolonging the depressive effect of consolidations. However, factors other than hysteresis can explain this change, as suggested in Gali (2015). Moreover, hysteresis is not uniquely defined, as different authors proposed different definitions: for example, Engler and Tervala (2018) suggests that fiscal policy can affect productivity in specific labour markets, thus generating a

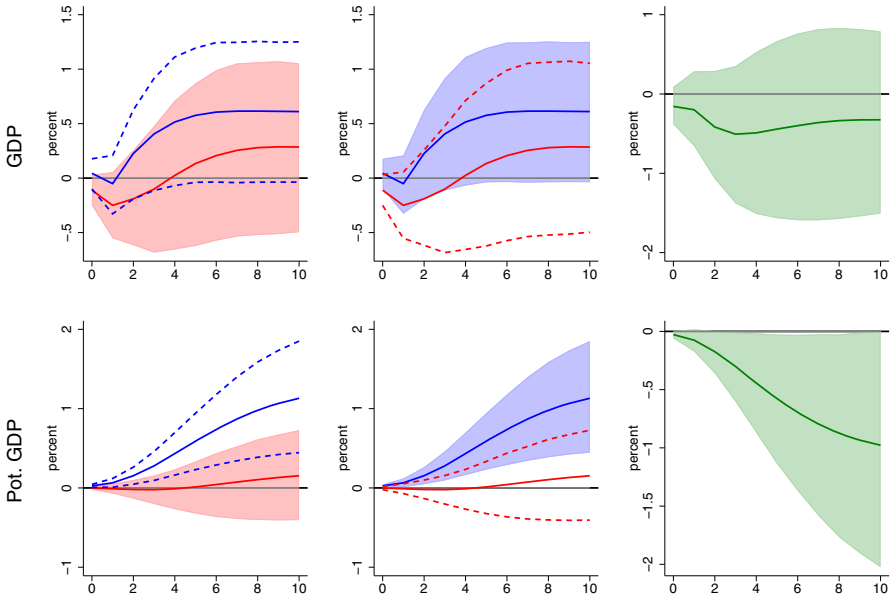

Fig. 4 Output responses to expenditure-based consolidation and EPL. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Expenditure-based consolidations are normalized to be 1% of output. The figure reports point estimates and 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries and blue for low-EPL countries. The difference is reported in green line (median) and shaded area (90% confidence intervals). To facilitate the comparison, the first column highlights the results for high EPL while leaving the low EPL in the background; the second column highlights the results for low EPL while leaving the high EPL in the background; and the third column reports only the difference. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

hysteresis of the short-term effects, while according to Blanchard and Summers (1986) it is the bargaining process which determines the long-term scars.

To better dissect these issues and shed further light on the role of hysteresis, I estimate an alternative IPVAR containing the unemployment rate, the average wage, the total factor productivity (TFP), and the consumer price index (CPI). The rationale behind this is that the responses of wage and unemployment rate can clarify the role of the labour market in the transmission of consolidations, while the ones of CPI and TFP can provide evidence on the possible distortionary effect of taxation. As a consequence, the vector of dependent variables becomes $Y = [g, r, def, un\_r, wage, tfp, cpi, lt\_r]$, where un_r is the unemployment rate, $wage$ the average wage, tfp the TFP, and cpi the CPI. These variables enter in log-differences, with the exception of the unemployment rate that enter in simple differences.

Figure 5 reports the responses to tax-based plans. When EPL is low, tax-based consolidations depress the economy on impact (unemployment increase, wage, and prices reduce), but this effect vanishes quickly. The persistence of the responses increases with the EPL: for high EPL unemployment increases significantly for four years, while the reduction in wage and CPI becomes permanent, despite not significant on impact.

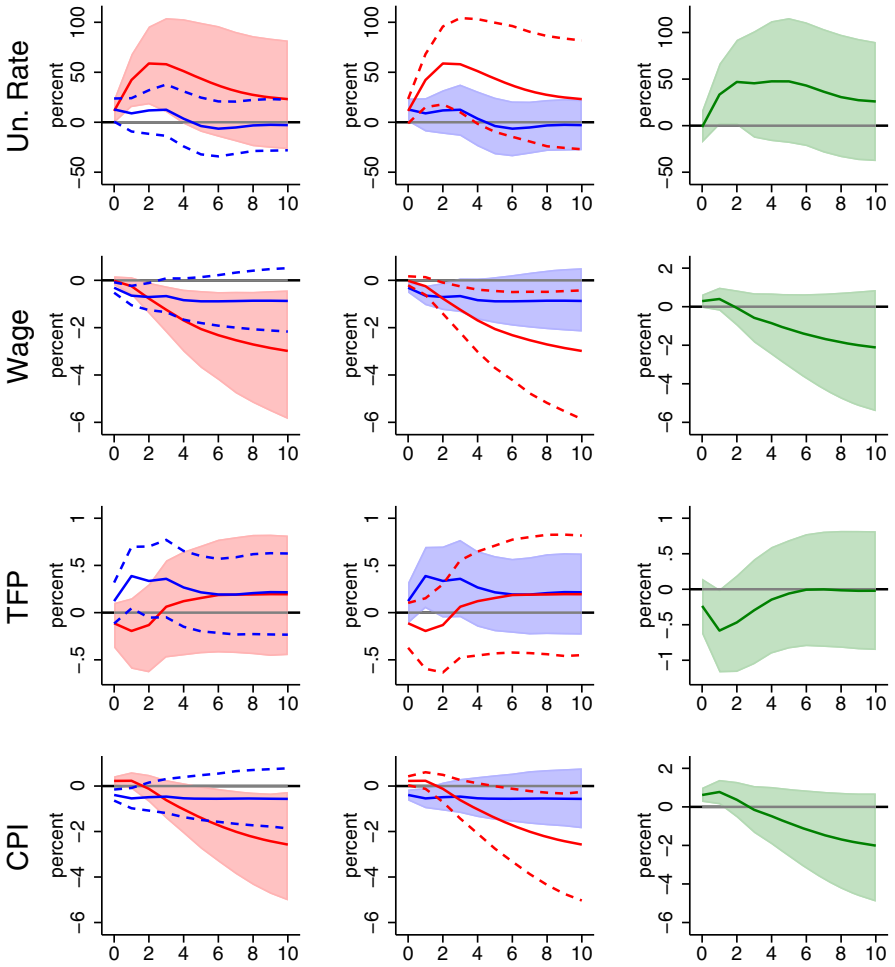

Fig. 5 Economy responses to tax-based consolidation and EPL. Note. Impulse responses from IPVAR for unemployment rate (first row), real average wage (second row), TFP (third row), and CPI (fourth row). Tax-based consolidations are normalized to be 1% of output. The figure reports point estimates and 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries and blue for low-EPL countries. The difference are reported in green line (median) and shaded area (90% confidence intervals). To facilitate the comparison, the first column highlights the results for high EPL while leaving the low EPL in the background; the second column highlights the results for low EPL while leaving the high EPL in the background; the third column reports only the difference. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2013

TFP remains mostly unaffected, with the exclusion of a moderate and short-lived increase when EPL is low.

Figure 6 shows the responses to expenditure-based consolidations. When EPL is high, expenditure-based consolidations moderately increase the unemployment rate, while CPI and wage marginally reduce. Also, TFP increases in the medium term. A

reduction in EPL mutes these responses, with the exclusion of a moderate increase in prices and a one-period reduction in TFP.

We can summarize these results by stating that the depressive effects of consolidations are magnified and extended when the labour market is rigid. During tax-based episodes, sclerotic labour markets are associated with larger and more persistent drops in output, wage, and employment, which also reduce potential output. During expenditure-based episodes, sclerotic labour markets mute the otherwise long-term expansionary effect of consolidations, thus increasing the negative effect on labour-related variables. (Unemployment rate increases and wage reduces.)

This set of impulse responses is in line with the predictions of Blanchard and Summers (1986). In their model, unions respond to a reduction in aggregate demand by protecting wage at the expense of higher unemployment in more sclerotic labour markets. Therefore, on impact unemployment increases, while wage remains unaffected. However, in the medium term the increase in unemployment generates a downward wage pressure, thus reducing it. This is coherent with the empirical findings for both tax- and expenditure-based episodes: increases in EPL make unemployment more reactive in the short term while muting the wage response, but in the medium to long term wage reduces persistently, while unemployment remains on a high level.

This role of EPL increases is, however, not in line with the fact that it is mainly a measure of hiring–firing costs. In this case, we would expect that the higher the EPL, the higher are the hiring and firing costs, the lower the employment volatility. This mismatch between the empirical findings and the theoretical prediction is probably due to the fact that when EPL is used alone, the measure captures different labour market rigidities, as also shown in Babecký et al. (2010). This characteristic, that motivated its use in this study, prevents to map EPL directly into theoretical models. To do that, it would be necessary to refine the analysis by including different rigidities. This is, however, beyond the scope of the present study.

The findings are in contrast with explanations for the long-term effects alternative to a hysteresis process as defined in Blanchard and Summers (1986). In particular, Barro and Redlick (2011) and Alesina et al. (2017) claim that tax hikes can reduce economic activity persistently because they are distortionary. In such a setting, tax-based consolidations would reduce TFP and, therefore, potential output, and increase prices. However, in the data TFP remains unaffected—or moderately increases—while prices reduce, thus suggesting that the demand-side effect dominates in tax-based consolidations. More in general, productivity shows little or null fluctuations after both types of consolidations, a finding that is against productivity-based hysteresis as the one in Engler and Tervala (2018).

Also, the evidence shows that the unemployment rate responds more to expenditure-based consolidations when EPL is high. This is in contrast with Cacciatore et al. (2021), which conjecture that higher hiring–firing costs reduce the responsiveness of output to fiscal shocks because they lower the elasticity of job creation and destruction to shocks. However, Cacciatore et al. (2021) does not investigate empirically whether unemployment reacts less in high-EPL environments. My results suggest that this is not the case for consolidations: this difference can be explained by a different role of labour markets in expansionary and contractionary fiscal policy. Despite being

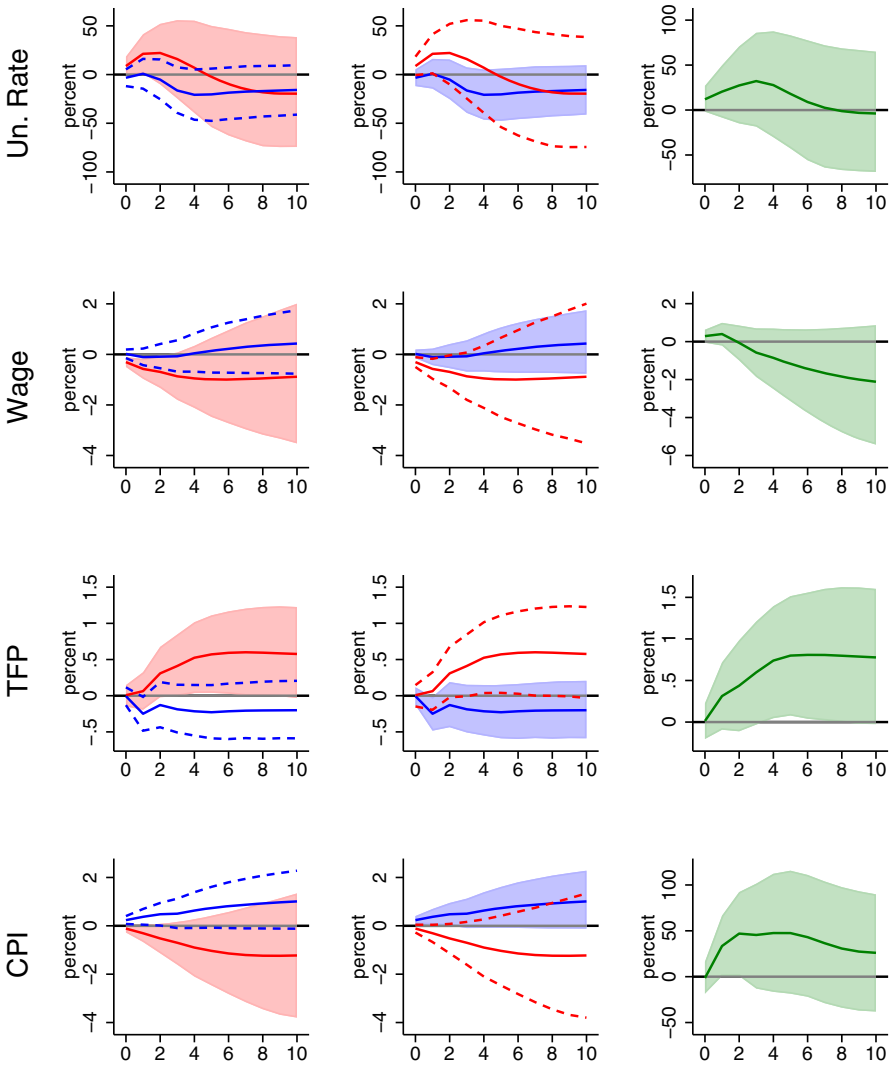

Fig. 6 Economy responses to expenditure-based consolidation and EPL. *Note*. Impulse responses from IPVAR for unemployment rate (first row), real average wage (second row), TFP (third row), and CPI (fourth row). Expenditure-based consolidations are normalized to be 1% of output. The figure reports point estimates and 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries and blue for low-EPL countries. The difference is reported in green line (median) and shaded area (90% confidence intervals). To facilitate the comparison, the first column highlights the results for high EPL while leaving the low EPL in the background; the second column highlights the results for low EPL while leaving the high EPL in the background; the third column reports only the difference. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

interesting, this is beyond the scope of this paper and should be explored by future research.

Finally, the evidence suggests that potential output increases after consolidations in a low-EPL environment. This result is particularly puzzling because there is no evidence of increases in output, productivity, or employment.[11] One possible explanation is that workers are more likely to change their effort as a response to shocks when employment is less protected, as suggested in Gnocchi et al. (2015). As a consequence, workers would increase effort when a contractionary fiscal policy is approved, thus raising potential output.

All in all, the results suggest that the structure of the labour market plays a pivotal role in explaining the long-term effects of consolidations. This implies that governments should consider the labour market structure when they design consolidations to avoid unintended persistent effects. The ideal policy would be to reform the labour market before approving consolidations because a more flexible labour market guarantees better performance in the long term while moderating the short-term costs.

In addition, these results support that consolidations contributed to the subdued performance of potential and actual growth after 2010 in high-EPL countries, like the members of the European Union. This corroborates the results discussed in Blanchard and Leigh (2013), Fatás and Summers (2018), and Gechert et al. (2019). Furthermore, the results also suggest that the subdued performance of European economies was potentially driven by the tax-based packages, which constitute a third of the total number of packages approved between 2010 and 2013 (14 over a total of 42).

4.3 Robustness

The literature points out how local projections are a better tool to investigate long-term effects (Jordà et al. 2020) and to accommodate nonlinearities (Ramey and Zubairy 2018). Despite these qualities, I opted for a VAR because local projections require a long time series to provide precise estimates, which is not available for consolidations. However, they can still represent a good robustness check for the general conclusions.

The model estimated is described in Eq. (2):

$$\begin{aligned}\Delta z_{i,t+k} = \alpha_i^k + \boldsymbol{Shock}_{i,t}\boldsymbol{\beta}^k + \left[\boldsymbol{Shock}_{i,t} \times \mathrm{epl}_{i,t}\right]\boldsymbol{\beta}_{int}^k \\ +\gamma^k X_{i,t} + \theta^k \mathrm{glob}_{i,t} + u_{i,t}\end{aligned} \tag{2}$$

where $Shock$ is the vector of shocks containing the expenditure- and tax-based plans and X is a vector of controls lagged two periods containing the real GDP, the EPL, the global output, the dependent variable, z, the long-term interest rate, the government deficit over potential GDP, the vector $Shock$, and its interaction with the EPL. These variables enter either in log-differences when they represent levels, and simple differences when they represent rates. In addition, the specification also contains a full

[11] To study this in depth, I investigated whether differences in the response of investment, interest rates, and capital intensity can explain this evidence, without finding any role for these variables. Results are available upon request.

set of country fixed-effects, α_i, and includes contemporaneous movements in global output to control for cross-sectional correlation. u is the vector of random errors.

$k = 0, \ldots, 10$ denotes the time horizon of the local projection. Therefore, the response functions are computed as follows: first, it is computed the difference between the (log)value of the dependent variable between period $t + k$ and $t - 1$. In this way, we can obtain directly the cumulated impulse responses Ramey and Zubairy (2018). Then, Eq. (2) is estimated to obtain an estimate for the horizon-specific coefficients, $\boldsymbol{\beta}^k$ and $\boldsymbol{\beta}^k_{int}$. This is done using ordinary least squares with Driscoll and Kraay (1998) robust standard errors. Finally, the estimates are combined to compute the impulse response when EPL is high (90th percentile) and low (10th percentile).

Figures 7 and 8 show the responses of GDP and potential GDP to, respectively, tax-based and expenditure-based consolidations. The responses are not qualitatively different from the ones from the VAR discussed above: increases in EPL magnify the depressive effects of consolidations, but only tax-based episodes reduce potential GDP. In a low-EPL environment, consolidations are neutral to expansionary and positively affect potential GDP.[12]

For the sake of brevity, here I discuss only the response of GDP and potential GDP, but the results for all other variables (wage, TFP, CPI, unemployment rate) are reported in "Appendix" and are qualitatively similar to the ones of the VAR. In addition, "Appendix" includes a wide range of different specifications, which include: (i) a different number of lags included; (ii) a different variable ordering[13]; (iii) the inclusion of a measure of product market rigidity, the PMR; (iv) a shorter sample to exclude the great recession; (v) the exclusion of one country at the time; and (vii) the inclusion of additional controls where $Y = [s_i, g, r, def, un\_r, lt\_r]$.[14]

5 Conclusions

This paper investigates whether hysteresis can explain the long-term scars that are produced by fiscal consolidations (Blanchard and Leigh 2013; Fatás and Summers 2018; Gechert et al. 2019). This is achieved by using an interacted panel VAR where consolidations are identified with a narrative measure spanning the period 1978–2013 for 17 OECD countries.

The empirical investigation finds that the depressive effects of consolidations are magnified and extended when the labour market is rigid. This implies that output, wage, and employment drop more and longer after tax-based consolidations, while expenditure-based consolidations start having negative effects on the labour market.

The empirical evidence matches the theoretical predictions of Blanchard and Summers (1986), thus supporting the hypothesis that hysteresis plays a crucial role in explaining the long-term effects of consolidations. At the same time, the paper does

[12] The response of potential GDP to tax-based consolidations must be taken with a grain of salt: the estimated effect is probably due to the sum of a low number of observation and a small number of episodes. As a matter of facts, tax-based consolidation constitutes about a third of the total number of consolidations.

[13] In the new order, the narrative measure for taxation is ordered first, and the one for expenditure second.

[14] It is worth noting that, in the last robustness check, s_i is the stock market index, and it is ordered before consolidations because financial indexes can incorporate relevant information on countries' fiscal balance.

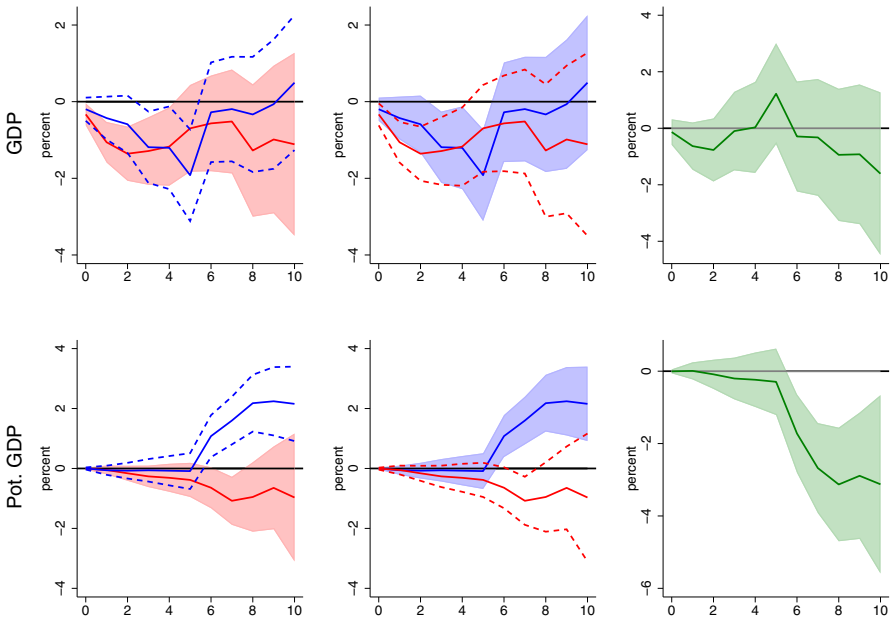

Fig. 7 Output responses to tax-based consolidation and EPL, local projections. *Note*. Impulse responses for an interacted local projections model with Driscoll–Kraay standard errors. Data are for all 17 countries, period 1978–2013. Tax-based consolidations are normalized to be 1% of output. The figure reports point estimates and 90% confidence intervals (dashed lines or shaded areas) and median estimates (continuous line) in red for high-EPL countries and blue for low-EPL countries. To facilitate the comparison, the first column highlights the results for high EPL while leaving the low EPL in the background; the second column highlights the results for low EPL while leaving the high EPL in the background; and the third column reports only the difference. The shocks are identified with the narrative tax-based consolidations

not find evidence of a relevant drop in productivity following consolidations. This speaks against other possible explanations for the long-term effect of consolidation, like the distortionary effect (Barro and Redlick 2011) of tax hikes and the presence of a productivity-based hysteresis (Engler and Tervala 2018).

The new findings support that the consolidations implemented after 2010 contributed to the subdued performance of actual and potential growth in high-EPL countries. Therefore, governments should consider the labour market structure when they design consolidations to avoid unintended persistent effects. The ideal policy would be to reform the labour market before approving consolidations because a more flexible labour market guarantees better performance in the long term while moderating the short-term costs.

The results also leave open questions to be investigated in future research. First, the role of labour markets might be different along the business cycle, which would explain the discrepancy between the amplifying role of labour market rigidity in this paper and the one conjectured in Cacciatore et al. (2021). Second, consolidations stimulate potential output in flexible labour markets. This can be explained by a change in

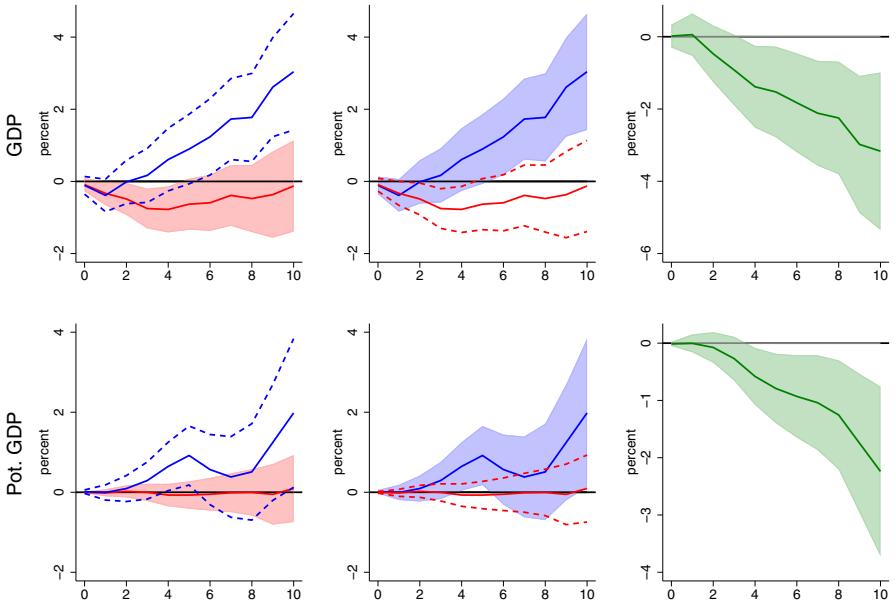

Fig. 8 Output responses to expenditure-based consolidation and EPL. *Note*. Impulse responses for an interacted local projections model with Driscoll–Kraay standard errors. Data are for all 17 countries, period 1978–2013. Expenditure-based consolidations are normalized to be 1% of output. The figure reports point estimates and 90% confidence intervals (dashed lines or shaded areas) and median estimates (continuous line) in red for high-EPL countries and blue for low-EPL countries. To facilitate the comparison, the first column highlights the results for high EPL while leaving the low EPL in the background; the second column highlights the results for low EPL while leaving the high EPL in the background; and the third column reports only the difference. The shocks are identified with the narrative expenditure-based consolidations

workers' efforts as a reaction to contractionary shocks, as Gnocchi et al. (2015) also suggest. However, the evidence supporting this hypothesis is still small.

Funding Open access funding provided by Copenhagen Business School Library No funds, grants, or other support were received for the submitted work.

Data availability The data that support the findings of this study are available from the corresponding author upon request.

Declarations

Conflict of interest The author has no relevant financial or non-financial interests to disclose.

Appendix

Data

Table 4 contains a description of the main variables in this study with the relative sources. When it was necessary to reconstruct a variable backward, as in the case of Germany until 1990, I selected a secondary source (for instance, the IMF WEO in the case of unemployment rate) and take the variations in the secondary source to reconstruct the primary source missing data.

Following Abbritti and Weber (2018), EPL is (recursively) extended using the following formula:

$$\mathrm{EPL}_t = \mathrm{EPL}_{t-1} + \Delta\hat{\mathrm{EPL}}_t \tag{3}$$

where Δ refers to the first difference operator and $\hat{\mathrm{EPL}}_t = c_1 + \beta_1 \mathrm{EPL}_t^{\mathrm{OECD}}$ corresponds to fitted values from an OLS regression of the CEP-OECD EPL indicator on

Table 4 List of variables

Variable	Explanation and Source
r	Discretionary raise in revenues scaled by GDP 1978–2013. Source: Alesina et al. (2018); Alesina et al. (2015a)
g	Discretionary cut in expenditure scaled by GDP 1978–2013. Source: Alesina et al. (2018); Alesina et al. (2015a)
gdp	Gross domestic product, volume Reconstructed for Germany (1977–1990) with Jordà, Schularick Taylor Macrohistory and Ireland (1980–1989) with IMF WEO. Source: OECD Economic Outlook n° 106; Jordà, Schularick Taylor (2017); IMF World Economic Outlook
pot_gdp	Potential output, volume 1985–2013. Source: OECD Economic Outlook n° 106 November 2019
inf	Percentage change in Consumer Prices Index. Source: Jordà, Schularick Taylor (2017)
lt_r	Short-term interest rate (nominal). Source: Jordà, Schularick Taylor (2017); Austria and Ireland OECD Economic Outlook n° 106
un_r	Unemployment as a share of labour force. Sources: OECD Economic Outlook n° 106 November 2019 reconstructed Germany (1980–1990) and Ireland (1980–1990) with IMF WEO
wage	Wage rate, average wage per employee, OECD Economic Outlook n° 106 November 2019
tfp	Total Factor Productivity Long-Term Productivity Database, A. Bergeaud, G. Cette and R. Lecat, http://www.longtermproductivity.com/
def	General government primary balance as a share of trend GDP. Source: OECD Economic Outlook n° 106; Australia (1977–1988), Germany (1977–1990), Ireland (1977–1989), France (1977) reconstructed with the IMF Historical Public Finance Dataset. Trend GDP is obtained with a Hodrick–Prescott Filter with $\lambda = 100$
epl	Employment Protection Level based on the CEP-OECD dataset until mid-1.5000s, then it uses the variation of the OECD series which have the same concept, scaled on the ratio among the two series. Source: CEP-OECD and OECD
glob	World GDP Source: OECD Economic Outlook n° 106

the OECD EPL indicator and on a constant c_1. The CEP-OECD EPL is nothing else than the first version of the OECD EPL indicator and is available from 1977 to 2003. Both indicators refer to regular contract dismissals: a higher value indicates stricter employment protection legislation. The OECD EPL covers from 1985 to 2019. The correlation between the CEP-OECD EPL and the OECD EPL indicator is 0.85 for 323 overlapping observations.

The identification strategy

The identification of structural shocks is the main issue in SVAR methodology. This is because, as a huge literature pointed out, the covariance between the residuals in a VAR as Equation (5) is non-null, i.e. the variance–covariance matrix is not diagonal. Instead, a shock affecting a variable must not correlate with other economic changes. A shock with such characteristic is also named "structural", and it produces its dynamic effects through the matrix Φ_{t-s} of the unrestricted VAR:

$$\begin{aligned} Y_{i,t} = C_i + C_i^1 \cdot \text{epl}_{i,t} + \sum_{k=1}^{L} A_k \cdot Y_{i,t-k} + \sum_{k=1}^{L} A_k^1 \cdot \text{epl}_{i,t} \cdot Y_{i,t-k} \\ + \sum_{k=0}^{L} \beta_k \text{glob}_{i,t-k} + u_{i,t} \\ t = 1; \ldots; T \quad i = 1; \ldots; N \quad u_{i,t} \sim N(0; \Sigma_{i,t}) \end{aligned} \tag{4}$$

where the subscripts i and t indicate country and time. In Eq. (4), C is the vector of country-specific intercepts, Y is the vector of endogenous, and A_k is the matrix of autoregressive coefficients up to lag L. u is the vector of residuals which is assumed to be uncorrelated across countries and normally distributed with a constant covariance matrix Σ. *epl* stands for the EPL that influences the dynamic relationship between the endogenous variables (A_k^1) and is also allowed to affect the level of the variables (via C^1). Being the EPL a proxy for labour market rigidity, changes in the plotted economic responses reflect the different level of rigidity.

The structural shocks are directly related to the vector of residuals of the unrestricted VAR $u_{i,t}$ with a matrix $B_{i,t}$ of restrictions, i.e.[15]:

$$u_{i,t} = B_{i,t} \epsilon_{i,t} \tag{5}$$

where $\epsilon_{i,t}$ is the vector of structural shocks, which are i.i.d. and normally distributed. Because of the characteristics of structural shocks, there is a direct relation between the variance–covariance matrix of the VAR's residuals and B, see Eq. (6).

$$\Sigma_{u_{i,t} u_{i,t}} = B_{i,t} B_{i,t}' \tag{6}$$

[15] This explanation follows the one in Sa et al. (2014).

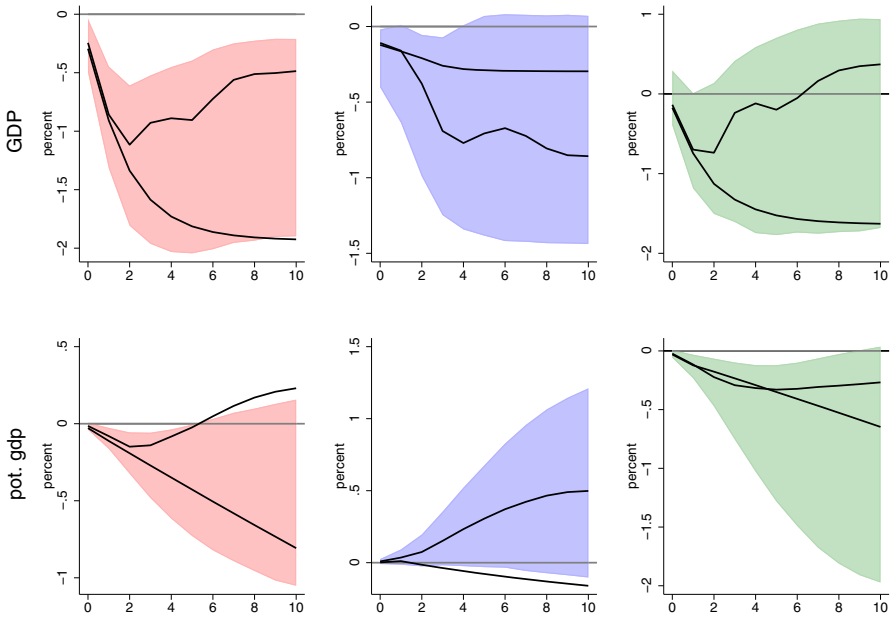

Fig. 9 Output responses to tax-based consolidation and EPL: 1 and 3 lags included. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Tax-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR with 1 and 2 lags are reported with the black lines. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2013

Following Beetsma et al. (2021), the paper exploits the dataset of consolidation fiscal policy of Alesina et al. (2015) as a proxy for the changes in the government deficit: therefore, $B_{i,t}$ is obtained by decomposing $\Sigma_{u_{i,t}u_{i,t}}$ à la Cholesky.

The contemporaneous effect of the q-th order variable on the j-the ordered variable is given by $B_{i,t}(w, j)$, where $B_{i,t}(w, j)$ is the (w, j) scalar element of $B_{i,t}$ and it is modelled as:

$$B_{i,t}(w, j) = B(w, j)^1 \text{epl}_{i,t} \qquad for j < q \tag{7}$$

The scalar $B(w, j)$ is the regression coefficient that denotes the marginal effect of a change in the respective interaction term on $B_{i,t}(w, j)$. In addition, $B_{i,t}(w, j) = 1$, for $j = q$ and $B_{i,t}(w, j) = 0$, for $j > q$, which follows from the lower triangular form.

Robustness of responses

For each exercise, the figures report the point estimates for the alternative model in black and the baseline confidence intervals in red (high EPL) and black (low EPL). The point estimates of alternative models are mostly within the confidence intervals,

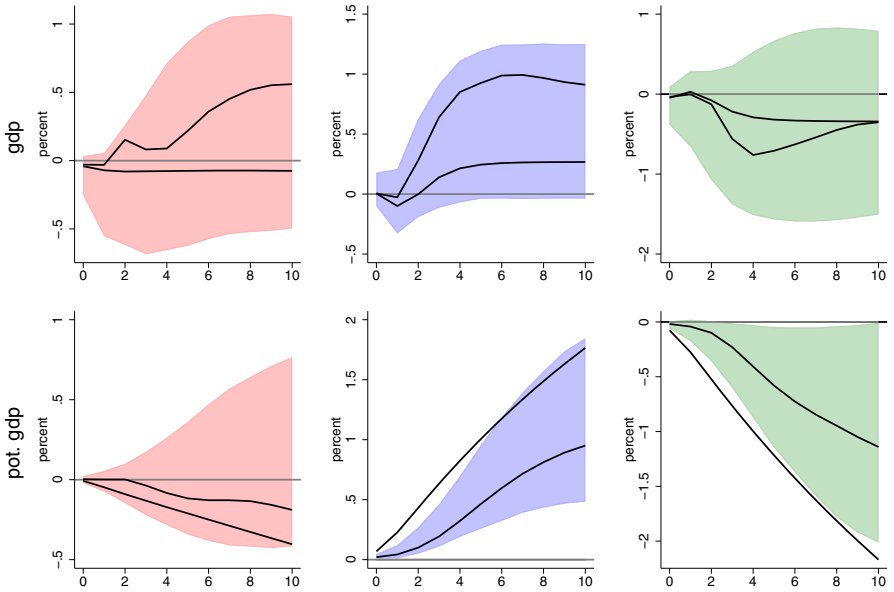

Fig. 10 Output responses to expenditure-based consolidation and EPL: 1 and 3 lags included. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Expenditure-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR with 1 and 2 lags are reported with the black lines. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

thus confirming the robustness of our results. In cases where the point estimates are beyond the confidence intervals for few periods, this always is in favour of a larger effect of consolidations.

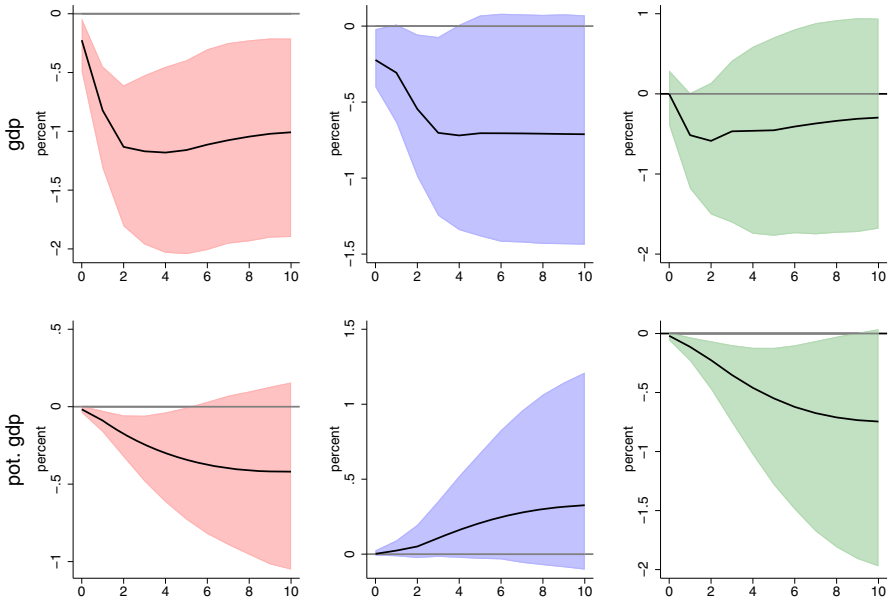

Fig. 11 Output responses to tax-based consolidation and EPL: tax-based plans ordered before expenditure-based plans. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Tax-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR with tax-based episodes ordered second and expenditure-based third are reported with the black lines. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2013

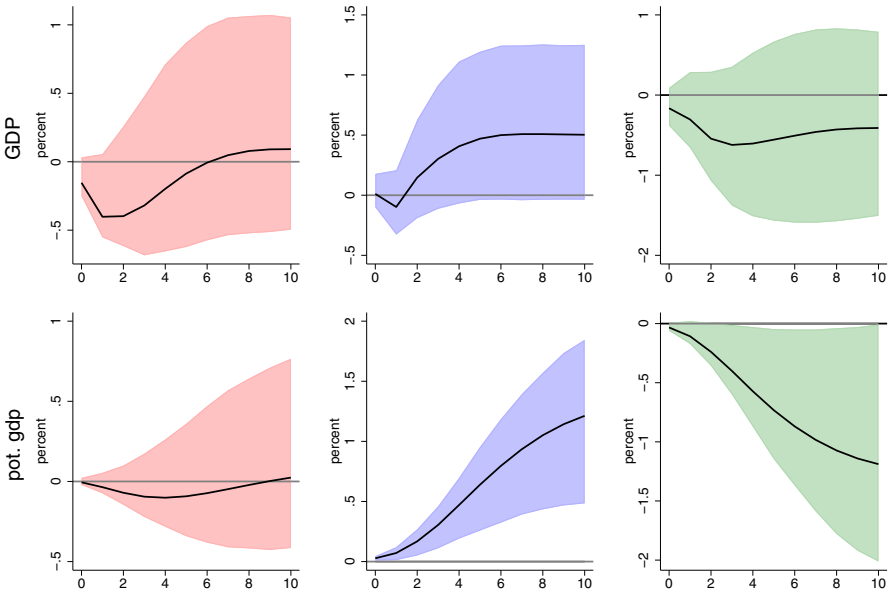

Fig. 12 Output responses to expenditure-based consolidation and EPL: tax-based plans ordered before expenditure-based plans. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Expenditure-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR with tax-based episodes ordered second end expenditure-based third are reported with the black lines. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

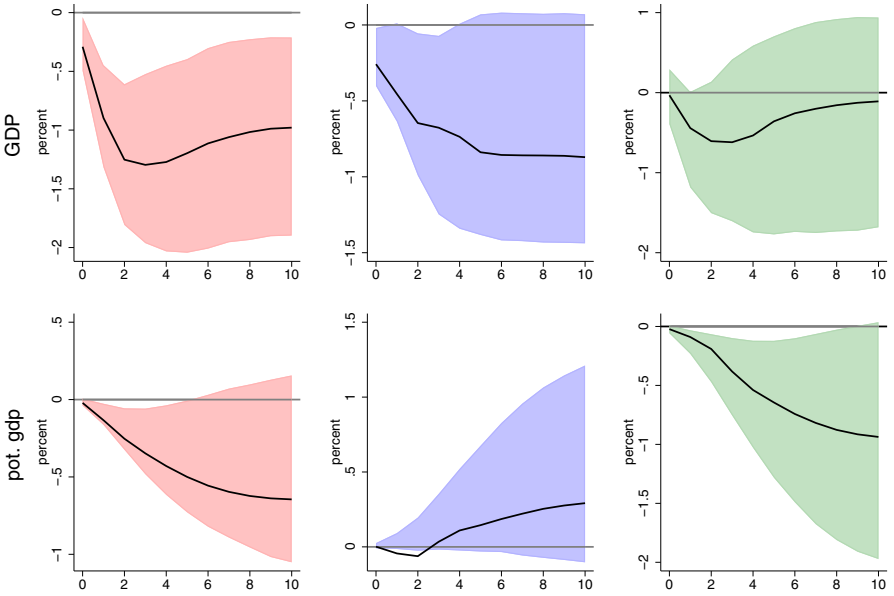

Fig. 13 Output responses to tax-based consolidation and EPL: including PMR. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Tax-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR including PMR as interaction are reported with the black lines. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

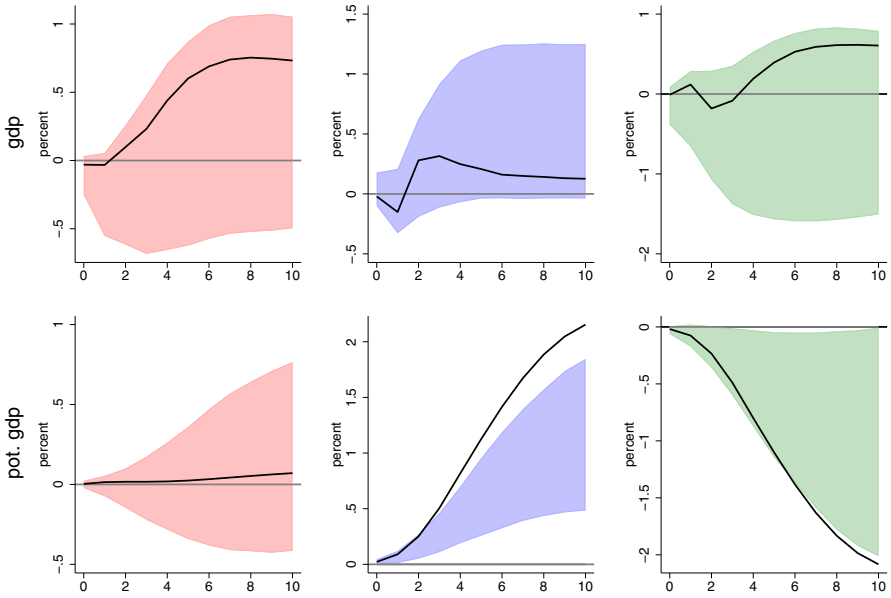

Fig. 14 Output responses to expenditure-based consolidation and EPL: including PMR. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Expenditure-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR including PMR as interaction are reported with the black lines. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

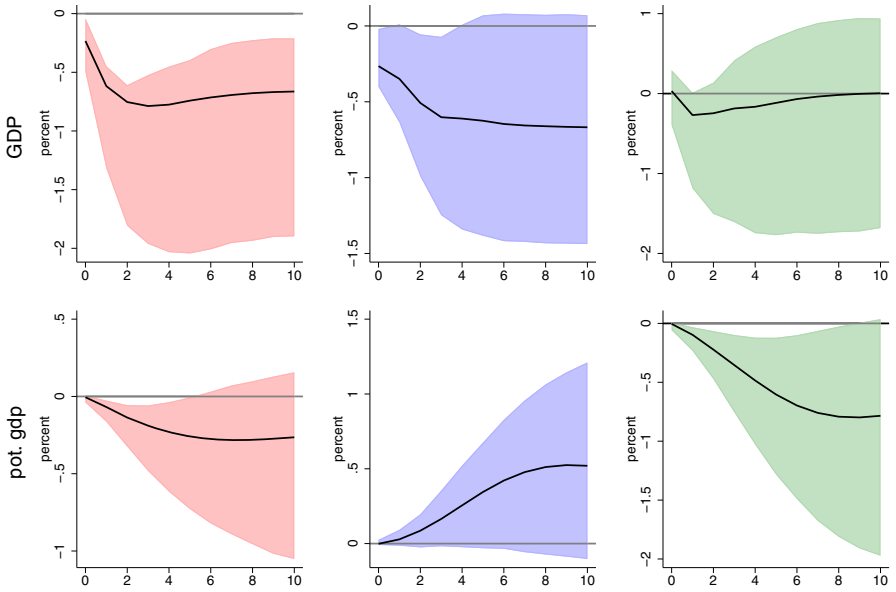

Fig. 15 Output responses to tax-based consolidation and EPL: shorter time period. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Tax-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR estimated on the 1978–2007 sample are reported with the black lines. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2007

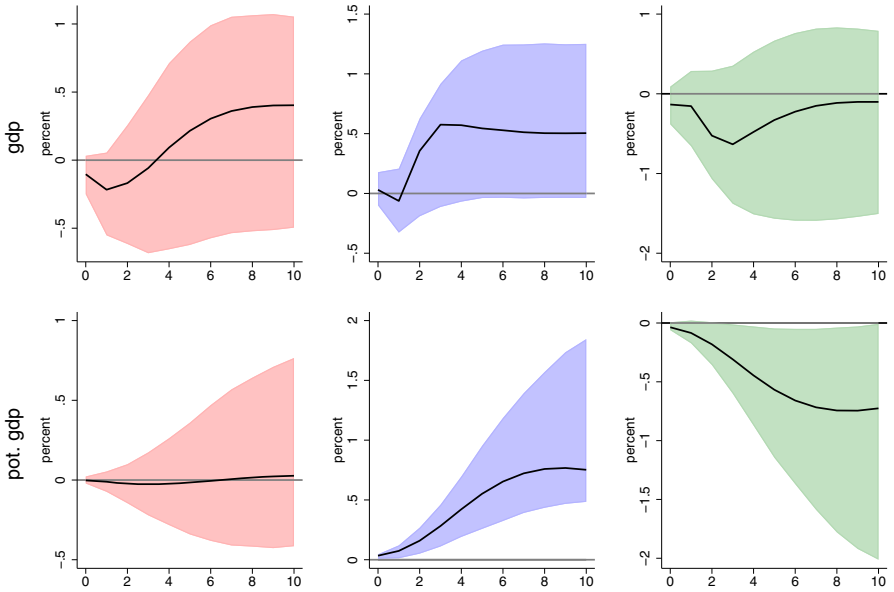

Fig. 16 Output responses to expenditure-based consolidation and EPL: shorter time period. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Expenditure-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR estimated on the 1978–2007 sample are reported with the black lines. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2007

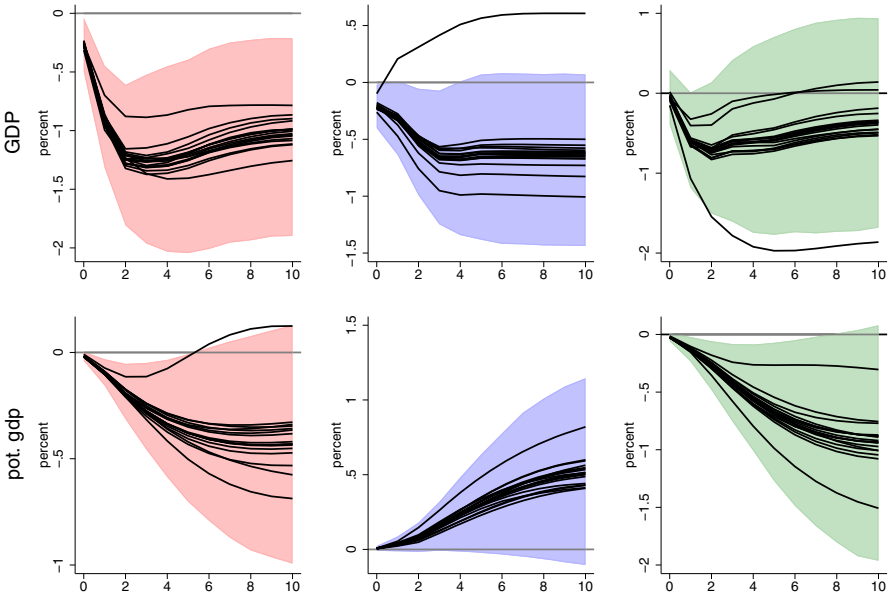

Fig. 17 Output responses to tax-based consolidation and EPL: excluding one country at the time. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Tax-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR estimated excluding one country at the time are reported with the black lines. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2013

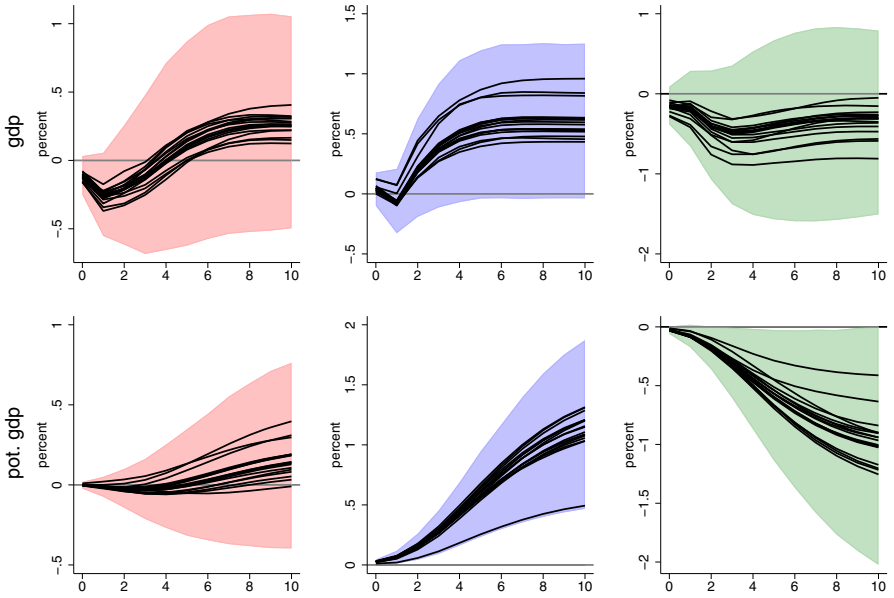

Fig. 18 Output responses to expenditure-based consolidation and EPL: excluding one country at the time. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Expenditure-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR estimated excluding one country at the time are reported with the black lines. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

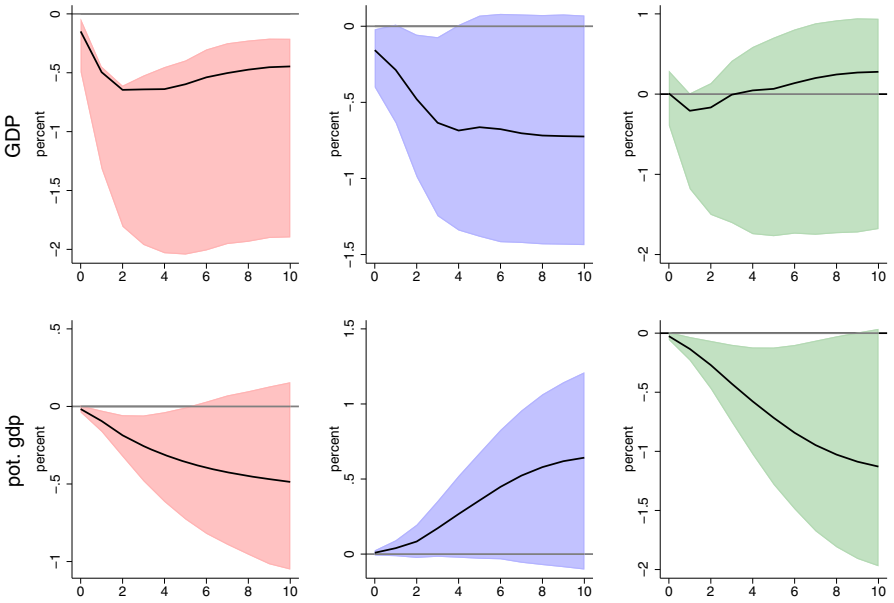

Fig. 19 Output responses to tax-based consolidation and EPL: adding controls. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Tax-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR estimated controlling for unemployment rate and stock market index are reported with the black lines. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2013

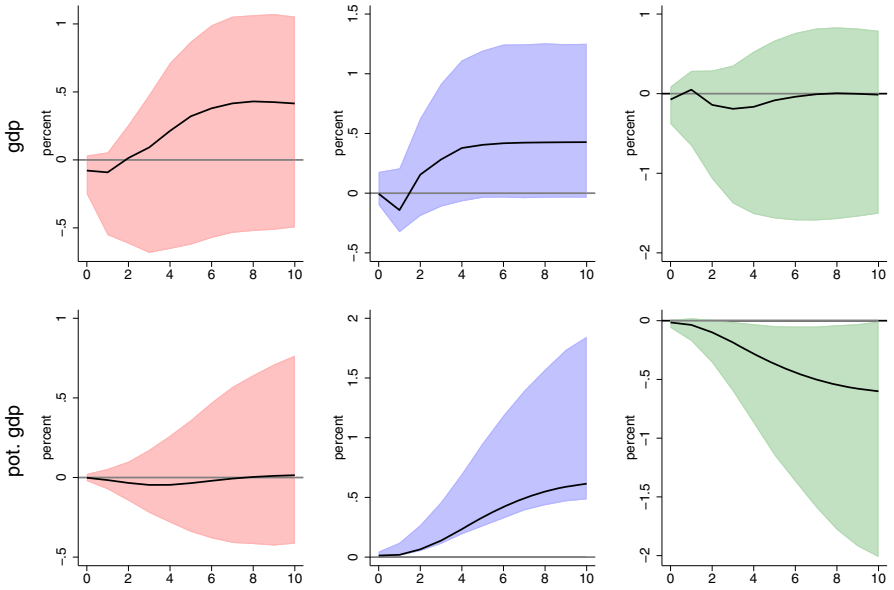

Fig. 20 Output responses to expenditure-based consolidation and EPL: adding controls. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Expenditure-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR estimated controlling for unemployment rate and stock market index are reported with the black lines. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

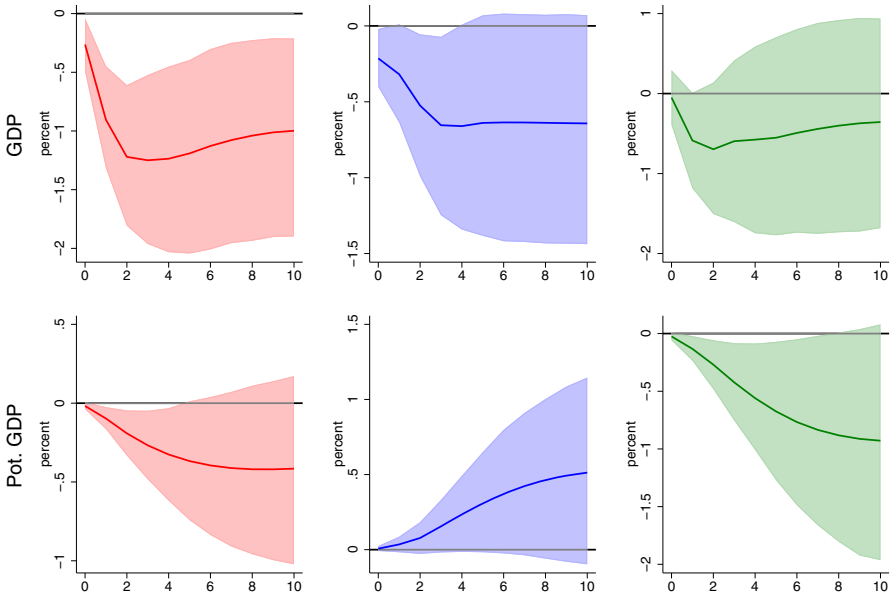

Fig. 21 Output responses to tax-based consolidation and EPL: TW-FE. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels) estimated with two-way fixed-effects. Tax-based consolidations are normalized to be 1% of output. The figure reports the median and 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2013

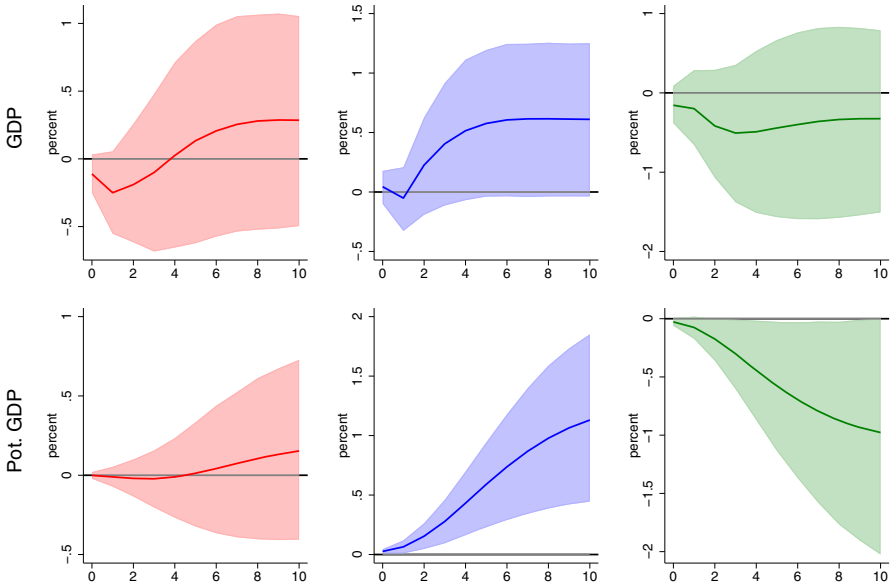

Fig. 22 Output responses to expenditure-based consolidation and EPL: TW-FE. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels) estimated with two-way fixed-effects. Expenditure-based consolidations are normalized to be 1% of output. The figure reports the median and 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

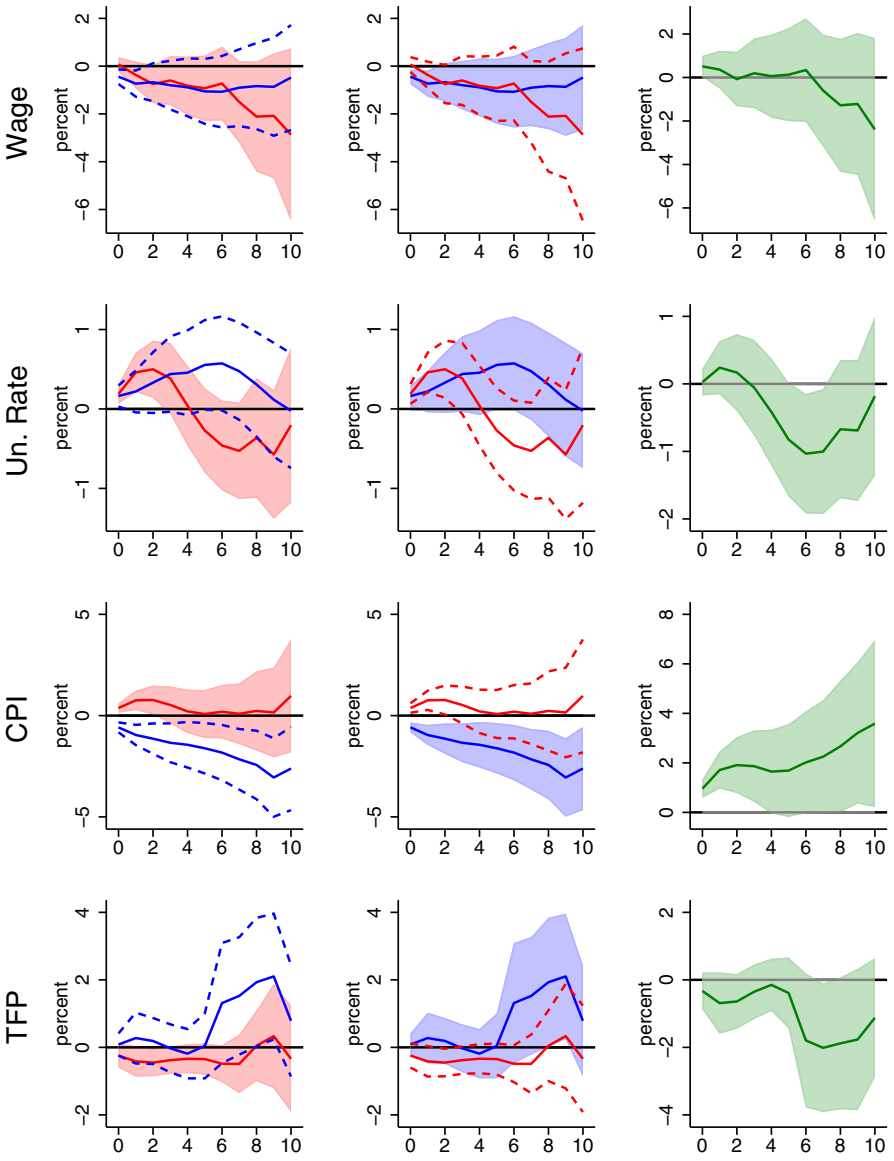

Fig. 23 Other variables responses to tax-based consolidation, LP responses to tax-based consolidation and EPL. *Note*. Impulse responses for an interacted local projections model for unemployment rate (first row), real average wage (second row), TFP (third row), and CPI (fourth row) with Driscoll–Kraay standard errors. Tax-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. To facilitate the comparison, the first column highlights the results for high EPL while leaving the low EPL in the background; the second column highlights the results for low EPL while leaving the high EPL in the background; and the third column reports only the difference. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2013

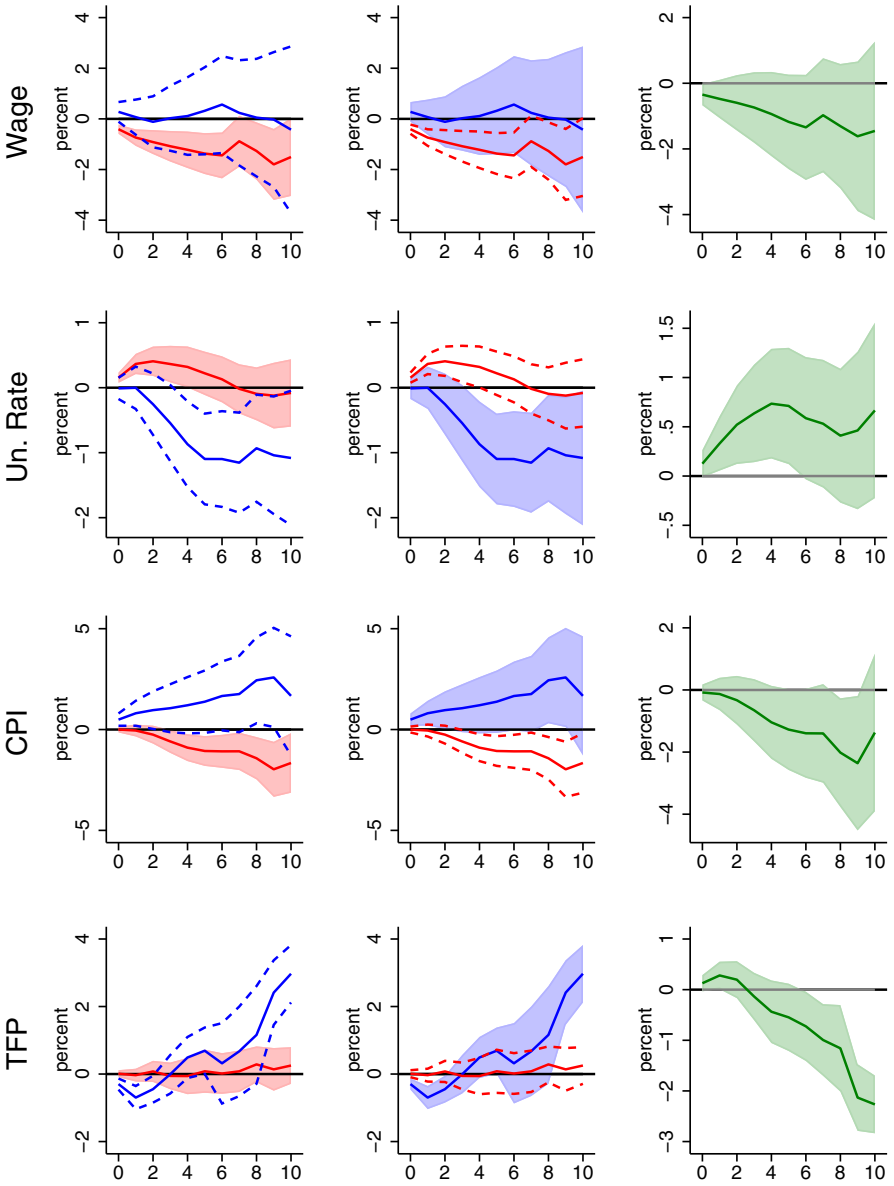

Fig. 24 Other variables responses to expenditure-based consolidation, LP. *Note*. Impulse responses for an interacted local projections model for unemployment rate (first row), real average wage (second row), TFP (third row), and CPI (fourth row) with Driscoll–Kraay standard errors. Expenditure-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. To facilitate the comparison, the first column highlights the results for high EPL while leaving the low EPL in the background; the second column highlights the results for low EPL while leaving the high EPL in the background; and the third column reports only the difference. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

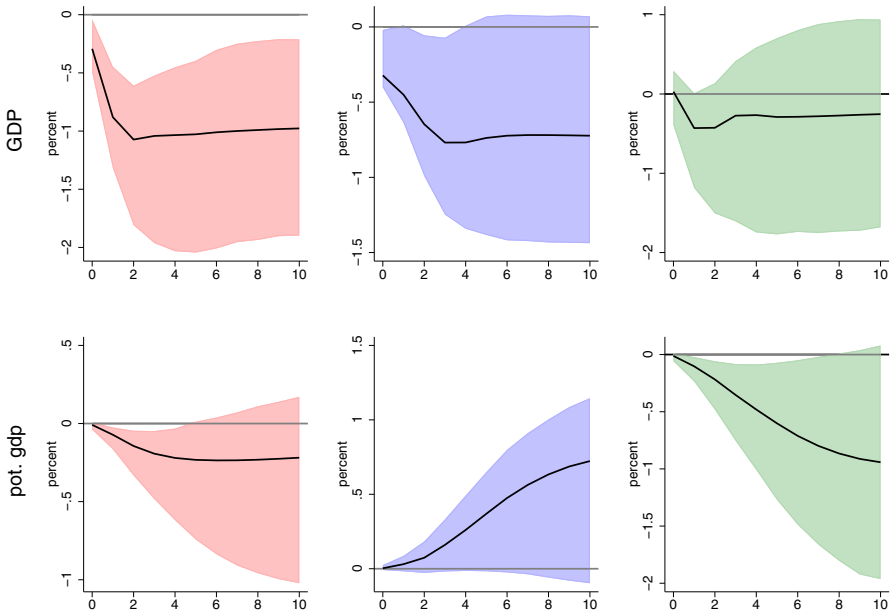

Fig. 25 Output responses to tax-based consolidation and EPL: excluding announced component. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Tax-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR estimated by excluding the announced component from the consolidation plans are reported with the black lines. The shocks are identified with the narrative tax-based consolidations. Data are for all 17 countries, period 1978–2013

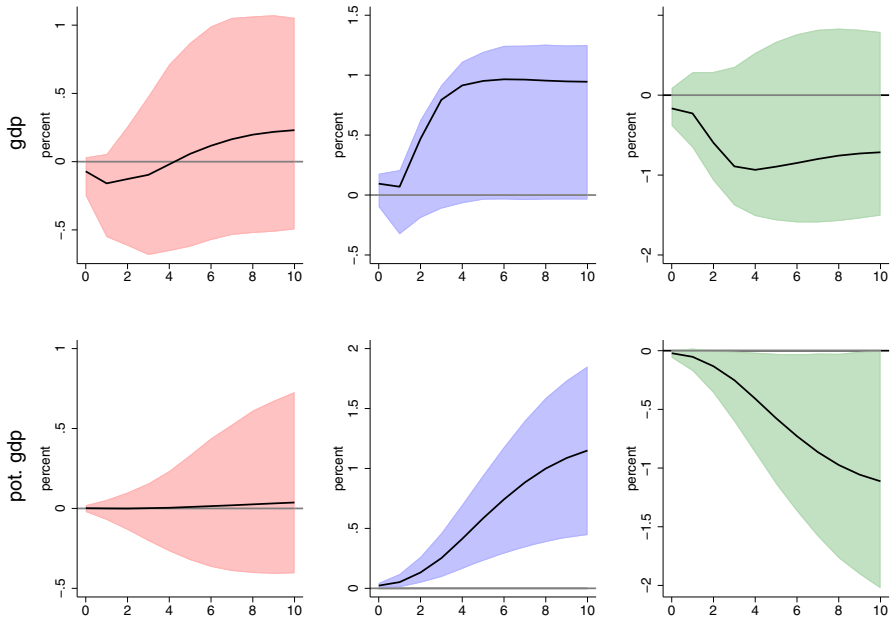

Fig. 26 Output responses to expenditure-based consolidation and EPL: excluding announced component. *Note*. Impulse responses from IPVAR for actual GDP (top panels) and potential GDP (bottom panels). Expenditure-based consolidations are normalized to be 1% of output. The figure reports the baseline 90% confidence intervals (dashed lines or shaded areas) in red for high-EPL countries, blue for low-EPL countries, and green shaded area for their difference. Median estimates for VAR estimated by excluding the announced component from the consolidation plans are reported with the black lines. The shocks are identified with the narrative expenditure-based consolidations. Data are for all 17 countries, period 1978–2013

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