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The Impact of ECB Policy on Structural Reforms*

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Abstract

We estimate the impact of monetary policy on structural reform adoption in the euro area. We identify exogenous ECB policy changes through an event study that extracts the unexpected variation in euro area interest rates on policy announcement days. We find that surprise monetary expansions increase the number of reforms significantly and that the effect is stronger for countries with weaker macroeconomic fundamentals or tighter public budget constraints. These findings are consistent with the hypothesis that expansionary monetary policy, by attenuating the short-run costs of reforms and increasing governments' financial leeway, spurs competition-friendly supply-side policy.

Key words: Macroeconomic policy, euro area, event study, panel data.

JEL classification: C23, E52, E58, P11.

Declarations of interest: none

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1 Introduction

Structural reforms comprise policies that improve the institutional and regulatory framework in which firms, households, and governments operate. They increase countries' competitiveness and resilience to shocks, and enhance employment prospects (Blanchard and Giavazzi, 2003; Campos *et al.*, 2017; Duval and Furceri, 2018). Following the global financial and the European crisis as well as many years of low growth, the calls for reforms are loud on both sides of the Atlantic. The need is particularly evident in the euro area, where labor and product markets are highly regulated and growth is weak despite aggressive easing by the European Central Bank (ECB).

This concurrence spurred an intense debate on the efficacy and potential side effects of ECB (un)conventional policy.¹ On the one hand, it is argued that expansionary monetary policy reduces reform pressure on slowly growing and indebted countries because it improves their financial market access and lowers public financing costs. The opposite view contends that monetary easing enables reforms as it increases governments' leeway to finance them. Expansionary policy may also spur demand, which attenuates the transitory costs of reforms, making them more likely. In this article, we address the following question: does expansionary monetary policy cause more or fewer structural reforms?

So far, the academic literature provides no answer to this question. While there are long-standing lines of research on the drivers of structural reforms (Drazen and Grilli, 1993; Abiad and Mody, 2005; Campos *et al.*, 2017) and on the effects of monetary policy (Christiano *et al.*, 1999; Romer and Romer, 2004; Ramey, 2016), the joint set of both literatures is essentially empty. We aim at filling this gap by studying the impact of monetary policy on structural reform adoption in the euro area, where the distance to the international best practice frontier and the need for reforms is particularly large. We first lay out a simple theoretical model in the form of a microfounded AS/AD framework that aims at synthesizing the main arguments in the debate. Then, we test the model's predictions empirically using a set of panel regressions.

The main challenge in estimating the effects of monetary policy is identification. While the stance of monetary policy might affect the decision of governments to undertake reforms, it also depends on economic conditions, which themselves are a function of reforms (Eggertsson *et al.*, 2014; Cacciatore *et al.*, 2016). To address this endogeneity issue, we use an event study design (Kuttner, 2001) and extract the unexpected variation in euro area interest rates on ECB policy announcements days. Our main structural reform measure is the reform responsiveness rate of the OECD, yet our results are robust to alternative reform indicators (and other sensitivity tests). The reform responsiveness rate measures the share of implemented out of recommended reforms in the OECD's yearly *Going for Growth* reports. It is a comprehensive metric of legislative and regulatory changes across a large number of markets and sectors.

¹ See Fernández-Villaverde *et al.* (2013), Draghi (2015), GCEE (2016).

We find that expansionary monetary policy shocks increase the reform rate. The effect is significant, both statistically and economically. The baseline specification suggests that a monetary surprise expansion of 25 basis points increases the reform rate by roughly 20 percentage points over two years. We then go into detail by studying potential transmission channels underlying this link and investigate whether monetary policy affects reform adoption differently across countries and reform types. The results indicate that monetary easing is more effective in the euro area periphery, in countries that participated in a financial assistance program, and for labor market reforms than in core and non-program countries or for product market reforms. Moreover, it shows stronger reform-inducing effects in countries with weaker macroeconomic fundamentals and more fragile public finances. These findings are consistent with the view that expansionary monetary policy spurs structural reforms by attenuating their short-term costs and increasing governments' room for maneuver.

The article presents a novel stylized fact: expansionary monetary policy increases structural reform adoption. It contributes to the empirical literature on the determinants of structural reforms, in which a causal analysis of the effects of monetary policy is largely absent. Moreover, our empirical results as well as our conceptual model suggest an expansion of the theoretical analysis of structural reform drivers to include monetary policy. As there is a widespread consensus that reforms increase countries' growth potential, stability, and resilience to shocks, a clear understanding of how central banks' decisions affect reform adoption may help in designing an adequate policy mix after deep recessions.

The paper relates to two strands of the literature. The first strand investigates the drivers of structural reforms. The crisis-induces-reform hypothesis suggests that the public and policy makers do not consider reforms as necessary as long as economic circumstances are satisfactory (Drazen and Grilli, 1993). An economic crisis changes this perception and increases the support for reforms. Thereby, crisis episodes can serve as catalyst for reforms. On the other hand, crises set the economy under stress and may thereby reduce reforms, if they are associated with short-term costs (Eichengreen and Wyplosz, 1998). Abiad and Mody (2005) show that banking crises induce reform reversals and stricter regulation. A similar controversy exists regarding the effects of economic growth, output gaps, unemployment, and government debt on reform activity. The empirical results are ambiguous as well (Duval, 2008; Duval and Furceri, 2018).

The second relevant strand of literature assesses the effects of monetary policy. The 'event study' approach typically uses high-frequency data and studies asset price effects (Kuttner, 2001; Gürkaynak *et al.*, 2005). Empirical research using this approach shows that many ECB unconventional policy announcements led to substantial declines in euro area sovereign bond yields (Fratzcher *et al.*, 2016). Structural vector autoregressive (SVAR) analysis mostly uses lower frequency data and investigates the macroeconomic impact of monetary policy. The majority of studies finds that expansionary monetary policy shocks raise real economic activity, employment and aggregate prices (Ramey, 2016).

The remainder of the paper is organized as follows. Section 2 lays out the conceptual framework. Section 3 describes the empirical methodology. Section 4 presents the regression results. Section 5 contains a sensitivity analysis, before Section 6 concludes.

2 Theoretical framework

In this section, we first summarize the current debate about monetary policy and structural reforms. Then, we present a stylized model that aims at synthesizing the main arguments.

2.1 The current debate

While an extensive literature studies either the drivers of structural reforms or the effects of monetary policy, the direct link between both has not yet been subject to a thorough analysis. Two opposing views coexist in the discussion, either considering expansionary monetary policy as reform catalyst or, in contrast, as reform hindrance. The arguments parallel those in the crisis-induces-reform debate (Drazen and Grilli, 1993), but are largely narrative.

On the one hand, expansionary monetary policy may reduce reform pressure by easing market access of indebted countries. According to this view, the ECB's accommodative stance has two main effects on reform activity. First, the bond buying programs improve governments' financing conditions (GCEE, 2016). This can reduce incentives to increase the efficiency of public spending and tax systems or to lower subsidies. An implicit guarantee by the ECB against a speculative run on public debt could also lead to moral hazard in the form of further risk-taking as governments expect to be bailed out, which reduces incentives to stabilize debt. A second potential effect is that sovereign bond yields no longer function as a signal of the soundness of public finances and may deviate from fundamentals (Fernández-Villaverde *et al.*, 2013). This makes signal extraction more difficult and can mask inefficient tax systems and public sectors. In the remainder of the article, we refer to these arguments as the 'moral-hazard hypothesis'.

On the other hand, expansionary policy may also increase reform efforts. Gordon (1996), Angelopoulos *et al.* (2013), and Draghi (2015) suggest that monetary policy easing, because it boosts demand and prices, can offset the transitional costs of reforms. Another main channel is that lower policy rates stimulate job creation and reduce public financing costs. This increases governments' financial leeway to lower public sector distortions as it facilitates negotiations with political interest groups and labor unions that might otherwise oppose reforms. The relaxation of the public budget constraint also allows to compensate the parts of the population most adversely affected by reforms. Henceforth, we refer to these arguments as the 'room-for-maneuver hypothesis'.

2.2 An illustrative model

To formalize these arguments and to derive our main empirical hypotheses, we lay out an illustrative micro-founded New Keynesian model with monopolistic competition, sticky

prices, and a monetary as well as a fiscal authority. The model captures structural reforms as a reduction in the labor tax wedge or in government consumption. Empirically, reforms also comprise the deregulation of product markets or reforms in other sectors, such as education.

2.2.1 Private sector

The private sector consists of sets of households and goods-producing firms.

Households. There is a continuum of infinitely lived households with identical asset endowments and preferences. A representative household maximizes

$$E_0 \sum_{t=0}^{\infty} \beta^t \varepsilon_t^u \left(\frac{c_t^{1-\sigma}}{(1-\sigma)} - \frac{v n_t^{1-\varphi}}{(1-\varphi)} \right) \text{ s. t. } C_t + \frac{B_{t+1}}{R_t} = (1 - \tau_t) W_t n_t + B_t + \Pi_t ,$$

by choosing real consumption c_t , labor n_t , and real government discounts bonds b_{t+1} at the rate $1/R_t$. The variable τ_t is a tax on labor income under the control of the government, W_t is the nominal wage, Π_t are dividends from intermediate-goods producing firms, $\beta < 1$ the discount factor, and ε_t^u an i.i.d. time-preference shock. Capital letters denote nominal variables. The first order conditions can be combined to

$$\varepsilon_t^u v n_t^\varphi c_t^\sigma = (1 - \tau_t) W_t.$$

The equation shows how labor taxes distort the consumption/labor decision. This provides a rationale for structural reforms that lower the tax wedge. Empirically, reforms could comprise changes in tax rates, simplifications of the tax code or reductions in social benefits.

Firms. Perfectly competitive firms on the interval $[0,1]$ produce the final good y_t by assembling intermediate goods y_{it} through the technology $y_t = \left(\int_0^1 y_{i,t}^q di \right)^{1/q}$, with constant elasticity of substitution $\theta = 1/(1 - q) > 1$. Profit maximization subject to the technology constraint and for given intermediate price P_{it} yields the following demand curve for intermediate good i : $y_{it} = (P_{i,t}/P_t)^\theta y_t$. The zero profit condition implies that the price index is $P_t = \left(\int_0^1 P_{i,t}^{1-\theta} di \right)^{1/(1-\theta)}$.

Another continuum of imperfectly competitive firms produces intermediate goods using the linear technology $y_{it} = n_{it}$. Their decision problem can be separated into two steps. First, they minimize costs subject to their technology constraint. This implies that nominal marginal costs of firm i equal the nominal wage rate W_t and are, thus, the same for all firms. Second, they maximize expected profits Ω_t by setting price Z_t , taking into account that they will not be able to re-set the price with probability $\zeta \in (0,1)$, and given marginal costs W_t and demand for their variety $y_{i,t}$: $\Omega_t = E_t \sum_{s=0}^{\infty} \zeta^s \mu_{t,t+s} (Z_t - W_{t+s} y_{i,t+s})$, where $\mu_{t,t+s}$ is the stochastic discount factor. The linearized first order condition to this problem gives the standard expectational Philips curve $\hat{\pi}_t = \kappa \hat{w}_t + \beta E_t \hat{\pi}_{t+1}$, where $\kappa = (1 - \zeta)(1 - \zeta\beta)/\zeta$, $\hat{\pi}_t$ is inflation, and a hat over a variable denotes deviations from the non-stochastic steady state.

2.2.2 Public sector and resource constraint

The public sector consists of a fiscal and a monetary authority. The government's budget constraint is $G_t + B_t = \tau_t W_t n_t + B_{t+1}/R_t$. The fiscal authority responds to fluctuations of the debt-to-gdp ratio B_t/Y_t by adjusting labor taxes and real government spending g_t as follows:

$$\frac{\tau_t}{\tau} = \exp\left(\gamma\left(\frac{b_t}{\pi_t y_t} - \frac{b}{\pi y}\right)\varepsilon_t^\tau\right) \quad \text{and} \quad \frac{g_t}{g} = \exp\left(-\delta\left(\frac{b_t}{\pi_t y_t} - \frac{b}{\pi y}\right)\varepsilon_t^g\right),$$

where ε_t^τ and ε_t^g are scaled autocorrelated policy shocks, and variables without subscript denote steady state values.

The parameters γ and δ capture the tendency of governments to stabilize debt through either tax or spending adjustments, or a combination of both. Special cases are $\gamma > 0, \delta = 0$ and $\gamma = 0, \delta > 0$. The first case implies that the fiscal authority uses a reduction in the debt ratio to lower the tax wedge, while leaving government consumption constant. The second case entails the exploitation of the additional fiscal space to increase public expenditures, holding taxes fixed. Alternative cases with $\gamma > \delta > 0$ or $\delta > \gamma > 0$ imply that the government mainly stabilizes debt by adjusting taxes or government spending, respectively.² Thus, the simple feedback rules allow for a variety of fiscal responses to changes in the debt ratio. In addition to lowering the tax wedge, we interpret structural reforms as reductions in public expenditures, for instance through increasing the efficiency of public spending and planning policies or through privatizations.

The inflation-targeting central bank sets the nominal rate on government bonds in response to fluctuations in inflation according to the linearized reaction function $\hat{R}_t = \rho\hat{R}_{t-1} + (1 - \rho)\alpha\hat{\pi}_t + \varepsilon_t^r$, where ε_t^r is an i.i.d. monetary policy shock and $\alpha > 1, \rho < 1$. Finally, in the symmetric equilibrium, the linearized resource constraint is $\hat{y}_t = \hat{g}_t + \hat{c}_t$.

2.2.3 Linear equilibrium dynamics

The linear rational expectations equilibrium are sequences $\{\hat{b}_t, \hat{g}_t, \hat{y}_t, \hat{R}_t, \hat{\pi}_t, \hat{\tau}_t\}_{t=0}^\infty$ satisfying

$$\hat{y}_t = E_t \hat{y}_{t+1} - \sigma^{-1}(\hat{R}_t - E_t \hat{\pi}_{t+1} - \varepsilon_t^u) + \hat{g}_t - E_t \hat{g}_{t+1} \quad (1)$$

$$\hat{\pi}_t = \kappa(\varphi + \sigma)\hat{y}_t - \kappa\sigma\hat{g}_t + \beta E_t \hat{\pi}_{t+1} + \kappa\tau/(1 - \tau)\hat{\tau}_t \quad (2)$$

and linearized policy rules for the interest rate, government spending, and taxes, as well as the linearized government budget constraint. Equations (1) and (2) are often referred to as the aggregate demand (AD) and aggregate supply curves (AS), respectively. They describe sequences for output and inflation as depending on specific macroeconomic policies and shocks. Structural reforms have an impact on output and inflation through $\hat{\tau}_t$ and \hat{g}_t , and monetary policy through \hat{R}_t .

² Stability requires that $\gamma + \delta$ is greater than some positive constant, which depends on the other parameters.

A surprise cut in government spending shifts the AD curve in the $(\hat{\pi}_t, \hat{y}_t)$ plain inward. It directly reduces aggregate demand according to (1) and pushes down inflation, as shown by (2) and for $\varphi > 0$. An exogenous decline in the labor wedge shifts the AS curve outward. (2) shows that this is associated with a decline in inflation and (1) indicates that lower inflation expectations reduce the real return on savings and thereby increase current output. Finally, an expansionary monetary policy shock lowers \hat{R}_t and stimulates output in (1), which increases inflation in (2).

These effects are illustrated in Figure 1, based on a calibrated version of the model using standard parameter values.³ The first three rows contain the deviations of output and inflation from the steady state in response to a government spending shock of -1 percent, a labor tax rate shock of -1 percentage point, and a compensating monetary policy shock of -2 percent, respectively. Inflation declines in the first two cases and output contracts following the negative government spending shock, whereas inflation and output increase in response to the monetary policy shock. Together, the responses suggest that monetary policy might affect the implementation of structural reforms because it can attenuate their deflationary and partially contractionary impact. This is illustrated in the bottom row, which summarizes the effects of a policy package containing all three measures. Output now increases and the decline in inflation is muted.

Similarly, but in an AS/AD framework with adaptive inflation expectations, Gordon (1996) shows that monetary policy should temporarily accelerate aggregate demand growth to avoid deflation and bring forward the production gains of labor market reforms. Moreover, Bean (1998) argues that with nominal wage inertia, structural reforms are temporarily contractionary if capital markets are imperfect and should therefore be accompanied by monetary easing. These implications carry over to sophisticated models. Cacciatore and Fiori (2016) highlight that market deregulation is short-run recessionary in a model with endogenous product creation based on Bilbiie *et al.* (2012). Cacciatore *et al.* (2016) show that optimal monetary policy is expansionary to facilitate the adjustment to reforms.

There are also arguments for why the link between monetary policy and reforms can be tighter during a protracted crisis, such as the one in the euro area. One main consequence of such a crisis is that the monetary policy rate is at the effective lower bound. Then, structural reforms can have negative effects on output due to their deflationary impact, which increases the real interest rate (Eggertsson *et al.*, 2014).⁴ Similar adverse output

³ We set $\beta = 0.99, \sigma = \varphi = 1, \nu = 0.8663, \theta = 10, \pi = 1, \alpha = 1.5, \gamma = \delta = 0.2, \frac{b}{y} = 0.7, \frac{g}{y} = 0.2, \zeta = 0.7, \rho = 0.5$ and the autocorrelation of the fiscal policy shocks equal to 0.5.

⁴ To formalize their argument in our framework, assume that a large negative demand shock $\varepsilon_t^u = \varepsilon_s^u$ drives the economy to the effective lower bound. Then, each period, the shock returns back to zero with probability $1 - \varpi$ and stays there. Furthermore, assume that $\varepsilon_t^g = 0 \forall t, \delta = 0, \hat{\tau}_t = \hat{\tau}_s$ when $\varepsilon_t^u = \varepsilon_s^u, \hat{\tau}_t = \hat{\tau}_L$ when $\varepsilon_t^u = \varepsilon_L^u = 0$, the central bank perfectly stabilizes inflation when $\varepsilon_L^u = 0$, and that the economy stays sufficiently close to the point of approximation. Then, substituting for the expectational terms in (2) yields $\hat{y}_s = \hat{y}_L + \frac{\rho}{\sigma(1-\varpi)} \hat{\pi}_s + \frac{1}{\sigma(1-\varpi)} \varepsilon_s^u$. This expression shows that the AD curve is upward sloping when the

dynamics following reforms arise if the economy is in a deleveraging phase, as deflationary pressures increase the real debt burden and lower aggregate demand (Andrés *et al.*, 2017). Output drops even further when both mechanisms combine, such that higher real debt forces borrowers to consume less while an unresponsive policy rate does not induce savers to consume sufficiently more (Eggertsson and Krugman, 2012). These mechanics suggest that unconventional monetary policy has stronger effects on reforms than conventional policy because monetary accommodation is needed more during crisis episodes to offset the adverse implications of disinflation following reforms.

In addition to strategic policy considerations, our model holds direct predictions for the impact of monetary policy shocks on taxes and government spending. The implications are highlighted in Figure 2, which shows the effects of the negative monetary policy shock on further variables. The solid lines refer to the baseline parameter values. The surprise decline in interest rates lowers debt financing costs and leads to an increase in the budget balance. The tax rate falls and government spending increases.

This is a central prediction of the model: the government can use the monetary policy-induced relaxation of its budget constraint to reduce the tax wedge or to increase public spending. The government can also adjust both instruments in the same direction, as long as the sum of the response coefficients ensures long-run debt stability. Thereby, the model captures both the room-for-maneuver hypothesis and the moral-hazard hypothesis. Which response prevails in the euro area is an empirical question and reflects the historical tendency how governments adjust taxes and spending in response to macroeconomic fluctuations.

Another central prediction of the model concerns the cross-section of euro area countries. Figure 2 shows that the fiscal adjustment depends on the long-run level of debt, output, and inflation in the economy. The responses are amplified when real debt is higher (by 20% relative to the baseline, dashed line), and attenuated when output or inflation are higher (by 20% and 10 p.p., dash-dotted and dotted line, respectively). This is because higher debt ratios imply a stronger impact of interest rate changes on the public budget balance, which induces larger fiscal responses.

2.2.4 Model predictions

Summarizing, we derive the following predictions for the empirical analysis. First, the sign of the linear effect of monetary policy shocks on structural reforms is theoretically ambiguous, although the sum of arguments points to a negative effect. Strategic considerations between policy makers suggest that reforms are more likely if they are complemented by monetary easing, while the mechanics of the model support both the room-for-maneuver and the moral-hazard hypothesis.

effective lower bound binds, instead of downward sloping, as in normal times. The policy implications are drastic: labor tax cuts are both deflationary and contractionary.

Second, we expect stronger effects of unconventional than of conventional monetary policy shocks and when countries are under economic stress. Strategic considerations suggest that the reform response to monetary easing is stronger at the effective lower bound and/or during a deleveraging phase, because then reforms are recessionary and monetary easing is more important. The mechanics predict that the impact of monetary shocks on reform decisions is stronger when debt is higher or inflation and output are lower.

3 Empirical methodology

In this section, we first describe measures of structural reform activity and how we identify monetary policy shocks. Thereafter, we outline the empirical model. Our identification strategy consists of two steps. First, we isolate the exogenous component of monetary policy using an event study approach. Then, we evaluate the effects of the monetary surprises on reform implementation in a set of panel regressions.

3.1 Measuring structural reform activity

It is difficult to measure structural reforms. There is no standard database that consistently documents reforms in different areas over a long sample and for many countries (Da Silva *et al.*, 2017). Due to these data limitations, there are many studies, which focus either on one reform area (Abiad and Mody, 2005; Campos and Coricelli, 2012; Angelopoulos *et al.*, 2013) or on one country over time (Campos *et al.*, 2017). Studies that quantitatively compare reform activity across countries and time mostly use reform indicators developed by the OECD (Égert and Gal, 2016). Prominent ones are the indicators of employment protection legislation (EPL) and of energy, transport and communications regulation (ETCR). Another OECD index is the reform responsiveness rate (RRR). The International Monetary Fund provides a narrative database of major labor and product market reforms (Duval *et al.*, 2018).

3.1.1 Construction of the reform responsiveness rate

For the benchmark analysis, we use the reform responsiveness rate. Its construction is based on the OECD's *Going for Growth* reports and it assesses the extent to which countries have implemented policy recommendations announced in these reports (OECD, various issues). For each member country, five policy priorities are determined based on their ability to improve long-term material living standards through higher labor productivity or through enhanced labor utilization.

The reference performance criterion is GDP per capita, given its broad coverage. This measure allows to rank each country and to determine in how far differences in living standards can be attributed to gaps in either productivity or labor utilization. At least three of the five priorities are based on internationally comparable OECD policy indicators, which have been linked empirically to aspects of economic performance. The additional two priorities are determined using a combination of indicators and country-specific expertise.

They ensure that important policy imperatives in non-indicator-based areas are not disregarded.

In a first step, the *Going for Growth* framework determines specific areas of relative strength and weakness in labor utilization and productivity. Each performance measure is juxtaposed with a corresponding policy indicator. Whenever both, the policy indicator and performance, lie well below the OECD average, a potential priority candidate is identified. Following this quantitative assessment, country experts qualitatively weigh the different potential priorities against each other, accounting for country-specific challenges, circumstances and social preferences. The final policy priorities are chosen based on their estimated impact on GDP per capita, on the distance of the policy stance from the OECD average and on recent developments in policy and outcomes (OECD, 2012). The relative emphasis put on productivity and labor utilization in the selection of the five priorities varies across countries and is established using the country specialists' expertise.

Table 1 displays the evolution of *Going for Growth* recommendations across different policy areas for all OECD countries. The distribution of priorities is relatively stable over time. Productivity-enhancing priorities have gained some importance and now make up two thirds of overall priorities. Within these, human capital as well as product market regulation, trade and foreign direct investment account for the lion's share. In the case of employment-enhancing policies, social benefits and active labor market policies obtain most weight.

The country-specific responsiveness rates are determined by the share of adopted measures among these recommendations. Whenever the OECD formulates a reform recommendation in a given priority area for a specific country, it is assessed in the following year whether "significant" action has been taken. An action is considered as significant, if the associated reform tackles the underlying recommendation and if it is legislated or implemented. In contrast, reforms that do not go beyond the stage of pure announcements or government plans are disregarded (OECD, 2019).

The RRR is then calculated based on a scoring system, which assigns value one for each possible reform recommendation, if significant action is taken, and zero otherwise. As a given policy priority may entail several reform recommendations, the overall scoring is often based on more than one reform opportunity per policy priority area. For instance, product market priorities can cover economy-wide barriers, such as excessive administrative burdens, but may also be restricted to industry-specific barriers, for example, in the electricity market (OCED, 2017). The overall responsiveness rate of country i and year t is computed as:

$$RRR_{i,t} = \frac{\sum_{p=1}^P n_{i,p,t}}{\sum_{p=1}^P N_{i,p,t}} , \quad (3)$$

where $n_{i,p,t}$ defines the number of reforms in country i , policy priority p , and year t . $N_{i,p,t}$ is the number of reform recommendations.

3.1.2 Summary statistics and external validation of the reform responsiveness rate

Our sample for the RRR comprises all euro area countries (except Cyprus, Lithuania and Malta) for the years 2006 to 2016. We linearly interpolate some missing values. Table 2 shows a considerable variation in the reform rate across countries and years. It ranges between zero and 0.917, with mean of 0.329 and standard deviation of 0.185. The mean implies that countries implement 32.9 percent of the recommended reforms on average.

To assess the external validity of the RRR, we investigate its pairwise correlation with the OECD's EPL and ETCR indices, and the IMF major reform indicators of employment protection legislation (EPL), unemployment benefits (UB) and product market regulation (PMR). Table 3 shows a significant correlation between the RRR and the IMF major reform indicators for employment protection legislation and unemployment benefits. This suggests that large parts of countries' responsiveness rates are driven by labor market reforms. The correlations with the OECD's EPL and ETCR index show the expected negative sign, which results from the opposite scaling of reform efforts⁵, but the absolute values are smaller. This may partly be explained by the lags between reform legislation and full reflection in market outcomes. Using the lagged RRR slightly raises the correlation, at least for labor market reforms.

Relaxations in employment protection legislation and in unemployment benefits explain reform patterns particularly well, especially in the euro area periphery. This is apparent from Figure 3, which juxtaposes the corresponding IMF indicators and the RRR. Specifically, Greece followed *Going for Growth* recommendations for the most part from 2010 up to 2012 and relaxed job protection of white-collar workers by reducing the notice period prior to dismissal. Moreover, probationary periods and temporary work agency contracts were extended and minimum labor costs for young workers between 18 and 25 years and apprentices were reduced. Ireland improved work incentives for women, strengthened labor market activation policies, and reduced unemployment benefits, in both 2010 and 2011. Italy undertook a comprehensive labor market reform in 2013, which relaxed employment protection rules and increased the flexibility for job dismissals. Similarly, Portugal reduced employment protection legislation for regular contracts and tackled disincentives to work by lowering the ceiling to unemployment insurance. In the same vein, the Slovak Republic eased legislation on regular contracts by shortening the length of the notice period prior to dismissal. Spain addressed labor market duality and lowered employment protection legislation. Moreover, wages were made more responsive to firm-specific conditions and the retirement age was raised.

In addition, periphery countries deregulated product markets via privatizations in the energy, postal and transport sectors. Pension, public sector and welfare reforms aimed at a fiscal consolidation. Early and tertiary education were improved (Greece, Ireland, Italy,

⁵ In contrast to the RRR, the OECD's EPL and ETCR indices take on values between zero and 6, with higher values indicating stricter regulation. Consequently, a reform is identified by a decline in each index.

Portugal, Slovak Republic, Spain), tax bases broadened (Greece, Ireland, Portugal), infrastructure strengthened (Ireland), bankruptcy and financial market supervision reformed (Ireland, Italy), and distortions in the housing market removed (Ireland, Slovak Republic, Spain).

Reform efforts in core countries vary less over time. Reforms mainly target work incentives by reducing disincentives to work at older ages (Austria, Belgium, Finland, France, Germany, and Luxembourg). Furthermore, the tax wedge on labor income was reduced (Austria, Belgium, Finland, France, Germany), administrative burdens and regulatory barriers to competition were lowered (Austria, Belgium, France, Germany, Luxembourg, Netherlands), and early and tertiary education improved (Austria, Finland, France, Germany, Luxembourg).

3.1.3 *Advantages and limitations of the reform responsiveness rate*

To the best of our knowledge, we are the first to use the RRR as measure of reform efforts in an empirical analysis of reform drivers. There are three reasons for this. First, while data for the other OECD or IMF indicators can easily be extracted from the respective web pages, there is no dataset for the RRR. The data need to be collected from the *Going for Growth* reports. Using this measure thus constitutes an innovation to previous studies. Second, the RRR was first introduced in 2010, which precludes the use of this measure in any prior research. Third, a large part of the literature is concerned either with the evaluation of the effects of reforms on growth (Campos and Horváth, 2012; Égert and Gal, 2016) or with specific types of reforms (Abiad and Mody, 2005; Campos and Coricelli, 2012; Angelopoulos *et al.*, 2013). Due to the limited time span covered by the RRR and the aggregation of different reform types, the RRR is less suited to address such questions.

For our purposes, the RRR provides advantages over the alternative measures. First, it includes many types of reforms, whereas the other OECD and IMF indicators only cover labor and product market regulation. Thereby, it provides a more comprehensive picture of overall reform activity. Moreover, it considers legislative action as reform and, thus, captures early stages of reform adoption. It reacts faster to new information than the other regulation indicators. Given the limited number of years in the sample, this is desirable because it reduces the required number of lags in the empirical model. Furthermore, the responsiveness rate contains more variation within our sample, while the alternative OECD indicators change, if at all, only marginally over time. Finally, the EPL and ETCR indicators are updated only every five years and end in 2013. This essentially prevents an assessment of the ECB's unconventional policy, which started only in 2007. Similarly, the IMF reform measure ends in 2013 and provides little time-variation as it focuses on major reforms. Most major reforms took place in the 1990s and early 2000s, which complicates an analysis for the euro area.

A drawback of the reform responsiveness rate is that it does not differentiate between reform areas. Moreover, it does not weigh the importance of each individual reform nor account for the difficulty to undertake reforms in certain areas, which makes it an imperfect

measure of reform intensity. Reforms are easier to implement, if they entail mainly benefits and few or no short-term costs, such as labor tax cuts, increased spending on active labor market policies or support to innovation. In contrast, reforms are more difficult when they hurt the short-term interests of specific groups, e.g. farmers in the area of agricultural policy, incumbent investors when it comes to boost competition, or if they are associated with job losses (OECD, 2010). A country suffering from weaknesses in labor market policies may thus appear less responsive to policy recommendations than one with priorities in easier-to-reform areas.⁶

Another caveat is that the responsiveness rate may overstate actual reform activity as it disregards reform reversals at later points in time. This is partly compensated by the fact that the rate captures only the year, in which legislative action is taken rather than the years, when legislation becomes effective. Whenever reforms are implemented over several years, only the decision year is considered as reform year in the coding, resulting in a slight understatement of overall reform activity.

3.2 Identification of monetary policy shocks

The main challenge in estimating the impact of monetary interventions on structural reforms is the isolation of exogenous variation in monetary policy. Endogeneity can result from both reverse causality and omitted variables. Regarding the former, the model in Section 2 and Eggertsson *et al.* (2014) and Cacciatore *et al.* (2016) show theoretically that structural reforms trigger a response of monetary policy because they affect inflation and output. Regarding omitted variables, the literature on the drivers of structural reforms shows the importance of the state of the economy for reform adoption (see Sections 1 and 2). Similarly, monetary policy responds to economic conditions. At the same time, it is difficult to control for this inherently unobservable variable.

To address both sources of endogeneity, we rely on an event study approach. This methodology uses high frequency data to test whether monetary policy interventions affect asset prices (Kuttner, 2001; Gürkaynak *et al.*, 2005). The intervention is measured as the change in a financial indicator related to monetary policy within a small time-window around a policy event. The main idea is that closely before the event, the policy indicator incorporates the expected endogenous response of monetary policy to economic conditions. Consequently, any change in the policy variable from before to after the event is considered as reflecting the surprise component of monetary policy revealed by the announcement. The time window is chosen to capture most of the indicator response to a policy decision while preventing irrelevant information from affecting it.

⁶ To address this problem, a “corrected” version of the RRR is occasionally provided by the OECD. This measure weighs each country’s reform responsiveness in a given priority area according to the difficulty to undertake reforms in that area. The difficulty is measured by the inverse of average responsiveness to priorities in this area across OECD member countries (OECD, 2013). Due to data limitations, we cannot use the “corrected” RRR as our main measure. For the years and euro area countries for which we possess data on this variable, the correlation with the RRR is 0.94.

In normal times, the short-term interest rate is the main policy instrument of central banks. Therefore, event studies for these periods typically employ financial market prices closely related to this variable as policy indicator. In an US sample where the zero lower bound plays only a marginal role, Gertler and Karadi (2015) use surprises in the three-month ahead federal funds futures rate. Thereby, they also capture forward guidance shocks by the Fed. We closely follow their approach for the period of conventional ECB policy.

However, the extraction of unconventional ECB surprises raises additional challenges. First, at the zero lower bound short-term rates provide insufficient variation. Therefore, we use interest rates for maturities of two years and longer. Second, short-term risk-free policy indicators might not reflect important ECB credit easing policies, such as the Longer-term Refinancing Operations (LTROs) or the Securities Markets Program (SMP). Hence, we employ sovereign yields, which reflect sovereign credit and liquidity risk. Finally, whereas US financial markets are highly integrated, euro area markets were fragmented when some of the most important ECB unconventional tools were announced. We thus employ a panel approach across countries to extract the average change in sovereign yields on announcement days.

We extract the variation in the phase-specific policy indicators using the following panel model for the daily frequency:

$$x_{i,j,t} = \alpha_i + \beta x_{i,j,t-1} + \sum_{a=1}^A \gamma_a D_{a,t} + \sum_{n=1}^N \delta_n Z_{n,t} + \varepsilon_{i,j,t} \quad , \quad (4)$$

where $x_{i,j,t}$ is a phase-specific dependent variable, i denotes countries, j maturities, and t days. α_i are country-specific constants and $D_{a,t}$ is a dummy variable taking value one, if monetary policy announcement $a = 1, \dots, A$ took place at day t , and zero otherwise. $Z_{n,t}$ controls for the release of macroeconomic news on variable $n = 1, \dots, N$. We include news on 136 macroeconomic data series for the euro area as a whole, for France, Germany, Italy, Spain, the UK, and the US to attenuate the risk that the one-day window covers information unrelated to the monetary policy announcements. For each series, we compute the difference between the first release and the expected value. The latter is the median of a panel of experts surveyed by Bloomberg.

For the period of conventional monetary policy, we drop the country index i from (4) and extract the common unexpected change in the next-to-maturity, 2nd, and 5th three-month euribor futures rate. We consider policy events between January 2000 and July 2007. For the period of unconventional policy, we use sovereign bond yields with a maturity of 2, 5 and 10 years for all euro area countries, for which data are available. We consider announcements between August 2007 and December 2016. They are listed in Section A1 of the online appendix (Table A2), which also contains a description of all variables that we use in the analysis (Table A1). Due to the limited number of events, we do not separate different types of unconventional policies.

The coefficients of interest are the γ_a s. They capture the variation in interest rates due to ECB announcement a . We transform the two vectors $(\gamma_1, \dots, \gamma_A)'$ corresponding to conventional and unconventional policy into two daily series taking value γ_a on the day of announcement a and zero otherwise. Subsequently, we aggregate both series into two yearly series by summing within years, where announcements taking place earlier in the year are given more weight than those taking place later, following the weighting scheme of Gertler and Karadi (2015). This is because an announcement in January has more time to affect variables measured at the yearly frequency than one in December. The frequency relation of our setup, which aggregates data from a one-day window to a year with 200 working days, is only about half of theirs, which aggregates 30 minute surprises to a month containing 200 trading hours.

For the baseline regressions, we merge both yearly series into one measure of monetary policy shocks to increase the number of observations. We show that the results are robust to using unconventional policy, unweighted shocks, and country-specific shocks. The latter are based on a panel model (across maturities) for the sovereign yields of each country separately. Figure 4 shows the baseline weighted and the unweighted shock series. Table 2 contains summary statistics. The common shock series varies between -30 and +25 basis points per year, fluctuates around zero, and has a standard deviation of 14 basis points. As pointed out by Ramey (2016), the weighting introduces some autocorrelation.

3.3 Regression models

To assess the effects of the monetary policy shocks on structural reforms and other macroeconomic variables, we use the following panel regression for the annual frequency:

$$\Delta y_{i,t} = \alpha_i + \sum_{j=0}^J \beta_j MP_{i,t-j} + \sum_{k=0}^K x'_{i,t-k} \gamma_k + \varepsilon_{i,t} \quad , \quad (5)$$

where variables are indexed by both country i and year t . The change in a generic variable, $\Delta y_{i,t}$, is regressed on an intercept, the monetary policy shocks $MP_{i,t-j}$, and a vector of control variables $x'_{i,t-k}$. For the baseline model, the dependent variable is the change in the reform responsiveness and the monetary shocks are common across countries. The baseline control set consists of the current and lagged value of a crisis dummy. The coefficients of interest are the β_j s. They capture the dynamic response of reforms to monetary policy shocks. We set $J=K=1$ in most regressions, but show that the results are similar when using more lags.

Due to the non-stationarity of most time series that we use, the dependent variables enter (5) in first differences. With regard to the reform responsiveness rate, country-specific augmented Dickey-Fuller and panel unit root tests allowing for unbalanced panels do not reject the null hypothesis of a unit root. Using first differences also controls for past reform efforts. Moreover, a White test for heteroskedasticity rejects the assumption of homoskedasticity and, as the differenced data still contain considerable persistence

according to their autocorrelation functions, we estimate model (5) with feasible generalized least squares. We account for heteroskedasticity and first-order autocorrelation in the error terms, which produces consistent and more efficient estimates than ordinary least squares. Section A3.2 of the online appendix shows that our results are robust to alternative estimators.

While our baseline regressions are largely immune to reverse causality and omitted variable bias, provided that the event study solves these issues, they potentially suffer from measurement error. We address this in Section 5.1, where we show that the main results are robust to using an instrumental variable (IV) approach.⁷ Finally, focusing on a monetary union has two empirical advantages. First, given the limited time-coverage of the reform data, this focus enlarges the number of observations relative to a pure time-series analysis. At the same time, many institutional factors, which might induce a correlation between monetary policy and structural reforms, are difficult to control for, such as financial supervision. These are constant across member countries.

4 Regression analysis of monetary policy and structural reforms

Before we present the main results, we conduct a preliminary analysis to assess the plausibility of our monetary policy shocks. We check whether they produce macroeconomic effects consistent with standard theory and empirical evidence. Table 4 reports the estimation of model (5) with the dependent variable being the change in log real GDP, log consumer prices, and the unemployment rate, respectively. The monetary shocks reduce output, lower consumer prices, and increase the unemployment rate. Most of the coefficients have the expected signs and are statistically significant. They suggest that a surprise monetary contraction of 100 basis points leads to a fall in GDP by 2.5 percent and in consumer prices by 1 percent as well as to an overall increase in the unemployment rate by 2 percentage points.

While these estimates are larger than those documented with classical SVAR analysis (Christiano et al., 1999), they are of similar size as estimates based on the single equation approach that we follow. Romer and Romer (2004), for example, find price effects of more than 4 percent. Coibion (2012) documents an increase in the unemployment rate of 1 percentage point. Furthermore, he shows that differences to the classical approach are due to differences in shock scaling, sample, and lag length selection. Overall, the results of the preliminary regressions indicate that the identified monetary policy shocks have the expected effects on the macro-economy.

⁷ We do not use IV local projections (Stock and Watson, 2018) given the data structure of the monetary policy shocks and the reform rates. While the former start in 2000, the latter begin only in 2006. Therefore, we can use an IV distributed lags model without losing observations. IV local projections instead require using leads of the reform rate such that observations at the end of the sample would be lost.

4.1 Estimating the impact of monetary shocks on structural reforms

Table 5 displays the main results, based on the full common shock series. Column 1 suggests a significant decline in structural reform activity in response to a contractionary monetary policy shock. The contemporaneous effect is individually significant. More importantly, the joint significance with its first lag, which is shown in the last row of the table, indicates that the null hypothesis that monetary policy has no effect is rejected at the 5 percent level.

Column 2 adds country fixed effects to the model.⁸ This specification reinforces the first impression. The current effect remains statistically significant and constant in size, and the coefficient on the lagged monetary policy shock becomes individually significant as well. Moreover, their joint significance increases to the 1 percent level. The Chi-squared statistic of the regression increases strongly. The fixed effects raise the explanatory power of the model and, by lowering the residual variance, increase the individual t-statistics. The estimated effects are economically relevant. Column 2 suggests that a contractionary monetary shock of 25 basis points lowers the reform responsiveness rate by cumulatively 20 percentage points after two years.

We augment the baseline model step by step by further explanatory variables (all in t and $t-1$) to test whether the results hold. We focus on economic control variables. A further sensitivity analysis in Section A3.1 of the online appendix concentrates on political reform drivers. In column 3, we correct for the output gap to see whether the impact of monetary policy runs mainly through aggregate demand. Golinelli and Rovelli (2013) find higher reform activity when employment and growth increases. In column 4, we add the structural budget balance to control for fiscal stimulus, which might affect reform efforts similarly as monetary policy by stimulating demand and giving breathing space to potential reform losers (Duval, 2008; Duval and Furceri, 2018). In both columns, the impact of monetary policy shocks remains highly significant and similar in size compared to column 2.

In columns 5 to 8, we extend the model with alternative measures of the business cycle and the state of public finances. We add the unemployment rate, government debt-to-gdp, a program dummy indicating whether countries receive aid from an IMF/ESM program, and a measure of fiscal space. There is some evidence that more dire economic times reduce reform efforts, in particular when looking at the lagged impact of the additional variables. This corroborates the notion that more budget-constrained governments have greater difficulty to reform (Eichengreen and Wyplosz, 1998). The current values of the controls need to be treated with caution as the point estimates might be affected by endogeneity.

The top panel of Figure 5 shows the dynamic effect of a monetary policy shock on the reform responsiveness rate. It is based on column 2 but adds two more lags of the shock to the model. The reform rate falls gradually. It reaches a trough in the third year, before

⁸ Here, we do not include year fixed effects to avoid multicollinearity with the common monetary policy shocks. The sensitivity analysis shows that the results are robust to combining year fixed effects with country-specific monetary policy shocks.

leveling out after four years. The cumulative response is highly statistically significant according to the 99 percent asymptotic confidence bands. As a sensitivity test of the dynamic effects, the bottom panel shows the results when estimating the model in levels.⁹ The effects are similar, both qualitatively and quantitatively.

Overall, the findings show a significant effect of monetary policy on structural reform activity. The point estimates change only modestly across columns in Table 5. The stability in the coefficients is reassuring as it suggests that the identified monetary shocks are not correlated with other variables. Regarding the main hypotheses, we conclude that unexpected monetary easing stimulates reform implementation, supporting the room-for-manuever hypothesis.

4.2 Transmission channels and country heterogeneity

In this section, we test the cross-sectional predictions of the theoretical model and investigate potential transmission channels of monetary policy shocks on reform activity. For this purpose, we include a number of interaction terms in the empirical model. They introduce cross-sectional variation in the effects of monetary policy and thereby sharpen identification as countries and governments might be more or less affected by monetary policy depending on their macroeconomic or financial situation. Specifically, we employ the following model:

$$\Delta Reform_{i,t} = \alpha_i + \sum_{j=0}^1 \beta_j MP_{t-j} + \beta_3 D_{i,t-1} + \beta_4 MP_{t-1} D_{i,t-1} + \sum_{k=0}^1 x'_{i,t-k} \gamma_k + \varepsilon_{i,t}, \quad (6)$$

where the interaction variable $D_{i,t-1}$ is one of the following: a periphery or program dummy, the unemployment rate, government debt, fiscal space, the output gap, and inflation. We lag the interaction variable and term by one year to allow for delays in the transmission of these factors to reform activity and to reduce endogeneity concerns. The set of controls, $x'_{i,t-k}$, contains the crisis dummy, the output gap, and the structural balance.

Table 6 contains the results. Column 1 distinguishes the effects between euro area core and peripheral countries. The significantly negative coefficient on the periphery dummy suggests that these countries adopt on average 12 percentage points fewer reforms in the sample than countries of the core, irrespective of the ECB's policy stance. In light of Section 2, we interpret this result as reflecting that peripheral countries are growing slower and have more strained public finances in our sample, which is dominated by the European crisis, giving them less room for reforms. Banerji *et al.* (2017) show that labor and product market reforms are more effective, when they are accompanied with fiscal accommodation and mitigation for affected workers and firms. Gehrke and Weber (2018) find that labor market

⁹ To control for autocorrelation and previous reform efforts, we include one lag of the reform rate as additional explanatory variable. This introduces nonlinearity into the dynamic effects. Therefore, we base statistical inference on Monte Carlo simulations, following Romer and Romer (2004). We use the estimated covariance matrix of the coefficients to draw 500 new coefficients from a multivariate normal distribution, from which we compute a distribution of impulse responses.

reforms adopted during a recession aggravate the downturn, while they increase growth during an upswing.

Consistent with these arguments, the coefficient on the interaction term shows that the impact of monetary policy shocks is stronger in the periphery than in the core. The point estimate is statistically significant at the 1 percent level. The bottom of the table shows that the lagged monetary policy shock and the interaction term are jointly significant as well. The joint effect is negative, implying that contractionary monetary policy shocks lower the reform rate in the periphery significantly. In contrast, monetary policy shocks have no statistically significant effect on reform efforts in the core. Section A2 of the online appendix digs deeper into the regional differences and presents country-specific effects.

Columns 2 to 4 are variations of these findings based on alternative indicators of the health of public finances or the state of the economy. In all three specifications, the interaction variable and the joint effect of the shock and the interaction term are statistically significant. Moreover, all effects have the expected negative sign. The reform responsiveness to monetary policy shocks is stronger in countries under a financial assistance program, with higher unemployment rates, or more elevated government debt. The findings support the second central prediction of the theoretical model (see Figure 2). They are in line with Eichengreen and Wyplosz (1998) and Abiad and Mody (2005) who argue that countries with little fiscal flexibility or suffering from banking crises adopt systematically fewer reforms.

Columns 5 to 7 test the flip side of the argument. They assess whether monetary policy has weaker effects in countries with more fiscal space, higher output gaps, or higher inflation. First, we find that such countries are, *per se*, more prone to engage in reforms. At the same time, they respond significantly less to monetary policy shocks. For example, more fiscal space implies systematically more reforms, but less sensitivity of the reform rate to monetary policy. Finally, Section A2.2 of the online appendix shows that unconventional monetary policy shocks have a stronger impact on the reform rate than conventional shocks, consistent with the predictions of the theoretical analysis.

5 Extensions and robustness analysis

In this section, we use different measures of the ECB's policy stance and employ alternative reform indicators to assess the robustness of the results. Section A3 of the online appendix contains further, more technical sensitivity tests. They show that the main results are robust to using alternative monetary policy shocks and estimators.

5.1 The impact of the monetary stance on reform responsiveness

To derive an overall picture of the impact of monetary policy on reform activity, we complement the analysis based on monetary shocks with an investigation of the impact of the monetary stance on reforms. We use several alternative interest rates to measure the monetary stance. While conventional ECB policy is typically measured by short-term, say, three-month interest rates, unconventional monetary policy aims at affecting other parts of

the yield curve. For example, negative deposit rates have an impact on very short-term (weekly or monthly) interbank rates, while forward guidance and asset purchases target interest rates between roughly one to ten years. Therefore, it is *a priori* not clear which interest rate best reflects the monetary stance throughout the full sample, that contains conventional and several types of unconventional monetary policies.

To accommodate this, we employ Overnight Index Swap (OIS) rates for different maturities, one at a time. Moreover, we control for macroeconomic conditions using the same set of economic variables as before. Finally, we lag the interest rates by one period to reduce concerns about reverse causality, as several countries account for a large share of the euro area economy and because periphery economies evolve similarly in the sample.

Table 7 shows that the interest rates have a negative impact on the reform rate. The effects are statistically significant except for the ten-year rate. For the three-month OIS rate, the point estimate implies that a 100 basis point increase reduces the reform rate by 4 percentage points. The effect is much smaller than the one of the monetary policy shocks. This difference can result from several factors. First, the risk-free rate might not fully reflect important ECB unconventional tools, such as SMP or Outright Monetary Transactions, which targeted credit risks. More technically, the standard deviation of the OIS rates is approximately larger by a factor of 10 in the sample. This higher variability might result in correspondingly smaller point estimates. Finally, lagging interest rates by one period might not fully resolve endogeneity.

To address the last point, we run instrumental variable regressions. We instrument the contemporaneous OIS rates, one at a time, with the arguably exogenous monetary policy shocks. The models contain the same controls as before, but in year t , to ensure consistency with interest rates. Across models, we use the same set of shocks as instruments: the contemporaneous monetary policy shock and its first lag, as interest rates are highly persistent. This instrument set ensures that heteroskedasticity robust F-statistics for instrument relevance and p-values for overidentification tests are large across specifications. Using no or two lags of the shock as instrument(s) gives similar results. We use unweighted common monetary policy shocks to ensure that the aggregation scheme is the same for the instrumented variable and the instruments.

Table 8 shows the results. The bottom part contains several statistics for assessing the validity of the instruments. Except for the ten-year rate, the Kleibergen-Paap F-statistics for weak identification are above ten and the Sargan-Hansen p-values for overidentification are above the 10 percent level, suggesting that the instruments are strong and valid. Moreover, Shea's partial R^2 's for the instruments in the first stage regressions show that the instruments are relevant drivers of interest rates. They explain 7 to 23 percent of the variation.

All interest rates have a negative impact on reform activity. As before, the effects are statistically significant. An exception is the impact of the ten-year rate, possibly reflecting

the poorer performance of the instruments. The point estimates all increase in absolute value relative to the non-instrumental case, consistent with the idea that structural reforms can boost growth and growth expectations, which, in turn, triggers higher interest rates and biases the non-instrumental estimates towards zero.

Finally, in an encompassing model, we include both the shocks and the monetary policy stance. We return to the baseline shocks and FGLS estimator and include the contemporaneous as well as the first lag of the shock. We also lag the monetary stance and all control variables by one year. Table 9 shows that both the shocks and the monetary policy stance have a negative impact. The point estimates are individually significant for the most part and are always jointly significant. The point estimates resemble those of the baseline model for the shocks and lie between the estimates of the previous two tables for the monetary stance. Compared with each other, shocks have larger effects than interest rates. This might be for two reasons. First, the shocks capture credit easing policies as they are based on country-specific sovereign yields, which may deviate substantially from euro area-wide risk-free rates. Second, because they reflect public financing conditions more closely, they also affect governments' budget constraints and, thereby, reform decisions more directly.

5.2 Cleaned monetary policy shocks

In this section, we investigate the properties of the monetary policy shocks. As mentioned in Section 3.2, the shocks are not exactly mean-zero and show some persistence. Therefore, we now test whether they are predictable. If they are, we clean them and test whether our main results remain unchanged. As the moving-averaging type weighting scheme of Gertler and Karadi (2015) mechanically introduces some autocorrelation into our annual shock measure (Ramey, 2016), we focus on the unweighted shocks. Columns 1 to 3 of Table 10 regress them on the previous year's output gap, inflation, and unemployment rate, one at a time. None of the variables predicts the shocks and the fit of the models is low. In a final specification, we regress the shocks on all variables jointly. The coefficient for inflation is borderline significant.

Therefore, in a next step, we use the residual of that regression as an alternative measure of monetary shocks and test whether it affects structural reforms. Columns 1 to 3 of Table 11 show that the residual from the reaction function regression has a statistically significant effect on reforms, when correcting for alternative reform drivers. The point estimates drop slightly in absolute size relative to the baseline estimates, but remain significant.

In columns 4 to 6, we employ a more technical way of cleaning the shocks. We first run an AR(1) model for the shocks and then use the residuals. The point estimates drop further in absolute size as the persistence of the shock measure drops, which reduces the monetary impetus, but the effects remain significant at least at the 5 percent level.

5.3 Alternative reform indicators

Next, we investigate how monetary policy affects alternative reform indicators and whether there are differences between labor and product market reforms. First, we employ the OECD employment protection legislation indicator. It measures the procedures and costs involved in dismissing individuals or groups of workers on regular contracts, taking values between zero and six. Higher scores indicate stricter regulation, such that a reform lowers the indicator. As the indicator captures only fully implemented changes in regulation, we expect it to respond more slowly to monetary policy than the reform responsiveness rate. As it provides considerably less time-variation (see Section 3), we employ country-specific monetary policy shocks, drop the country fixed effects and include year dummies to exploit more of the cross-sectional covariation between the indicator and the shocks. Columns 1 to 3 of Table 12 report the results for different specifications of covariates. We find significant effects of monetary policy shocks on employment protection.

Second, we use the OECD indicator of product market regulation. The index measures regulatory provisions in the following sectors: telecoms, electricity, gas, post, rail, air passenger transport, and road freight. Again, values range from zero to six with higher values indicating stricter regulation. Columns 4 to 6 show no significant impact of the monetary policy shocks. There are two potential explanations for this finding. First, it may be explained by the stronger need to compensate potential reform losers for labor than for product market reforms. The effects of the former are more directly experienced via job dismissals or wage cuts and therefore face stronger resistance. Second, whereas labor market reforms are the outcome of government action, changes in product market regulation can also be driven by market forces, such as the entrance of new market participants (Da Silva *et al.*, 2017).

Finally, we use the IMF major reform indicator as alternative outcome variable. The IMF classifies major reforms in employment protection legislation, unemployment benefits, and product market regulation (in seven product markets) on a narrative basis. Individual major reforms are indicated with -1 or +1, depending whether they imply more or less regulation. Higher values correspond to more flexibility. However, as the indicator focuses on major reforms, there are only few, if any, reforms in many countries of our sample. We therefore construct an overall IMF reform index for each country by summing across reform areas within a given year. Columns 8 and 9 show that the monetary shocks have a statistically significant impact on major reforms.

6 Conclusion

This paper investigates the impact of monetary policy shocks on structural reform adoption. First, we lay out a conceptual framework how monetary policy can affect reform decisions. Then, we extract the unexpected variation in euro area interest rates around ECB announcements using an event study approach and estimate the effect of the monetary shocks on the reform responsiveness rate. This indicator measures the implemented in

percent of recommended reforms and is a comprehensive monitor of governments' reform action.

Our findings suggest that an expansionary monetary policy shock increases reform efforts significantly. This result is robust to an extensive sensitivity analysis. Our results further show that expansionary monetary surprises have stronger reform-inducing effects during dire economic times, in the euro area periphery, and in the area of labor market regulation than in prosperous core countries with ample fiscal space, or on product market regulation. This pattern is consistent with the room-for-maneuver hypothesis, which contends that monetary easing allows crisis-hit countries to embark on reform adoption that might otherwise not have been able to cover the direct financial or political and social costs of reforms.

All in all, our results suggest that expansionary monetary policy has macroeconomic effects beyond the direct short-term stabilization of aggregate demand. It creates the breathing space necessary for reforms, which let economies grow faster and more stable in the long-term. This effect of monetary policy is a new stylized fact and adds to the understanding of the drivers of structural reforms and of the side effects of monetary policy.

References

- Abiad, A. and A. Mody (2005). 'Financial reform: What shakes it? What shapes it?', *American Economic Review*, vol. **95**(1), pp. 66-88.
- Andrés, J., Ó. Arce and C. Thomas (2017). 'Structural reforms in a debt overhang', *Journal of Monetary Economics*, vol. **88**, pp. 15-34.
- Angelopoulos, K., W. Jiang and J. R. Malley (2013). 'Tax reforms under market distortions in product and labour markets', *European Economic Review*, vol. **61**, pp. 28-42.
- Banerji, A., M. V. Crispolti, M. E. Dabla-Norris, M. C. H. Ebeke, D. Furceri, M. T. Komatsuzaki and M. T. Pogosyan (2017). *Labor and product market reforms in advanced economies: fiscal costs, gains, and support*: International Monetary Fund.
- Bean, C. (1998). 'The interaction of aggregate-demand policies and labour market reform', *Swedish Economic Policy Review*, vol. **5**(2), pp. 353-382.
- Bilbiie, F. O., F. Ghironi and M. J. Melitz (2012). 'Endogenous entry, product variety, and business cycles', *Journal of political economy*, vol. **120**(2), pp. 304-345.
- Blanchard, O. and F. Giavazzi (2003). 'Macroeconomic effects of regulation and deregulation in goods and labor markets', *The quarterly journal of economics*, vol. **118**(3), pp. 879-907.
- Cacciatore, M. and G. Fiori (2016). 'The macroeconomic effects of goods and labor markets deregulation', *Review of Economic Dynamics*, vol. **20**, pp. 1-24.
- Cacciatore, M., G. Fiori and F. Ghironi (2016). 'Market deregulation and optimal monetary policy in a monetary union', *Journal of International Economics*, vol. **99**, pp. 120-137.
- Campos, N. F. and F. Coricelli (2012). 'Financial liberalization and reversals: political and economic determinants', *Economic policy*, vol. **27**(71), pp. 483-513.
- Campos, N. F., P. De Grauwe and Y. Ji (2017) *Structural Reforms, Growth and Inequality: An Overview of Theory, Measurement and Evidence*, Institute for the Study of Labor (IZA).
- Campos, N. F. and R. Horváth (2012). 'Reform redux: Measurement, determinants and growth implications', *European Journal of Political Economy*, vol. **28**(2), pp. 227-237.
- Christiano, L. J., M. Eichenbaum and C. L. Evans (1999). 'Monetary policy shocks: What have we learned and to what end?', *Handbook of macroeconomics*, vol. **1**, pp. 65-148.

- Coibion, O. (2012). 'Are the effects of monetary policy shocks big or small?', *American Economic Journal: Macroeconomics*, vol. **4(2)**, pp. 1-32.
- Da Silva, A. D., A. Givone and D. Sondermann (2017) *When do countries implement structural reforms?*, European Central Bank.
- Draghi, M. (2015). 'Structural reforms, inflation and monetary policy', *Introductory speech at the ECB Forum on Central Banking*, vol. **22 May**
- Drazen, A. and V. Grilli (1993). 'The benefit of crises for economic reforms', *The American Economic Review*, vol. **83(3)**, pp. 598.
- Duval, R. (2008). 'Is there a role for macroeconomic policy in fostering structural reforms? Panel evidence from OECD countries over the past two decades', *European Journal of Political Economy*, vol. **24(2)**, pp. 491-502.
- Duval, R. and D. Furceri (2018). 'The effects of labor and product market reforms: the role of macroeconomic conditions and policies', *IMF Economic Review*, vol. **66(1)**, pp. 31-69.
- Duval, R., D. Furceri, B. Hu, J. T. Jalles and H. L. Nguyen (2018). 'A narrative database of major labor and product market reforms in advanced economies'.
- Égert, B. and P. Gal (2016). 'The quantification of structural reforms in OECD countries: A new framework', *OECD Journal: Economic Studies*, vol. **2016(1)**.
- Eggertsson, G., A. Ferrero and A. Raffo (2014). 'Can structural reforms help Europe?', *Journal of Monetary Economics*, vol. **61**, pp. 2-22.
- Eggertsson, G. B. and P. Krugman (2012). 'Debt, deleveraging, and the liquidity trap: A Fisher-Minsky-Koo approach', *The quarterly journal of economics*, vol. **127(3)**, pp. 1469-1513.
- Eichengreen, B. and C. Wyplosz (1998). 'The Stability Pact: more than a minor nuisance?', *Economic policy*, vol. **13(26)**, pp. 66-113.
- Fernández-Villaverde, J., L. Garicano and T. Santos (2013). 'Political credit cycles: the case of the Eurozone', *Journal of Economic Perspectives*, vol. **27(3)**, pp. 145-166.
- Fratzcher, M., M. L. Duca and R. Straub (2016). 'ECB unconventional monetary policy: Market impact and international spillovers', *IMF Economic Review*, vol. **64(1)**, pp. 36-74.
- GCEE (2016). 'Time for reforms', *German Council of Economic Experts Annual Economic Report*, vol. **2016/17**.
- Gehrke, B. and E. Weber (2018). 'Identifying asymmetric effects of labor market reforms', *European Economic Review*.
- Gertler, M. and P. Karadi (2015). 'Monetary policy surprises, credit costs, and economic activity', *American Economic Journal: Macroeconomics*, vol. **7(1)**, pp. 44-76.
- Golinelli, R. and R. Rovelli (2013). 'Did growth and reforms increase citizens' support for the transition?', *European Journal of Political Economy*, vol. **30**, pp. 112-137.
- Gordon, R. J. (1996) *Macroeconomic policy in the presence of structural maladjustment*, National Bureau of Economic Research.
- Gürkaynak, R. S., B. Sack and E. Swanson (2005). 'The sensitivity of long-term interest rates to economic news: Evidence and implications for macroeconomic models', *American Economic Review*, vol. **95(1)**, pp. 425-436.
- Kuttner, K. N. (2001). 'Monetary policy surprises and interest rates: Evidence from the Fed funds futures market', *Journal of Monetary Economics*, vol. **47(3)**, pp. 523-544.
- OECD (various issues). *Economic policy reforms: Going for growth 2012, 2013, 2015, 2017, 2019*: OECD Publishing.
- Ramey, V. A. (2016). 'Macroeconomic shocks and their propagation', *Handbook of macroeconomics*, pp. 71-162: Elsevier.
- Romer, C. D. and D. H. Romer (2004). 'A new measure of monetary shocks: Derivation and implications', *The American Economic Review*, vol. **94(4)**, pp. 1055-1084.
- Stock, J. H. and M. W. Watson (2018). 'Identification and estimation of dynamic causal effects in macroeconomics using external instruments', *The Economic Journal*, vol. **128(610)**, pp. 917-948.

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Figures

Figure 1: Simulated impulse responses to macroeconomic policy shocks

The figure shows the impulse responses of output and inflation (in percent and annualized percentage point deviations from steady state, respectively) to a government spending shock of -1% (first row, solid line), to a tax rate shock of -1 percentage point (second row, dashed line), to a monetary policy shock of -2 percentage points (third row, dotted line), and all three shocks combined (last row, solid line with circles), based on a calibrated New Keynesian model using illustrative parameter values.

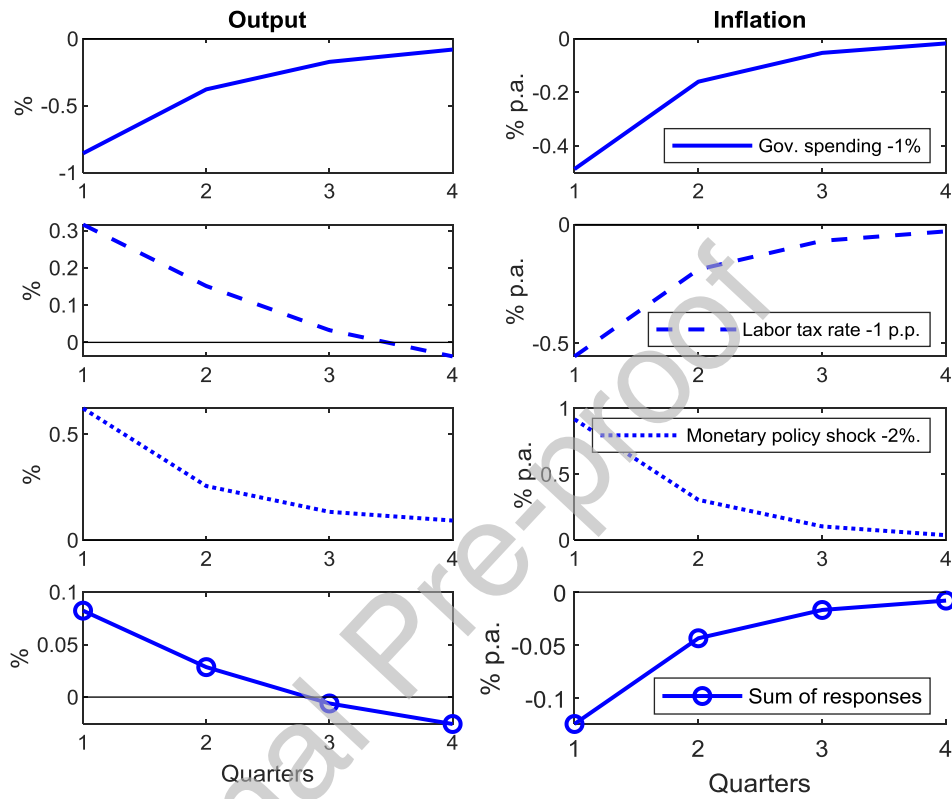


Figure 2: Simulated impulse responses to a monetary surprise expansion

The figure shows the impulse responses of the nominal interest rate, the public budget balance, the labor tax rate and government consumption to a monetary policy shock of -2 percentage points for the baseline parameter values (solid line) as well as for a high value of steady state debt (dashed line), output (dash-dotted line), and inflation (dotted line).

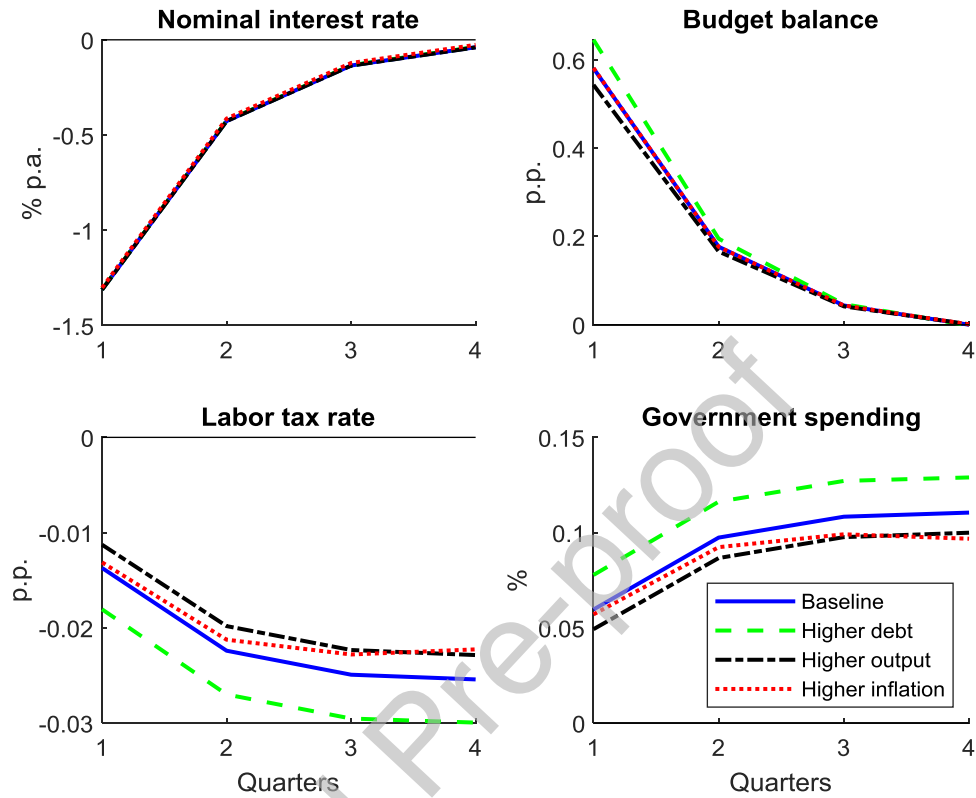


Figure 3: Comparison of structural reform indicators: RRR and the IMF's EPL/UB

The figure shows the OECD's reform responsiveness rates (black) and the cumulated IMF major reform indicators of employment protection legislation and unemployment benefits (grey) for euro area core (dotted line) and periphery (dashed line) countries. No data available for Cyprus, Lithuania and Malta. Sample period: 2006-2016 for reform responsiveness rates, 2006-2013 for IMF major reforms in employment protection legislation and unemployment benefits. Source: OECD, Duval *et al.*, 2018.

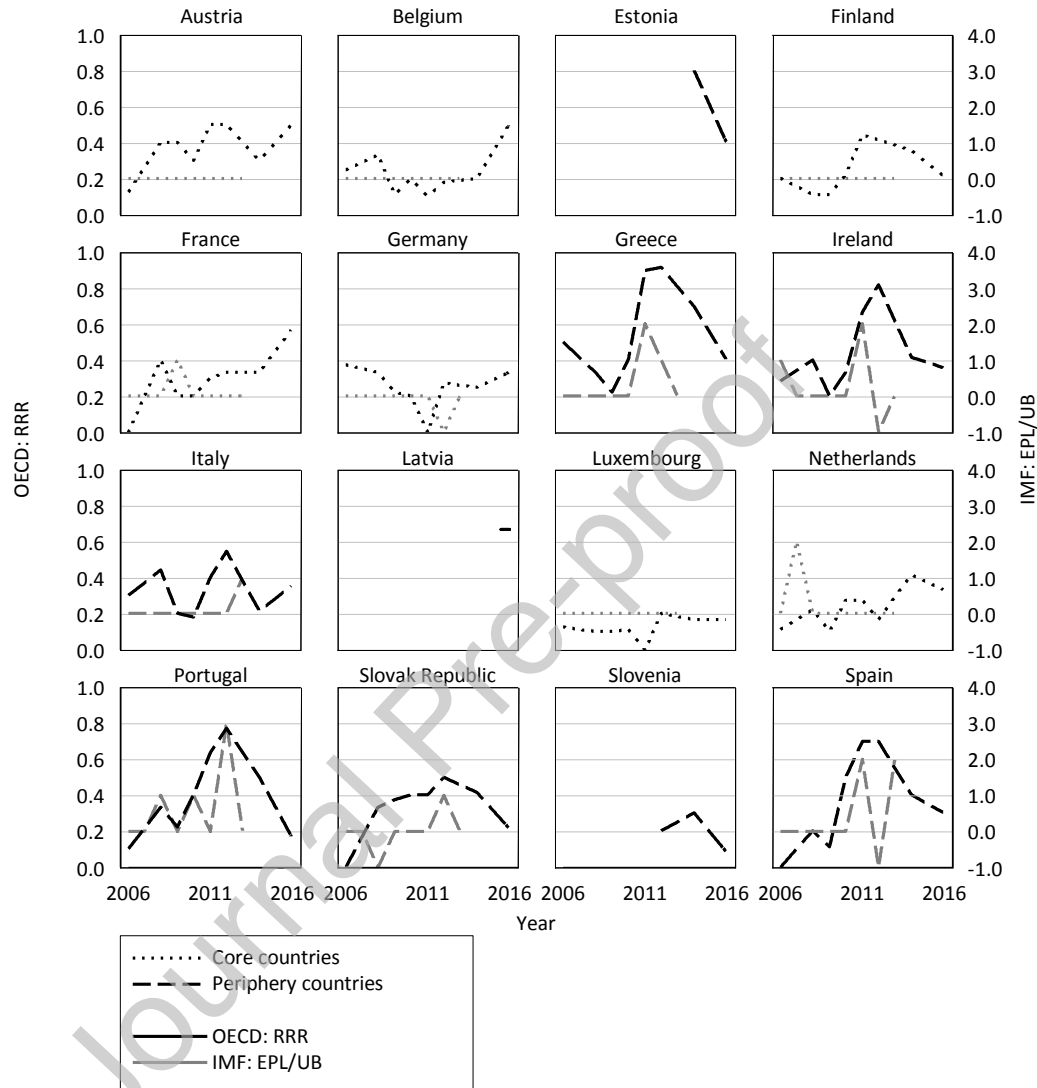
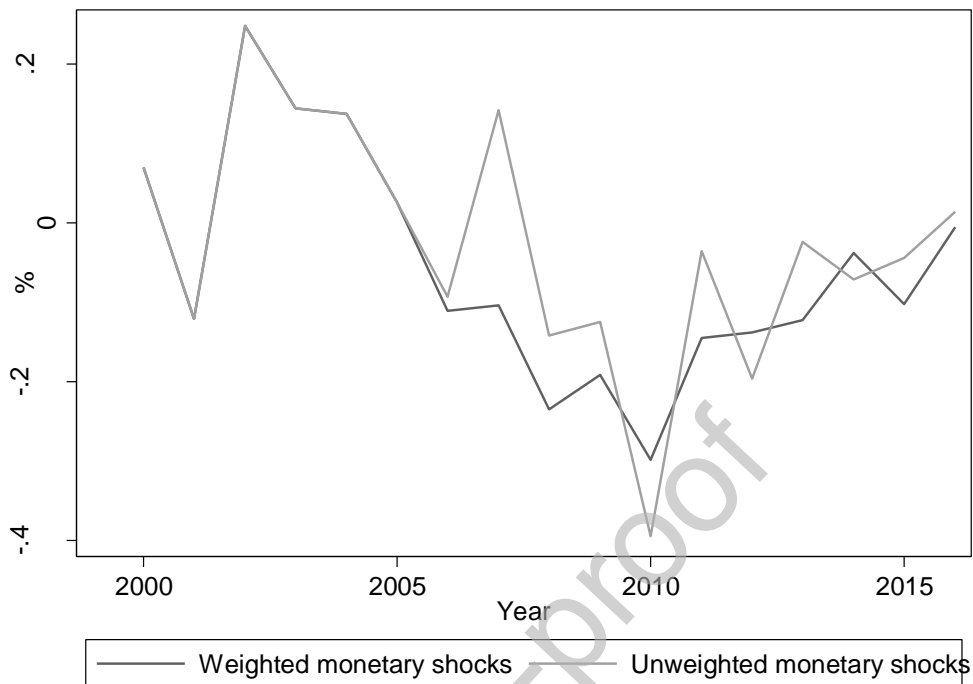
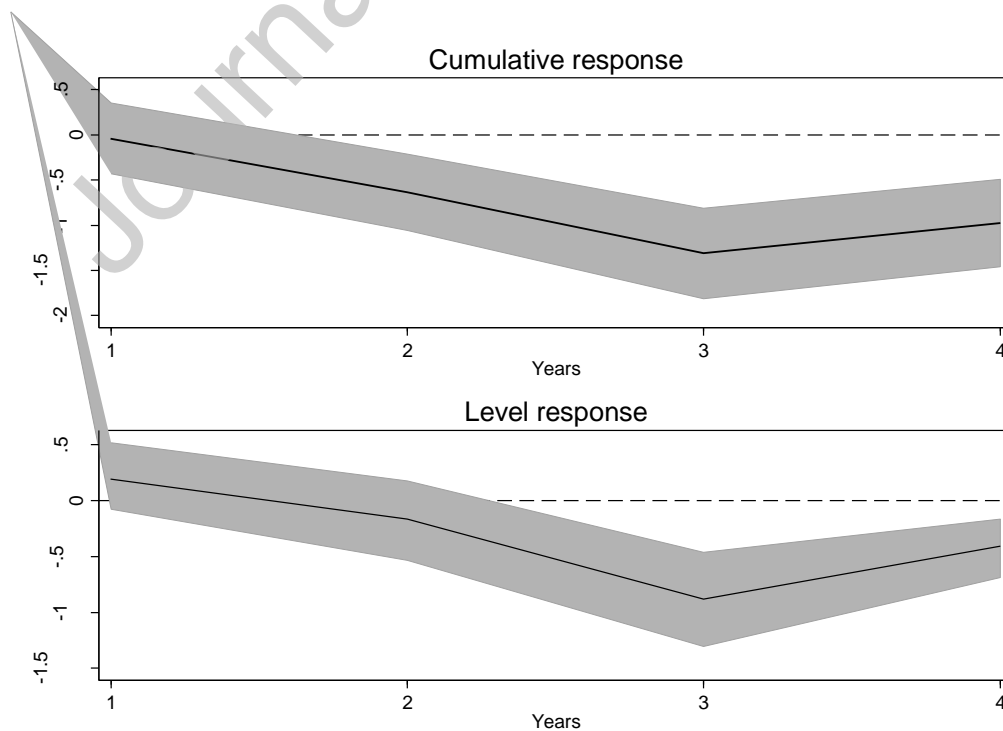


Figure 4: Monetary policy shocks in the euro area 2000-2016

The figure shows the baseline weighted (dark grey) and unweighted (light grey) monetary policy shock series in percent, averaged across all euro area countries. Sample period: 2000-2016. Source: Bloomberg.

**Figure 5: Response of reform responsiveness rate to monetary policy shock**

The figure shows the cumulative effect of a +100 basis points monetary policy shock on the reform responsiveness rate in the euro area. The solid line refers to the point estimate and the shaded area to the 99 percent confidence bands. The top panel shows the cumulative response, while the bottom shows the level response.



Tables

Table 1: Evolution of *Going for Growth* priorities by policy area

The share of <i>Going for Growth</i> priorities by area (in %)	2007	2011	2013	2015	2017
Labor productivity					
Human capital	14	15	16	16	17
R&D and innovation policies	2	2	4	6	7
Product market regulation, trade and FDI	24	25	21	22	19
Agriculture and energy subsidies	5	4	4	4	3
Tax system-structure and efficiency	3	5	5	5	9
Efficiency of public spending	5	5	5	4	5
General efficiency	3	3	3	2	3
Efficiency of the healthcare sector	2	2	2	2	1
Public infrastructure	2	2	2	2	4
Legal infrastructure and the rule of law	2	1	1	1	1
Financial markets regulation	1	1	1	0	0
Housing/planning policies/barriers to labor mobility	1	1	1	1	2
Total productivity	58	62	60	61	66
Labor utilization					
Tax system – emphasis on the level of labor tax wedges	9	8	7	7	5
Social benefits and active labor market policies (ALMPs)	15	14	17	17	17
UB/social protection and ALMPs	4	5	9	10	15
Retirement and disability schemes	11	9	7	6	2
Retirement systems	6	6	4	4	1
Disability and sickness schemes	5	3	3	2	1
Policy barriers to full-time female participation	5	3	5	5	6
Labor market regulation and collective wage agreements	11	11	10	9	5
Job protection legislation	6	8	7	6	3
Minimum wages and wage bargaining systems	5	3	2	3	1
Housing/planning policies/barriers to labor mobility	3	2	2	2	2
Total labor utilization	42	38	40	39	34
Total number of priorities	155	175	175	175	175

Source: OECD (2015), OECD (2017).

Table 2: Summary statistics of structural reform indicators and monetary policy shocks

	Observations	Mean	S.D.	Minimum	Maximum
OECD Reform Responsiveness Rate	152	0.329	0.185	0	0.917
OECD Employment Protection Legislation	187	2.489	0.659	1.270	4.583
OECD Regulation in Energy, Transport and Communications	214	2.664	0.822	1.268	5.309
IMF major reforms	182	0.670	1.020	-1	6
Common monetary policy shocks	323	-0.058	0.141	-0.298	0.248
Common unconventional monetary policy shocks	171	-0.117	0.094	-0.300	0.021
Country-specific monetary policy shocks	323	-0.047	0.292	-2.648	1.542

Notes: Sample for structural reforms: 2006-2016 for reform responsiveness rate, 2000-2013 for employment protection legislation and regulation in energy, transport and communications. Source: OECD. Sample IMF major reforms: 2000-2013. Source: Duval *et al.*, 2018. Sample period for monetary policy shocks: 2000-2016, 2008-2016 for unconventional monetary policy shocks. Source: Bloomberg. Yearly observations.

Table 3: Pairwise correlations between structural reform indicators for the euro area

	OECD				IMF		
	RRR, t	RRR, t-1	EPL	ETCR	EPL	UB	PMR
RRR, t	1	0.741***	-0.079	-0.045	0.244**	0.212**	0.003
RRR, t-1		1	-0.099	-0.042	0.223**	0.089	-0.081

Notes: Sample period for structural reforms: 2006-2016 for reform responsiveness rate (RRR), 2000-2013 for employment protection legislation (EPL) and regulation in energy, transport and communications (ETCR) and for IMF major reforms in employment protection legislation (EPL), unemployment benefits (UB) and product market regulation (PMR). Yearly observations. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 4: Macroeconomic effects of monetary policy shocks in the euro area

	(1)	(2)	(3)
Dependent variable:	$\Delta \log(\text{GDP})$	$\Delta \log(\text{CPI})$	$\Delta \text{unemployment}$
Monetary shock, t	-0.025** (-2.1)	-0.011* (-1.7)	0.011*** (2.6)
Monetary shock, t-1	0.008 (0.7)	0.005 (0.8)	0.008** (2.1)
Observations	304	304	304

Notes: FGLS with standard errors adjusted for heteroskedasticity and autocorrelation of order 1. Dependent variables are indicated below the column numbers, control variables consist of a crisis dummy in t and t-1. Sample period 2000-2016, yearly observations. t-statistics in parentheses: * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 5: Effects of monetary policy shocks on reform activity in the euro area

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: change in reform responsiveness rate								
Monetary shock, t	-0.334**	-0.334***	-0.327***	-0.425***	-0.473***	-0.370**	-0.379***	-0.517***
	(-2.4)	(-3.3)	(-3.2)	(-4.5)	(-3.6)	(-2.6)	(-2.7)	(-2.9)
Monetary shock, t-1	-0.233	-0.456***	-0.515***	-0.536***	-0.518***	-0.459***	-0.457***	-0.197
	(-1.5)	(-3.3)	(-3.8)	(-3.9)	(-3.2)	(-2.8)	(-2.9)	(-1.0)
Crisis dummy, t	0.019	-0.011	0.001	-0.023	-0.018	-0.023	-0.040	-0.071**
	(0.6)	(-0.3)	(0.0)	(-0.8)	(-0.6)	(-0.8)	(-1.3)	(-2.0)
Crisis dummy, t-1	-0.065**	-0.092***	-0.090***	-0.130***	-0.138***	-0.117***	-0.121***	-0.167***
	(-2.3)	(-3.1)	(-2.7)	(-4.2)	(-4.5)	(-3.8)	(-3.9)	(-4.7)
Output gap, t			0.008**	0.003	0.006	0.006	0.004	0.009
			(2.1)	(0.8)	(1.2)	(1.1)	(0.8)	(1.1)
Output gap, t-1			-0.007*	-0.001	-0.008	-0.010*	-0.011**	0.000
			(-2.0)	(-0.4)	(-1.6)	(-1.9)	(-2.2)	(0.0)
Struct. balance, t				0.022***	0.027***	0.031***	0.025***	0.022*
				(3.1)	(3.5)	(4.1)	(3.1)	(1.9)
Struct. balance, t-1				-0.034***	-0.033***	-0.033***	-0.030***	-0.063***
				(-5.1)	(-5.0)	(-4.9)	(-4.2)	(-7.1)
Unemployment, t					1.386	0.673	0.007	-0.884
					(1.4)	(0.7)	(0.0)	(-0.6)
Unemployment, t-1					-1.977**	-1.230	-1.145	-0.448
					(-2.2)	(-1.3)	(-1.2)	(-0.3)
Gov. debt, t						0.004	0.002	-0.000
						(1.6)	(1.0)	(-0.1)
Gov. debt, t-1						-0.005**	-0.004**	0.001
						(-2.3)	(-2.0)	(0.2)
Program, t							0.093	0.092*
							(1.6)	(1.7)
Program, t-1							0.036	0.073
							(0.6)	(1.4)
Fiscal space, t								-0.271
								(-0.5)
Fiscal space, t-1								0.205
								(0.4)
Country effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	136	136	136	136	136	136	136	95
Chi2 of regression	13.50	383.77	402.12	668.75	229.43	279.49	337.76	159.07
p-value joint test	0.015	0.001	0.000	0.000	0.000	0.003	0.002	0.014

Notes: FGLS with standard errors adjusted for heteroskedasticity and autocorrelation of order 1. All models contain an unreported intercept. A reform is an increase in the indicator. Sample period: 2006-2016, yearly observations. t-statistics in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The p-value at the bottom of the table refers to a test for joint significance of the monetary shocks.

Table 6: Transmission channels of monetary policy shocks to reform activity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: change in reform responsiveness rate							
Interaction variable	Periphery	Program	Unemploym.	Gov. debt	Fiscal space	Output gap	Inflation
Monetary shock, t	-0.510***	-0.378***	-0.497***	-0.312**	-0.322*	-0.416***	-0.434***
	(-3.5)	(-2.9)	(-4.5)	(-2.2)	(-1.9)	(-4.3)	(-3.6)
Monetary shock, t-1	-0.101	-0.308*	0.272	-0.109	0.350	-0.211	-0.799***
	(-0.5)	(-1.8)	(0.9)	(-0.4)	(1.5)	(-1.2)	(-3.8)
Interaction variable, t-1	-0.120*	-0.296***	-0.024***	-0.003***	2.526***	0.024***	0.040**
	(-1.9)	(-3.3)	(-3.2)	(-3.0)	(2.6)	(2.6)	(2.1)
Interaction term, t-1	-0.818***	-2.017***	-0.085***	-0.005	23.185***	0.150***	0.281**
	(-3.0)	(-4.7)	(-2.7)	(-1.5)	(3.3)	(3.0)	(2.6)
Observations	136	136	136	136	95	136	136
Chi2 of regression	311.58	383.13	737.71	304.07	170.34	699.25	475.40
p-value joint test	0.001	0.000	0.000	0.015	0.005	0.000	0.001

Notes: FGLS with standard errors adjusted for heteroskedasticity and autocorrelation of order 1. A reform is an increase in the dependent variable. All models contain country fixed effects and contemporaneous and lagged values of the crisis dummy, output gap, and structural balance. Sample period: 2006-2016, yearly observations. t-statistics in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The bottom of the table shows the number of observations, the chi-squared statistic of the regression, and the p-value of a test for joint significance of the monetary policy shock in t-1 and the interaction term between the monetary policy shock in t-1 and the interaction variable in t-1. The interaction variable is indicated at the top of the column.

Table 7: Effects of interest rates on reform activity in the euro area

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: change in reform responsiveness rate					
OIS 1 Week, t-1	-0.046*** (-3.6)					
OIS 1 Month, t-1		-0.045*** (-3.5)				
OIS 3 Month, t-1			-0.043*** (-3.3)			
OIS 1 Year, t-1				-0.034** (-2.6)		
OIS 2 Years, t-1					-0.025* (-1.9)	
OIS 10 Years, t-1						-0.002 (-0.1)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	136	136	136	136	136	136
Chi2 of regression	593.38	594.98	590.84	570.27	545.34	483.87

Notes: FGLS with standard errors adjusted for heteroskedasticity and autocorrelation of order 1. All models contain unreported country dummies and lags of a crisis dummy, a program dummy, the unemployment rate, potential growth, the output gap, public debt, and the structural balance. A reform is an increase in the indicator. Sample period: 2006-2016, yearly observations. t-statistics in parentheses: * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 8: Instrumental variables regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: change in reform responsiveness rate					
OIS 1 Week	-0.071** (-2.4)					
OIS 1 Month		-0.073** (-2.4)				
OIS 3 Month			-0.075** (-2.4)			
OIS 1 Year				-0.082** (-2.3)		
OIS 2 Years					-0.082** (-2.1)	
OIS 10 Years						-0.037 (-0.5)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	136	136	136	136	136	136
F-stat. second stage	14.58	14.29	13.65	11.99	11.06	19.16
F-stat. weak identification	17.72	16.90	15.27	11.49	10.24	6.27
p-value overidentification	0.99	0.96	0.91	0.67	0.45	0.02
Shea's partial R2	0.23	0.22	0.21	0.16	0.14	0.07

Notes: Two-stage least squares with OIS rates instrumented using lag 0 and 1 of unweighted common monetary policy shocks. All models contain unreported country dummies and a crisis dummy, a program dummy, the unemployment rate, potential growth, the output gap, public debt, and the structural balance. A reform is an increase in the indicator. Sample period: 2006-2016, yearly observations. Robust t-statistics in parentheses: * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 9: Controlling for the monetary stance

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: change in reform responsiveness rate						
Monetary shock, t	-0.318** (-2.6)	-0.307** (-2.5)	-0.294** (-2.4)	-0.270** (-2.2)	-0.280** (-2.3)	-0.334** (-2.2)
Monetary shock, t-1	-0.286* (-1.9)	-0.283* (-1.9)	-0.276* (-1.8)	-0.264* (-1.7)	-0.272* (-1.8)	-0.258 (-1.6)
OIS 1 Week, t-1	-0.055*** (-4.1)					
OIS 1 Month, t-1		-0.054*** (-4.0)				
OIS 3 Months, t-1			-0.051*** (-3.8)			
OIS 1 Year, t-1				-0.041*** (-3.0)		
OIS 2 Years, t-1					-0.034** (-2.4)	
OIS 10 Years, t-1						-0.026 (-1.3)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	136	136	136	136	136	136
Chi2 of regression	418.28	423.95	440.51	482.99	503.26	611.07
p-value joint test	0.027	0.032	0.042	0.07	0.067	0.097

Notes: FGLS with standard errors adjusted for heteroskedasticity and autocorrelation of order 1. All models contain unreported country dummies and lags of a crisis dummy, a program dummy, the unemployment rate, potential growth, the output gap, public debt, and the structural balance. A reform is an increase in the indicator. The p-value at the bottom of the table refers to testing the joint significance of the monetary policy shocks. Sample period: 2006-2016, yearly observations. t-statistics in parentheses: * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 10: Predictive regressions

	(1)	(2)	(3)	(4)
Dependent variable: monetary policy shock, t				
Output gap, t-1	0.003 (1.2)			-0.002 (-0.4)
Inflation, t-1		0.009 (1.4)		0.013* (1.9)
Unemployment, t-1			-0.004 (-1.4)	-0.003 (-0.6)
Observations	304	304	323	288
R2	0.01	0.01	0.01	0.03

Notes: Fixed effects regression with clustered standard errors. t-statistics in parentheses: * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 11: Impact of cleaned monetary policy shocks on reforms

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: change in reform responsiveness rate						
<i>Cleaned monetary shocks</i>						
Forecasting residual, t	-0.236*** (-2.8)	-0.265*** (-3.1)	-0.276*** (-3.4)			
Forecasting residual, t-1	-0.276*** (-3.1)	-0.296*** (-3.3)	-0.327*** (-3.7)			
Residual AR(1), t				-0.157** (-2.0)	-0.193** (-2.2)	-0.283*** (-3.0)
Residual AR(1), t-1				-0.174** (-2.1)	-0.200** (-2.2)	-0.312*** (-3.1)
<i>Control variables</i>						
Crisis dummy, t and t-1	Yes	Yes	Yes	Yes	Yes	Yes
Output gap, t and t-1	Yes	Yes	Yes	Yes	Yes	Yes
Struct. balance, t and t-1	Yes	Yes	Yes	Yes	Yes	Yes
Program dummy, t and t-1		Yes	Yes		Yes	Yes
Unemployment, t and t-1			Yes			Yes
Observations	136	136	136	136	136	136
Chi2 of regression	362.91	317.98	674.32	511.15	460.40	388.33

Notes: FGLS with standard errors adjusted for heteroskedasticity and autocorrelation of order 1. All models contain unreported country dummies. A reform is an increase in the indicator. Sample period: 2006-2016, yearly observations. t-statistics in parentheses: * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 12: Alternative reform measures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable:									
	Change in OECD employment protection legislation			Change in OECD product market regulation			Change in IMF major reforms		
Monetary shock, t	0.02 (1.01)	0.05** (2.24)	0.07*** (2.59)	-0.01 (-0.28)	-0.00 (-0.06)	-0.02 (-0.46)	0.16 (0.73)	0.20 (0.69)	0.17 (0.56)
Monetary shock, t-1	0.10*** (3.56)	0.10*** (3.91)	0.11*** (3.83)	-0.02 (-0.56)	-0.02 (-0.43)	-0.01 (-0.34)	-0.39 (-1.60)	-0.46* (-1.76)	-0.46* (-1.74)
<i>Control variables</i>									
Crisis dummy, t and t-1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Output gap, t and t-1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Struct. balance, t and t-1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program dummy, t and t-1		Yes	Yes		Yes	Yes		Yes	Yes
Unemployment, t and t-1			Yes			Yes			Yes
Observations	172	172	172	195	195	195	169	169	169
Chi2 of regression	179.65	247.03	173.32	99.20	99.85	114.14	24.89	25.62	25.51

Notes: FGLS with standard errors adjusted for heteroskedasticity and autocorrelation of order 1. All models contain unreported year dummies. The dependent variable is an OECD employment protection index in columns (1)-(3) and an OECD product market regulation index in columns (4)-(6). For these indicators, a reform is a decrease in the dependent variable. For the indicator variable based on IMF major reforms in employment protection legislation, unemployment benefits or product market regulation in columns (7)-(9), a reform is an increase in the dependent variable. Sample period: 2000-2013, yearly observations. t-statistics in parentheses: * p < 0.1, ** p < 0.05, *** p < 0.01.