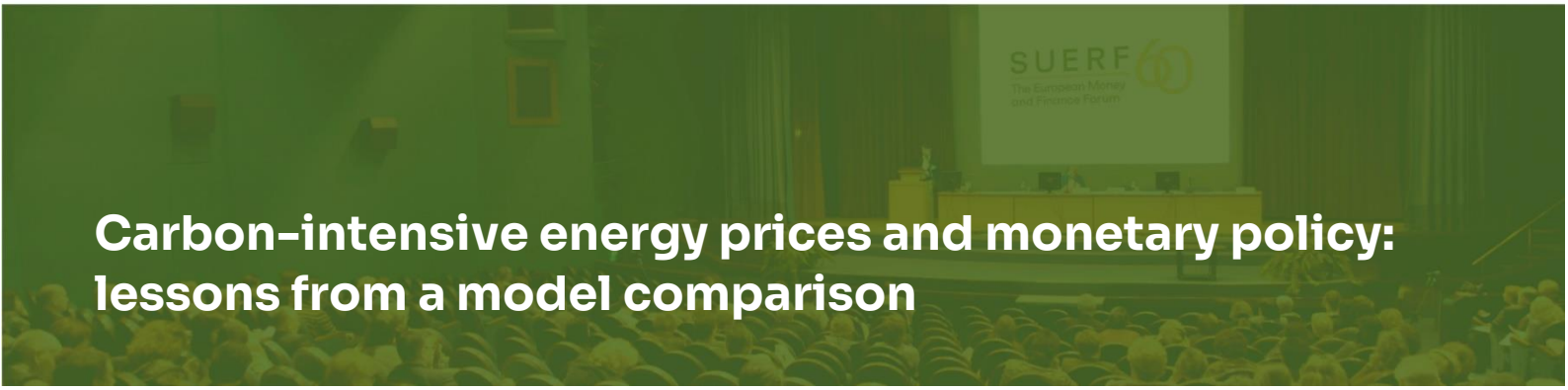
SUERF
The European Money and Finance Forum

SUERF Policy Brief
No 1528, July 2026



Carbon-intensive energy prices and monetary policy: lessons from a model comparison

Author(s)

Matthias Burgert | Swiss National Bank
Matthieu Darracq Pariès | European Central Bank (ECB)
Luigi Durand | Central Bank of Chile
Mario González | Central Bank of Chile
Romanos Priftis | European Central Bank (ECB)
Oke Röhe | Deutsche Bundesbank
Matthias Rottner | Bank for International Settlements (BIS), Deutsche Bundesbank
Edgar Silgado-Gómez | Banco de España
Nikolai Stähler | Deutsche Bundesbank
Janos Varga | European Commission

Keywords: carbon-intensive energy, energy price shocks, inflation, monetary policy, multi-sector models, climate transition

JEL codes: C54, E52, H23, Q43

Abstract

Carbon-intensive energy price increases can pose a significant challenge for central banks as they affect inflation and thus central banks in ensuring their price-stability mandate. We compare the responses of six institutional multi-sector macroeconomic models used by central banks and international organisations to assess how carbon-intensive energy price shocks propagate through the economy. For a temporary shock, the models deliver a robust, common message: inflation increases sharply, monetary policy tightens, and output declines, with differences mainly in timing and magnitude. For a permanent increase, inflation outcomes are less clear-cut and depend crucially on how monetary policy interprets the associated decline in potential output.

Disclaimer: This policy brief is based on ECB Working Paper Series, No 3192. The views, opinions, findings, and conclusions or recommendations expressed in this paper are strictly those of the authors. They do not necessarily reflect the views of the Banco de España, Bank for International Settlements (BIS), the Central Bank of Chile, the Deutsche Bundesbank, the European Central Bank, the European Commission, the Swiss National Bank, or the Eurosystem.

The transition towards a green economy is essential to address climate change. At the same time, it can pose significant challenges for central banks, as it may affect inflation dynamics and thus complicate the pursuit of price stability. Energy price shocks are among the most important channels through which climate policy, geopolitical tensions and the transition away from fossil fuels can shape macroeconomic outcomes. A key insight is that these effects cannot be fully understood without taking sectoral developments into account. Climate policies, for example, may affect some sectors much more strongly than others, with potentially important implications for financial stability, monetary policy transmission, and aggregate growth (e.g., Aguilar et al., 2023).

Our paper (Burgert et al., 2025a) studies this issue through a model comparison exercise, which helps to account for model uncertainty. When different models point to similar mechanisms, the resulting policy message is more robust. At the same time, differences across models are informative in their own right, as they highlight where results depend on modelling choices and where uncertainty is particularly high. Finally, the range of outcomes supports a more realistic assessment of the economic impacts.

Our comparison brings together several institutional multi-sector macroeconomic models developed at central banks and international organisations: BIS-MS (Burgert et al., 2025b), SEEM (Beltran et al., 2024), C-EAGLE (Garcia et al., 2026), EMuSe (Hinterlang et al., 2023), NAWM-E (Coenen et al., 2024) and E-QUEST (Varga et al., 2022). While these models differ along several dimensions, including country coverage, sectoral structure, energy modelling and nominal rigidities, they share a detailed representation of sectoral linkages, particularly those related to the energy sector. As New Keynesian models, they are well suited to analysing inflation dynamics and the monetary policy response to exogenous shocks. More broadly, this class of models has become increasingly important for central banks assessing the macroeconomic implications of the green transition (e.g., Nakov and Thomas (2023), Olovsson and Vestin (2023), Ferrari and Nispi Landi (2024), Sahuc et al. (2024), Kaldorf and Rottner (2025) among many others).

The multi-sector models of this study are used to analyse both temporary and permanent increases in energy prices. In the temporary shock scenario, the models point to a broadly consistent pattern: inflation rises while output falls. This creates a familiar but uncomfortable policy trade-off. A forceful monetary policy response can help contain inflationary pressures but also dampens real activity. In case of a permanent energy price increase, the real effects are more persistent. The inflation response, however, depends crucially on how monetary policy interprets the associated decline in potential output.

Temporary increase in carbon-intensive energy price

The first exercise considers a temporary 25% increase in the price of carbon-intensive energy in the euro area. The shock lasts for four quarters before gradually fading. While the models differ in how they implement the shock, the exercise is harmonised around a common target path for the carbon-intensive energy price.[1]

Figure 1 shows that inflation consistently increases across all models on impact. The average response is around 2 percentage points, with most models reaching a peak between 2 and 3 percentage points. The shock is therefore clearly inflationary in the short run. In most models, however, the inflation response is relatively short-lived: inflation gradually returns towards the baseline after a few quarters as the energy price shock fades. Simultaneously, output falls, with an average decline of about 0.3%.

Monetary policy tightens following the energy price shock, which is transmitted through sectoral energy and production linkages. The policy rate increases in all models, in line with the central bank's reaction to the rise in headline inflation. On average, it remains elevated for several quarters before gradually returning to baseline as inflationary pressures subside.

[1] For instance, while some models might attribute the shock exclusively to oil others might also account for other sources of carbon-intensive energy, such as coal and gas, which is an input of electricity production.

Across all models, the qualitative responses are consistent: inflation rises, monetary policy tightens, and output declines. The main differences concern timing and magnitude. In some models, inflation peaks immediately, while others imply a more gradual pass-through from energy costs to consumer prices. This reflects differences in how energy enters production and consumption, the degree of price and wage stickiness, and the structure of sectoral linkages.

Figure 1. Temporary carbon-intensive energy price shock: mean and range across models.

Responses of euro area inflation, real output and the policy rate to a temporary 25% increase in carbon-intensive energy prices

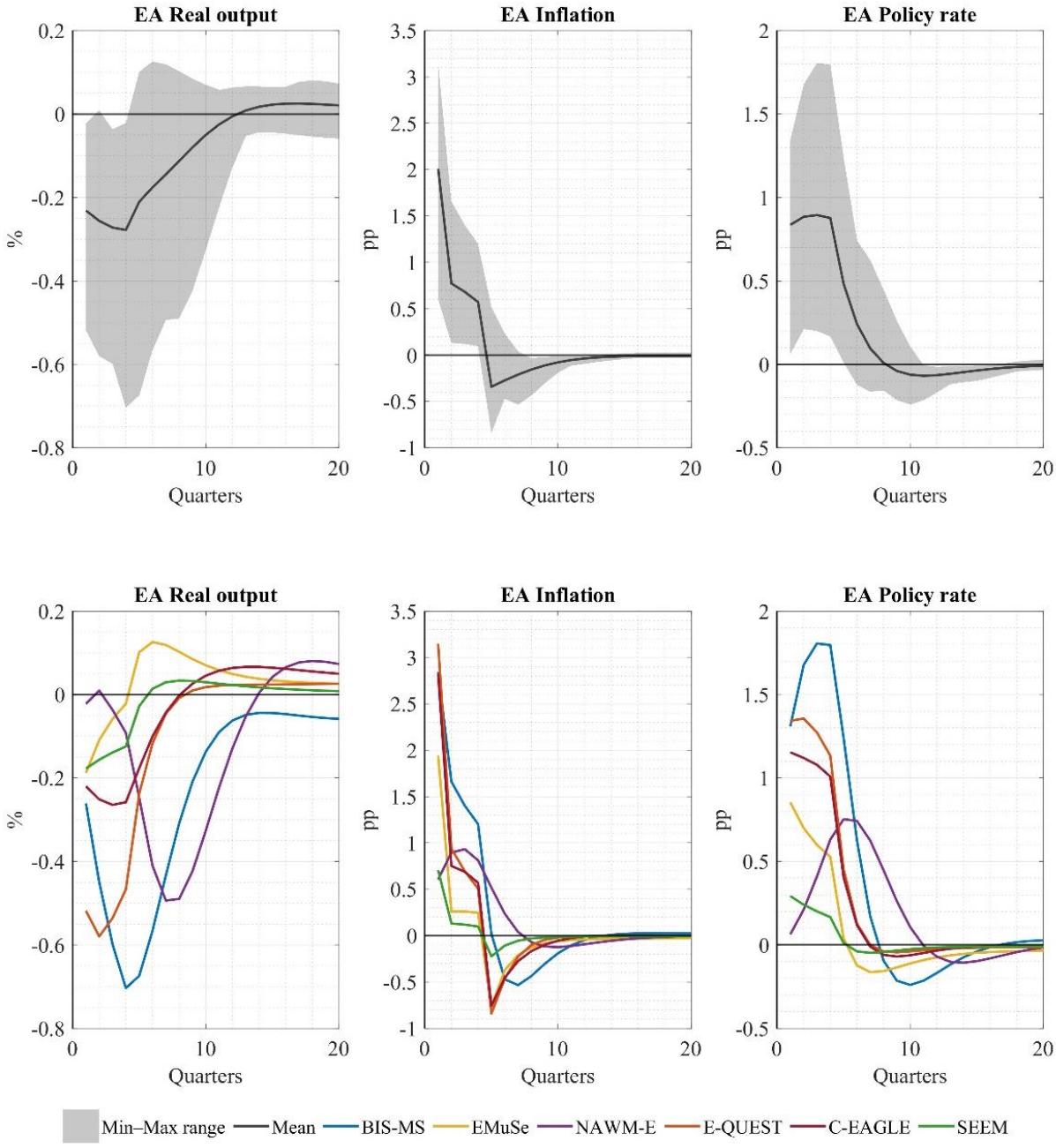
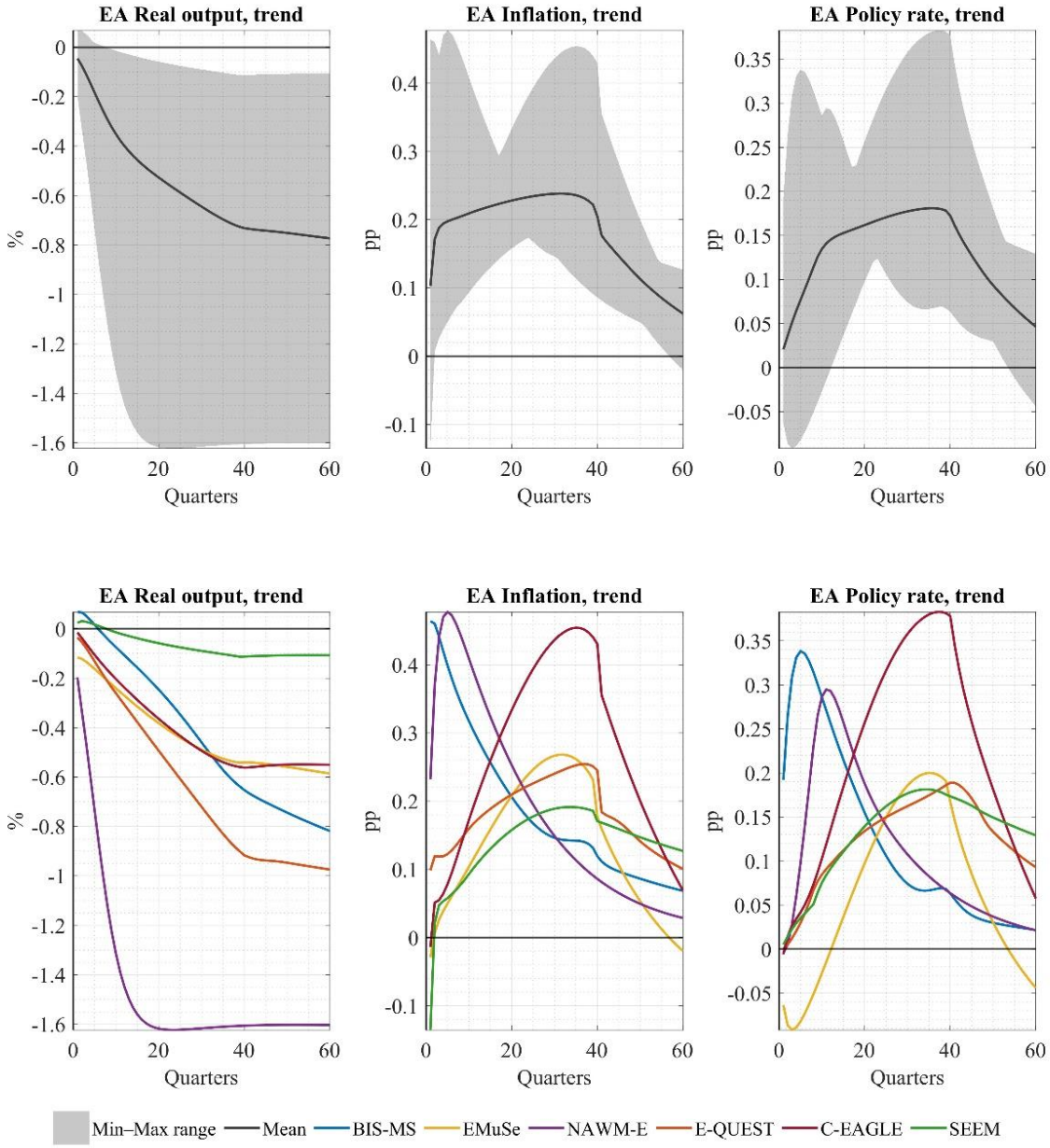


Figure 2. Permanent carbon-intensive energy price shock: mean, range and model-specific responses.
Responses of euro area inflation, real output and the policy rate to a permanent 25% increase in carbon-intensive energy prices, when monetary policy targets output relative to a slowly adjusting long-run trend.



Permanent increase in carbon-intensive energy price

The second exercise considers a permanent increase in carbon-intensive energy price, which is constructed by gradually increasing the price of carbon-intensive energy by 25% over ten years.

As shown in Figure 2, the permanent shock leads to a persistent decline in real output. In the model comparison, average output is still around 0.7% below baseline after 40 quarters. This is the key real-side effect of a permanent energy price increase. The figure also suggests that a permanent price increase is associated with an inflation surge.

The inflation response is, however, less clear-cut and depends strongly on the monetary policy rule. Different rules can reflect, in part, how the central bank perceives the transition to a new, lower level of potential output. If, for example,

monetary policy fully and immediately accounts for the lower future level of output, it can lead the central bank to provide relatively less stimulus to aggregate demand. However, this reduction does not fully compensate for the contraction in consumption and investments arising from the anticipated lower future income, eventually leading to deflation in equilibrium. If, instead, the adjustment to the lower long-run level of output is perceived as gradual, the central bank provides more accommodation, leading to an inflationary outcome, as shown in Figure 2.

Conclusion

Carbon-intensive energy price shocks pose a recurring challenge for monetary policy. When the shock is temporary, the main difficulty is managing a short-run trade-off: inflation rises sharply while output falls. Monetary policy can help contain inflationary pressures, but it cannot fully offset the price effect without imposing additional real costs. When the shock is permanent, the impact is less clear. While the economy moves towards a lower level of output, inflation dynamics depend on how monetary policy responds and measures the transition. If policy targets output relative to a trend that adjusts only slowly, accommodation can support demand but also generate inflationary pressure. Recognising changes in potential output is therefore important to avoiding policy mistakes.

More generally, changes in carbon-intensive energy prices require careful macroeconomic diagnosis. The key questions are not only whether energy prices rise, but whether the increase is temporary or permanent, how it propagates across sectors, and how monetary policy responds.

References

Aguilar, P., B. González and S. Hurtado (2023): "Green Policies and Transition Risk Propagation in Production Networks," SUERF Policy Brief, No. 515.

Beltrán, F., L. Durand, M. González-Frugone, and J. Moreno (2024): "A preliminary assessment of the economic effects of energy and climate in Chile," Latin American Journal of Central Banking, 100146.

Burgert, M., M. Darracq Pariès, L. Durand, M. González, R. Priftis, O. Röhe, M. Rottner, E. Silgado-Gómez, N. Stähler, and J. Varga (2025a): "Macroeconomic effects of carbon-intensive energy price changes: a model comparison," BIS Working Papers, No 1313.

Burgert, M., G. Cornelli, B. Erik, B. Mojon, D. Rees, and M. Rottner (2025b): "The BIS multisector model: a multi-country environment for macroeconomic analysis," BIS Working Papers, No 1297.

Coenen, G., M. Lozej, and R. Priftis (2024): "Macroeconomic effects of carbon transition policies: An assessment based on the ECB's New Area-Wide Model with a disaggregated energy sector," European Economic Review, 167(C).

Ferrari, A. and V. Nispi Landi (2024): "Will the green transition be inflationary? Expectations matter," IMF Economic Review, 1–64.

García-Sánchez, P., P. Jacquinot, Č. Lenarčič, K. Mavromatis, N. Papadopoulou, and E. Silgado-Gómez (2026): "Green Transition in the Euro Area: Domestic and Global Factors," European Economic Review, 182.

Hinterlang, N., A. Martin, O. Röhe, N. Stähler, and J. Strobel (2023): "The Environmental Multi-Sector DSGE model EMuSe: A technical documentation," Deutsche Bundesbank Technical Paper, 03/2023.

Kaldorf, M. and M. Rottner (2025): "Climate Minsky moments and endogenous financial crises," BIS Working Papers, No 1248.

Nakov, A. and C. Thomas (2023): "Climate-conscious monetary policy," ECB Working Paper, No 2845.

Olovsson, C., and D. Vestin (2025): "Greenflation?," European Economic Review, 105237.

Sahuc, J.-G., F. Smets, and G. Vermandel (2024): "The New Keynesian Climate Model," Banque de France Working Paper, No 977.

Varga, J., W. Roeger, and J. in 't Veld (2022): "E-QUEST: A multisector dynamic general equilibrium model with energy and a model-based assessment to reach the EU climate targets," Economic Modelling, 114, 105911.

About the author(s)

Matthias Burgert is a Senior Economist in the Monetary Policy Analysis Unit at the Swiss National Bank. Prior to joining the SNB in 2017, Matthias worked as research economist at the European Commission's Directorate General Economics and Financial Affairs (DG ECFIN). Matthias studied economics and statistics at Humboldt University Berlin and at ENSAE-Paris. He obtained a doctoral degree in economics from Goethe University Frankfurt in 2015. His research focuses on topics related to monetary economics, fiscal policy, real estate markets and DSGE modelling.

Matthieu Darracq Pariès is Deputy Head of the Forecasting and Policy Modelling Division of the European Central Bank.

Luigi Durand is currently a Senior Economist in the Medium-Term Projections Department of the Monetary Policy Division of the Central Bank of Chile, focusing on macroeconomic forecasting and applied research. His research interests are in international macroeconomics, economic growth, and environmental economics. Luigi received his PhD in Economics from Johns Hopkins University**.**

Mario González is a Senior Economist in the Modelling Department of the Monetary Policy Division at the Central Bank of Chile. His work focuses on the development and application of DSGE models to evaluate the impact of macroeconomic shocks and inform policy analysis. His research interests lie in macroeconomics, with a particular emphasis on international macroeconomics, financial markets, and environmental economics. Mario holds a PhD in Economics from the University of California, Santa Cruz (2017), where he also completed an MSc in Economics. He received his undergraduate degree in Business Administration from the Pontifical Catholic University of Chile.

Romanos Priftis is a Senior Economist in the Forecasting and Policy Modelling Division of the European Central Bank. He hold a Ph.D. in economics from the European University Institute. His research interests are climate change, the design of fiscal and monetary policies,DSGE modeling, and applied macro-econometrics.

Oke Röhe is Head of Section "Structural Issues – Euro Area" in the Directorate General Economics at Deutsche Bundesbank. He holds a PhD from the University of Regensburg. His main research interest is quantitative macroeconomics with a specific focus on productivity developments.

Matthias Rottner is an Economist at the Bank for International Settlements. He is currently on leave from the Bundesbank Research Centre. His research interests are in quantitative macroeconomics with a particular emphasis on monetary economics, macro-finance, environmental economics, and machine learning. He received his PhD in Economics from the European University Institute in 2021.

Edgar Silgado-Gómez is a Senior Research Economist at the Banco de España. His research focuses on macroeconomics, with particular emphasis on uncertainty, imperfect information, fiscal and monetary policy. He holds a Ph.D. in Economics and Finance from the University of Rome Tor Vergata.

Nikolai Stähler is an economist at Deutsche Bundesbank, Public Finance Division. He holds a Master's degree from the University of Regensburg and a Ph.D. in economics from Johannes Gutenberg-University Mainz. His research focuses on topics related to fiscal policy, labour and international economics as well as ageing.

Janos Varga is an Economist at the European Commission, Directorate General for Economic and Financial Affairs (DG ECFIN) where he is a member of the macroeconomic modelling team. He carries out model-based impact assessments using DG ECFIN's dynamic stochastic general equilibrium models. He obtained his postgraduate research degree in economics from the Central European University. Prior to joining the European Commission, he worked as Research Assistant at Collegium Budapest - Institute for Advanced Studies and Harvard University. His current research focuses on structural reforms, economic integration and cohesion policy assessment.

SUERF Policy Notes and Briefs disseminate SUERF Members' economic research, policy-oriented analyses, and views. They analyze relevant developments, address challenges and propose solutions to current monetary, financial and macroeconomic themes. The style is analytical yet non-technical, facilitating interaction and the exchange of ideas between researchers, policy makers and financial practitioners.

SUERF Policy Notes and Briefs are accessible to the public free of charge at https://www.suerf.org/publications/suerf-policy-notes-and-briefs/

The views expressed are those of the authors and not necessarily those of the institutions the authors are affiliated with.

© SUERF – The European Money and Finance Forum. Reproduction or translation for educational and non-commercial purposes is permitted provided that the source is acknowledged.

Editorial Board: Ernest Gnan, David T. Llewellyn, Donato Masciandaro

Designed by the Information Management and Services Division of the Oesterreichische Nationalbank (OeNB)

SUERF Secretariat
c/o OeNB, Otto-Wagner-Platz 3A-1090 Vienna, Austria
Phone: +43 1 40 420 7206 E-Mail: suerf@oenb.at Website: https://www.suerf.org/