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Call for applications: Klaus Liebscher Economic Research Scholarship

Please e-mail applications to *scholarship@oenb.at* by the end of October 2021. Applicants will be notified of the jury's decision by end-November 2021.

The Oesterreichische Nationalbank (OeNB) invites applications for the "Klaus Liebscher Economic Research Scholarship." This scholarship program gives outstanding researchers the opportunity to contribute their expertise to the research activities of the OeNB's Economic Analysis and Research Department. This contribution will take the form of remunerated consultancy services.

The scholarship program targets Austrian and international experts with a proven research record in economics and finance, and postdoctoral research experience. Applicants need to be in active employment and should be interested in broadening their research experience and expanding their personal research networks. Given the OeNB's strategic research focus on Central, Eastern and Southeastern Europe, the analysis of economic developments in this region will be a key field of research in this context.

The OeNB offers a stimulating and professional research environment in close proximity to the policymaking process. The selected scholarship recipients will be expected to collaborate with the OeNB's research staff on a prespecified topic and are invited to participate actively in the department's internal seminars and other research activities. Their research output may be published in one of the department's publication outlets or as an OeNB Working Paper. As a rule, the consultancy services under the scholarship will be provided over a period of two to three months. As far as possible, an adequate accommodation for the stay in Vienna will be provided.[1]

Applicants must provide the following documents and information:

- a letter of motivation, including an indication of the time period envisaged for the consultancy
- a detailed consultancy proposal
- a description of current research topics and activities
- an academic curriculum vitae
- an up-to-date list of publications (or an extract therefrom)
- the names of two references that the OeNB may contact to obtain further information about the applicant
- evidence of basic income during the term of the scholarship (employment contract with the applicant's home institution)
- written confirmation by the home institution that the provision of consultancy services by the applicant is not in violation of the applicant's employment contract with the home institution

[1] *We assume that the coronavirus crisis will abate in the course of 2021. We are also exploring alternative formats to continue research cooperation under the scholarship program for as long as we cannot resume visits due to the pandemic situation.*

Nontechnical summaries in English and German

Nontechnical summaries in English

How effective were measures introduced in the COVID-19 crisis in supporting household incomes?

Susanne Maidorn, Lukas Reiss

We analyze how the COVID-19 crisis has affected the distribution of income in Austria using a microsimulation model developed by the Office of the Fiscal Advisory Council (FISKSIM). Starting point: In 2020, more than one-third of Austrian households were affected, at least temporarily, by unemployment, short-time work or lower self-employed income. The Austrian government introduced fiscal measures to support household incomes, which, overall, clearly cushioned the financial impact of the crisis on households. We find that, by comparison, lower-income households benefited more strongly from relief payments, mainly because of measures that were specifically targeted at low-income earners, such as payments from the family hardship fund, and additional support for the unemployed. Within the different income groups, households that suffered larger financial losses because of the pandemic, on average, benefited the most from COVID-19 relief in Austria, particularly from instruments specifically designed to compensate for such losses (e.g. the hardship fund and family hardship fund). Indirectly, this also applies to the use of short-time work, which helped avoid higher income losses caused by unemployment.

Corporate equity finance in Austria – impediments and possible improvements

Peter Breyer, Eleonora Endlich, Dieter Huber, Doris Oswald, Christoph Prenner, Lukas Reiss, Martin Schneider, Walter Waschiczek

This study gives an overview of the role equity – as opposed to debt – plays in the funding of Austrian companies. Essentially, we address the challenges companies face in raising equity in Austria and present ways forward, including international best practices. In greater detail, we first discuss the equity ratios of Austrian companies before and after the onset of the COVID-19 pandemic. Austrian businesses had been steadily increasing equity funding in the years before the pandemic, and their equity ratios even caught up with the international average. Naturally, the pandemic has since been weighing considerably on the equity levels of Austrian companies. The decrease would, however, be twice as high in the absence of the support measures taken to cushion the economic effects of the pandemic. Second, we show that ownership of Austrian corporate equity is broadly distributed across all economic sectors. The bulk of Austrian companies' equity is sourced from the rest of the world and from the domestic private sector, i.e. households and private foundations, while the financial sector plays only a minor role in providing equity. Third, we discuss what makes equity financing difficult, drawing on the results of a structured OeNB survey conducted with businesses and other stakeholders and on talks with international institutional investors. Why would business owners hesitate to raise capital externally? For example, they may be reluctant to share control with external investors and may face information deficits and data gaps as well as differences in the tax treatment of debt and equity. On the supply side, equity is limited because investors lack information on the economic situation of capital-seeking companies and because investments in unlisted companies are less liquid. Fourth, we outline possible avenues for strengthening corporate equity in Austria. Cases in point, which were identified together with representatives of national and international institutions and market participants, include providing both tax incentives and intermediation support for equity finance and establishing public-private partnerships.

The impact of climate change on monetary policy

Andreas Breitenfellner, Wolfgang Pointner

Climate change poses risks to the stability of economic and financial systems. These risks affect the mission of central banks to maintain monetary and financial stability. Hence, the aim of this article is to clarify to what extent central banks may, can and should take climate change into account in monetary policy decision-making. Rising temperatures, extreme weather events and the political and technological responses to climate change may have significant effects on prices, output or financial markets. Monetary policymakers need to reflect these effects in their assessment of inflationary risks. These effects might also decrease the natural rate of interest, thus reducing central banks' room for maneuver in monetary policy. At the same time, climate change increases uncertainty about future economic developments as global warming drives global temperatures to new record highs, making the resulting environmental, social and financial impacts difficult to estimate. Without prejudice to the objective of price stability, the Eurosystem's

monetary policy mandate also provides for the support of general economic policies in the European Union. These general economic policies include achieving a high level of environmental protection. However, this is not to say that central banks should steer climate policy; this responsibility lies with governments and parliaments. Through carbon taxes, emissions trading schemes, direct regulations or green industrial policies, governments and parliaments can support the transition to a carbon-neutral economy more effectively and efficiently than monetary policymakers would be able to. Especially fiscal policy can and should correct market failure in pricing emissions harmful to the climate by setting carbon prices. Cost transparency and a well-managed transition would also lower the risks to financial stability. Managing climate-related financial risks is a challenge for financial institutions and central banks, but financial markets can only function efficiently when these risks are correctly priced. Monetary policy has a range of tools at its disposal that may be used to fight climate change. The framework for credit operations, collateral policies, asset purchases or asset quality assessment and disclosure could be adjusted to reflect climate-related risks and to contribute to the decarbonization of the economy. Although monetary policy activities have until now been governed by the principle of market neutrality, it is becoming increasingly clear that it would not be meaningful to stick to strict market neutrality in view of climate-related forms of market failure. A good starting point for central banks would appear to adopt a risk-oriented approach. In this spirit, one of the goals of the ECB's new monetary policy strategy is to incorporate climate factors in its monetary policy analyses. Moreover, the ECB will adjust its operational framework for monetary policy with regard to disclosure, risk assessment, asset purchases and the collateral framework. Climate-aware policies have also been embraced by central banks beyond the euro area, including Sveriges Riksbank (which leans toward a risk-based approach) and the Bank of England (which leans toward a proactive approach). Whatever approach central banks choose, outcomes might be similarly ambitious. In any case, financial market supervision and monetary policy will complement but never replace governments' decarbonization efforts. Our contemplations square well with the ECB's action plan, which is a result of its monetary policy strategy review and which was presented in July 2021. In this action plan, the Governing Council of the ECB commits to further incorporating climate change considerations into its monetary policy framework and operations. In order to achieve a climate-neutral economy by the mid-21st century, all public and private economic actors will have to contribute according to their capabilities.

Nontechnical summaries in German

Treffsicherheit der Maßnahmen zur Stützung der Haushaltseinkommen während der COVID-19-Krise in Österreich

Susanne Maidorn, Lukas Reiss

Die vorliegende Studie analysiert die Verteilungswirkungen der COVID-19-Krise auf Basis des Mikrosimulationsmodells des Büros des Fiskalrats (FISKSIM). Mehr als ein Drittel der österreichischen Haushalte war im Jahr 2020 zumindest temporär von Arbeitslosigkeit, Kurzarbeit oder von Verlusten an Selbstständigeneinkommen betroffen. Die fiskalischen Maßnahmen zur Stützung der Haushaltseinkommen federten die Effekte der Krise insgesamt deutlich ab. Zudem haben niedrige Einkommen relativ stärker von den geleisteten Auszahlungen profitiert. Dies lag vor allem an Maßnahmen, die explizit auf niedrige Einkommen ausgerichtet waren, wie der Familienhärteausgleich, oder gezielt bei Arbeitslosigkeit ausgezahlt wurden. Gleichzeitig profitierten innerhalb der verschiedenen Einkommensgruppen jene Haushalte stärker, die durch den COVID-19-Schock stärkere finanzielle Verluste erlitten hatten. Hierzu trugen vor allem jene Maßnahmen bei, die auf eine Kompensation dieser Verluste ausgerichtet waren, wie der Härtefallfonds und der Familienhärteausgleich. Indirekt trifft das auch für die Inanspruchnahme der Kurzarbeit zu, durch die höhere Einkommensverluste im Fall von Arbeitslosigkeit vermieden werden konnten.

Eigenkapitalausstattung österreichischer Unternehmen – Hindernisse und Handlungsoptionen

Peter Breyer, Eleonora Endlich, Dieter Huber, Doris Oswald, Christoph Prenner, Lukas Reiss, Martin Schneider, Walter Waschiczek

Diese Studie gibt einen Überblick über die Eigenkapitalausstattung österreichischer Unternehmen und zeigt aktuell bestehende Hemmnisse in der Eigenkapitalfinanzierung sowie Optionen zu deren Überwindung auf. Sie gliedert sich in vier Teile: Der erste Abschnitt betrachtet die Eigenkapitalausstattung der österreichischen Unternehmen vor und während der COVID-19-Pandemie. Dabei zeigt sich, dass sich die Eigenkapitalquote der Unternehmen in Österreich in den Jahren vor der Pandemie stetig verbessert hat und mittlerweile im internationalen Durchschnitt liegt. Allerdings dürfte die COVID-19-Pandemie auch unter Berücksichtigung aller derzeit bekannten Hilfsmaßnahmen die Eigenkapitalausstattung der österreichischen Unternehmen deutlich reduzieren, ohne Hilfsmaßnahmen würde sie allerdings doppelt so stark sinken. Im zweiten Teil wird gezeigt, dass die Eigenkapitalgeber der österreichischen Unternehmen breit über alle volkswirtschaftlichen Sektoren gestreut sind. Die Eigenkapitalaufbringung des österreichischen Unternehmenssektors erfolgt zu einem wesentlichen Teil aus dem Ausland und von inländischen Privaten, bestehend aus privaten Haushalten und Privatstiftungen, während der Anteil des Finanzsektors am Eigenkapitalaufkommen relativ gering ist. Im dritten Teil werden aktuelle Hemmnisse betreffend die Aufbringung von Eigenkapital diskutiert, basierend auf einer strukturierten Befragung relevanter Interessensverbände und Unternehmen sowie Gesprächen mit internationalen institutionellen Investoren. Hemmnisse betreffend die Nachfrage der Unternehmen nach Eigenkapital umfassen etwa die Ablehnung der Einflussnahme durch externe Investoren, Informations- und Datendefizite seitens der Unternehmen und die steuerliche Diskriminierung von Eigenkapital gegenüber Fremdkapital. Das Angebot von Eigenkapital wird durch Informationsdefizite bezüglich der wirtschaftlichen Lage kapitalsuchender Unternehmen, die geringe Liquidität einer Beteiligung an nicht börsennotierten Unternehmen sowie fehlendes Finanzwissen auf Investorenseite beeinträchtigt. Im vierten Teil werden Möglichkeiten zur Stärkung der Eigenkapitalbasis von Unternehmen in Österreich skizziert. In den Gesprächen mit Expertenorganisationen und Marktteilnehmern wurden als mögliche Maßnahmen zur Stärkung der Eigenkapitalausstattung vor allem steuerliche Fördermaßnahmen, Investitionen in Eigenkapital durch Intermediäre sowie staatliche Unterstützungsmaßnahmengenannt.

Die Auswirkungen des Klimawandels auf die Geldpolitik

Andreas Breitenfellner, Wolfgang Pointner

Der Klimawandel ist eine grundlegende Herausforderung für die Stabilität von Volkswirtschaften und Finanzmärkten. Notenbanken, deren Auftrag die Wahrung dieser Stabilität ist, müssen sich mit daher mit dem Klimawandel und seinen Folgen beschäftigen. In diesem Artikel wollen wir daher die Fragen beantworten: Inwieweit darf, kann und soll die Geldpolitik der Notenbanken den Klimawandel in ihre Entscheidungen einbeziehen? Steigende Temperaturen, extreme Wetterereignisse und die politischen und technologischen Reaktionen auf den Klimawandel können erhebliche

Auswirkungen auf Preise, Produktion oder Finanzmärkte haben. Die Geldpolitik muss diese Auswirkungen bei ihrer Beurteilung der Risiken für die Preisstabilität berücksichtigen. Diese Auswirkungen können auch den Gleichgewichtszinssatz verringern, was den geldpolitischen Spielraum der Zentralbanken einschränken würde. Der Klimawandel erhöht auch die Unsicherheit über die künftige Entwicklung der Wirtschaft, da die globale Erwärmung Temperaturen erreichen wird, die noch nie gemessen wurden, und deren ökologische, soziale und finanzielle Effekte daher nicht gut abschätzbar sind. Soweit dies ohne Beeinträchtigung des Preisstabilitätsziels möglich ist, sieht das Mandat des Eurosystems vor, dass die Geldpolitik des Eurosystems auch die allgemeine Wirtschaftspolitik in der Union unterstützt. Zu diesen Zielen der allgemeinen Wirtschaftspolitik zählt auch ein hohes Maß an Umweltschutz und Verbesserung der Umweltqualität. Zentralbanken machen aber keine Klimapolitik, das ist die Aufgabe von Regierungen und Parlamenten. Diese können durch CO_2-Steuern, Emissionshandelssysteme, direkte Regulierungen oder grüne Industriepolitik den Übergang zu einer CO_2-neutralen Wirtschaft effektiver und effizienter unterstützen als die Geldpolitik. Insbesondere die Fiskalpolitik kann und soll durch CO_2-Preise das Marktversagen bei der Bepreisung von klimaschädlichen Emissionen korrigieren. Kostenwahrheit und ein gut gemanagter Übergang würden auch die Risiken für die Finanzmarktstabilität verringern. Das Management dieser klimabedingten Finanzrisiken ist eine Herausforderung für Finanzinstitute und Notenbanken, denn nur wenn diese Risiken auch korrekt bepreist werden, können Finanzmärkte effizient funktionieren. Der Geldpolitik stehen mehrere Instrumente zur Verfügung, die zur Bekämpfung des Klimawandels eingesetzt werden könnten. Der Rahmen für Kreditgeschäfte, Sicherheitenpolitik, Wertpapierkäufe oder die Bewertung und Offenlegung der Qualität von Vermögenswerten könnte angepasst werden, um klimabedingten Risiken Rechnung zu tragen und damit zur Dekarbonisierung der Wirtschaft beizutragen. Während bisher die geldpolitischen Aktivitäten dem Grundsatz der Marktneutralität unterworfen waren, setzt sich die Erkenntnis durch, dass dies angesichts der klimabedingten Marktversagensformen wenig zielführend wäre. Ein risikoorientierter Ansatz der Zentralbanken scheint ein guter Ausgangspunkt zu sein. In diesem Sinne beinhaltet die neue geldpolitische Strategieerklärung der EZB das Ziel, dass Klimafaktoren in künftige geldpolitische Analysen einfließen werden. Auch in Bezug auf Offenlegung, Risikobewertung, Ankauf von Vermögenswerten und dem Sicherheitenrahmen werden Anpassungen angestrebt. Auch außerhalb des Euroraums gibt es Beispiele für unterschiedliche Ansätze klimabewusster Geldpolitik, z. B. die schwedische Riksbank oder die Bank of England. Welchen Ansatz die Zentralbanken auch immer wählen, Finanzmarktaufsicht und Geldpolitik werden die Dekarbonisierungsbemühungen der Regierungen ergänzen, aber können diese niemals ersetzen. Unsere Überlegungen passen gut zu dem kürzlich vorgelegten Aktionsplan der EZB, der ein Ergebnis der jüngsten Überprüfung der geldpolitischen Strategie ist. Der EZB-Rat zeigt sich damit entschlossen, Klimaschutzaspekte stärker in seinen geldpolitischen Handlungsrahmen einfließen zu lassen, seine Analysekapazitäten im Hinblick auf den Klimawandel auszubauen und bei geldpolitischen Geschäften Klimaschutzaspekte zu berücksichtigen. Um bis Mitte des 21. Jahrhunderts eine klimaneutrale Wirtschaft zu erreichen, werden alle öffentlichen und privaten Wirtschaftsakteure entsprechend ihren Fähigkeiten dazu beitragen müssen.

Economic situation in Austria

Austrian economy growing strongly in mid-2021

Friedrich Fritzer, Martin Schneider, Richard Sellner, Klaus Vondra[1]

The Austrian economy continued to recover in mid-2021. In the second quarter, real GDP grew by 3.6% compared with the previous quarter as the easing of containment measures led to significant growth. At the same time, the construction and industry sectors experienced a slowdown. According to leading short-term indicators, strong growth is expected to continue in the third quarter. One of the reasons is that summer tourism might reach its pre-crisis levels much faster than anticipated due to the sharp increase in overnight stays of Austrian, German and Dutch guests. On the other hand, industry climate indicators as well as current export trends show first signs of cooling. Owing to supply bottlenecks and shortages in materials, manufacturing businesses are increasingly struggling to handle large amounts of orders. Compared to Austria, Germany is being hit significantly harder by these bottlenecks because of its position in the supply chain and the fact that the automotive industry plays a more important role in Germany's economy. Current economic projections point to growth between 3½% and 4% in 2021 and a growth rate of 4% to 5% in 2022. The fourth wave of the COVID-19 pandemic, however, poses a downside risk to the outlook. Following a marked increase of HICP inflation in Austria in the first five months of the year, the inflation rate remained at 2.8% in June and July 2021 and then climbed to 3.2% in August. The rise in inflation measured in 2021 to date was mainly driven by rising energy prices, which accounted for three-fourths of the increase. Close to one-fourth of the rise is attributable to nonenergy industrial goods and food, whereas the latest inflation rate for services was somewhat below the level measured in early 2021. By August, core inflation climbed to 2.5%, 0.5 percentage points beyond the January 2021 value.

1 Revision of national accounts: domestic economy recovered at a somewhat slower pace in the second quarter

The easing of pandemic restrictions in early 2021 led to a speedy recovery of the Austrian economy. *In the second quarter of 2021*, real GDP *grew by 3.6%* (quarter on quarter; real, seasonally and working-day adjusted). Growth was mostly driven by

Table 1

National accounts data for Austria (Q2 data published on September 2, 2021)

	GDP	Private consumption	Government consumption	Gross fixed capital formation	Exports	Imports	Domestic demand (without inventories)	Net exports	Changes in inventories	Statistical discrepancy
	Change on previous period in %						*Contribution to GDP growth in percentage points*			
Q1 20	–2.2	–3.4	+0.6	–0.3	–5.0	+0.2	–1.7	–3.0	2.0	0.5
Q2 20	–10.9	–12.4	+1.3	–8.4	–18.6	–16.8	–8.1	–1.4	–0.6	–0.9
Q3 20	+11.0	+14.8	+1.1	+7.7	+17.5	+11.8	9.5	3.0	–2.0	0.4
Q4 20	–2.5	–6.0	+1.7	–1.2	+1.2	+5.4	–3.0	–2.1	2.2	0.4
Q1 21	–0.2	–1.6	+1.2	+4.7	–2.9	+2.3	0.6	–2.9	1.9	0.2
Q2 21	+3.6	+3.2	+2.9	+1.8	+7.1	–2.1	2.6	5.0	–2.4	–1.7
2017	+2.5	+1.9	+0.9	+4.0	+5.7	+5.8	2.1	0.2	0.1	0.1
2018	+2.5	+1.1	+1.2	+4.0	+4.9	+4.6	1.7	0.3	0.4	0.1
2019	+1.4	+0.8	+1.4	+3.9	+2.9	+2.5	1.6	0.3	–0.7	0.2
2020	–6.3	–8.1	+2.4	–5.3	–11.5	–9.0	–5.0	–1.8	0.1	0.4

Source: Statistics Austria.

[1] *Oesterreichische Nationalbank, Economic Analysis Division, friedrich.fritzer@oenb.at, martin.schneider@oenb.at, richard.sellner@oenb.at, klaus.vondra@oenb.at.*

Table 2

National accounts data for Austria (production-side data published on September 2, 2021)

	Q2 21	Q1 21	Q4 20	Q3 20	Q2 20	Q1 20	2020	2019	2018	2017
	Change on previous period in %									
GDP	+3.6	–0.2	–2.5	+11.0	–10.9	–2.2	–6.3	+1.4	+2.5	+2.5
Gross value added	+4.0	0.0	–2.8	+10.6	–10.5	–2.2	–6.3	+1.4	+2.7	+2.6
Agriculture (NACE A)	+5.1	+2.9	–3.8	–2.3	–0.8	+0.7	–3.0	–1.0	+3.6	+5.6
Industry (NACE B–E)	–0.1	+4.3	+1.8	+11.9	–12.1	–1.1	–6.4	+1.2	+4.6	+4.1
Manufacturing (NACE B–E)	–0.4	+4.5	+1.6	+12.7	–12.9	–1.8	–7.2	+0.8	+5.2	+3.9
Construction (NACE F)	+0.3	+5.1	–0.1	+5.4	–6.9	–2.5	–4.1	+2.8	+1.8	+3.3
Services, total (NACE G–U)	+5.8	–2.0	–4.5	+11.1	–10.7	–2.6	–6.6	+1.4	+2.2	+2.0
Services, private (NACE G–N)	+7.9	–2.9	–5.8	+14.0	–13.3	–2.8	–8.0	+1.7	+2.8	+2.3
Trade, transport/storage, hospitality (NACE G–I)	+20.4	–7.4	–16.3	+29.2	–21.7	–6.9	–15.4	+1.1	+2.0	+1.5
Information and communication (NACE J)	–0.4	+2.9	+1.2	+0.5	–3.4	–1.4	–1.6	+3.8	+9.8	+2.1
Financial and insurance services (NACE K)	+0.8	–2.2	+1.9	+2.3	0.0	+2.6	+4.1	+3.1	+2.9	+5.3
Real estate activities (NACE L)	+1.0	+0.1	–0.2	–0.5	–0.7	+0.9	+1.0	+1.2	+1.1	+1.4
Scientific and technical activities (NACE M–N)	+0.6	+0.0	+5.9	+13.5	–18.4	–0.1	–7.9	+2.1	+3.6	+3.7
Public services (NACE O–U)	+0.9	+0.0	–1.3	+4.4	–3.9	–2.0	–2.9	+0.7	+0.7	+1.4
Public administration (NACE O–Q)	+0.7	+0.8	+0.4	+0.7	–0.6	–0.5	–0.4	+0.7	+0.9	+1.3
Other services (NACE R–U)	+2.6	–6.3	–12.9	+39.3	–26.8	–10.9	–18.3	+0.6	–0.4	+2.1

Source: OeNB.

exports, which rose by 7.1%, followed by private (+3.2%) and government consumption (+2.9%). Gross fixed capital formation lost its momentum and only grew by 1.8%, after its steep increase (+4.7%) in the first quarter. Imports fell by 2.1%, strengthening the growth of GDP.

On the output side, there are major differences between individual sectors. In the *service sector*, which was severely hit by the lockdown, the loosening of restrictions triggered a strong rebound in the second quarter. In the *wholesale and retail trade, transportation and storage* and *accommodation and food service activities* (NACE G–I), value added increased by 20.4% in real terms (quarter on quarter, seasonally and working-day adjusted). Although a breakdown by sectors is not available, employment data[2] suggest that growth was almost exclusively powered *by accommodation and food service activities* (NACE I), which had been hit particularly hard by the lockdown. *Construction* (NACE F) only increased marginally (+0.3%) in the second quarter following rapid growth in the first quarter (+5.1%), while *industry* (B–E) even recorded a slight decline in value added (–0.1%). This points to a significant shift in growth drivers in the second quarter.

2 GDP slightly surpassed its pre-crisis levels for the first time in late July

The Austrian economy continued to grow at a moderate pace at the beginning of the third quarter, as suggested by current results of the weekly OeNB GDP indicator.[3] In week 29 (July 19–25, 2021), Austrian output marginally surpassed its pre-crisis levels for the first time since the pandemic took hold. At +0.6%, it exceeded the rate recorded in the corresponding week of 2019. Still, average GDP in weeks 25–29 (June 21 to July 25, 2021) remained 0.6% below its pre-crisis level.

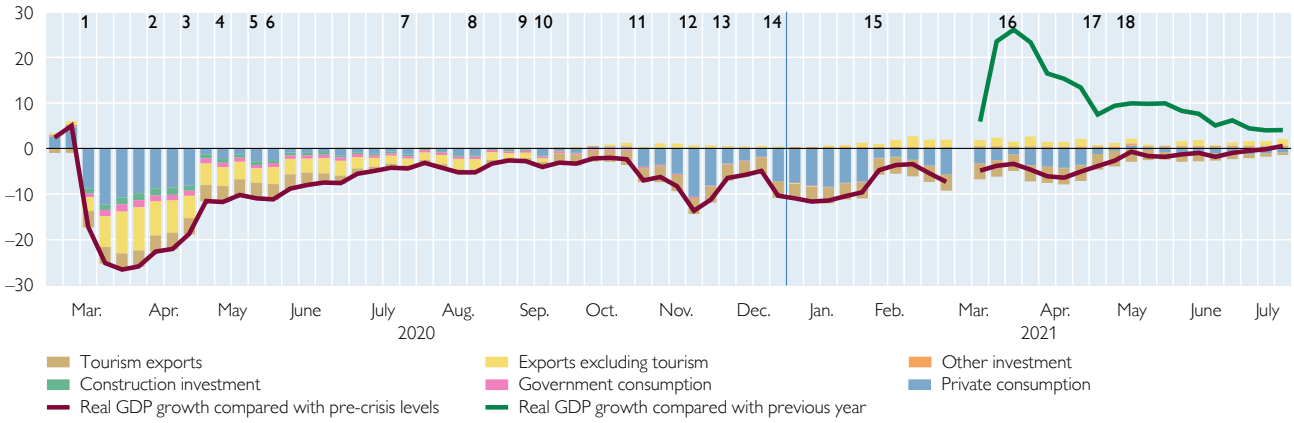
[2] *In "accommodation and food service activities", employment rose by 31.9% quarter on quarter (seasonally and working-day adjusted). In wholesale and retail trade as well as in the transportation and storage services sector, employment grew by 1.1% and 2.8%, respectively.*

[3] *See also weekly OeNB GDP indicator at https://www.oenb.at/Publikationen/corona/bip-indikator-der-oenb.html.*

Chart 1

Weekly GDP indicator for Austria

Change of real GDP against the corresponding week of the pre-crisis period or of the previous year (%)



Source: OeNB.

Note: 1: lockdown (March 16), 2: small shops reopen (April 14), 3: all shops reopen (May 2), 4: restaurants reopen (May 15), 5: hotels reopen (May 29), 6: borders reopened gradually (June 4), 7: face masks mandatory again (July 24), 8: Austria issues travel warnings for Croatia, the Balearic Islands, etc. (from Aug. 17), 9: travel warnings issued for Austria (from Sep. 16), 10: containment measures tightened (Sep. 21, Oct. 25), 11: partial lockdown (Nov. 3), 12: lockdown (Nov. 17), 13: partial lockdown (Dec. 7), 14: lockdown (Dec. 26), 15: partial lockdown (Feb. 8), 16: partial lockdown in eastern Austria (April 1), 17: partial lockdown ends in eastern Austria (May 3), 18: restaurants, tourism and leisure services reopen (May 19).

Compared with the same weeks of the previous year, growth rates currently show a strong positive trend (see chart 1, green line) as a result of a pronounced base effect. In week 29, output surpassed the rate recorded in the corresponding week the year before by 4.5%.

3 August 2021 results of the OeNB's export indicator: export growth remained high in the summer

In May 2021, Austrian goods exports exceeded their level of May 2020 by 31.5% in nominal terms, as Statistics Austria's latest data show. Hence, exports increased a little faster than expected based on the recent OeNB's export indicator (+27.2%).

According to current results of the OeNB's export indicator[4] based on truck mileage data, export growth remained high in June and July at –0.9% and +0.0%, respectively (monthly change, seasonally and working-day adjusted). This translates into annual growth rates of 25.8% or 12.6% (not adjusted). But the meaningfulness of these growth rates is limited due to the deep plunges in the previous year. When compared with the corresponding months of 2019, nominal exports of goods in June and July 2021 grew by 9.4% and 7.9%, respectively (working-day adjusted).

4 Leading indicators at high levels in spite of declining foreign trade

The beginning of September saw almost unchanged positive sentiment in the Austrian economy. In July, the short-term indicator of UniCredit Bank Austria reached an all-time high at 6.0 points and stayed there in August as well. Bank Austria's purchasing managers' index as well as the economic sentiment indicator of the European Commission maintained their high levels, although both declined slightly in July and August.

[4] *See also the OeNB's export indicator at https://www.oenb.at/Geldpolitik/Konjunktur/oenb-exportindikator.html.*

On the other hand, leading indicators for foreign trade show first signs of a possible future downturn. The European Commission's monthly estimate of order book levels continued to increase in July. Quarterly available estimates of exports dropped in the third quarter, having reached a historical high at 20.7 points in the second quarter, but at 8.7 points, they still remain marginally above the long-term average. By contrast, the export order index declined steeply in July (to 57.4 points after 66.4 points in June), according to Bank Austria, reflecting existing capacity issues in international trade, such as logistic problems, lack of containers and closing of container ports and cargo airports in China, as a result of strict local containment measures due to the ongoing pandemic situation.

Box 1

The impact of materials shortages in Austria and Germany

Transport route blockages, production losses, misallocated containers and ports shut down due to the COVID-19 pandemic or overshooting demand for industrial metals, construction materials and semiconductors: Reports about supply chain disruptions, shortages of materials and rising commodity and transport prices have been figuring prominently in the business news in recent weeks and months. Supply-side restrictions have been an issue in Austria, too, as illustrated by anecdotal evidence from individual firms (e.g. staff working short time at the MAN Truck & Bus plant in Steyr, Upper Austria[5]) and numerous current analytical reports (e.g. by Raiffeisen Research, Erste Bank or Bank Austria).[6] While such limitations have been debated a lot, no estimates have been available so far regarding the impact they may have had on manufacturing output in Austria. For Germany, a number of analyses were published in recent weeks. In the following, we estimate the repercussions of supply bottlenecks and disruptions on manufacturing output in Austria, using two different frameworks, and compare the results with the outcomes for Germany.

Our first analysis (building on the analysis by Beckmann and Jannsen (2021) for Germany[7]) is based on the assumption of a long-run equilibrium between industrial production and new orders. Chart B1 compares actual output figures (blue line), output figures projected assuming an equilibrium relationship with new order levels (red line) and the percentage deviation between the two curves (green line) for Austria and Germany. When estimating the impact of supply disruptions, we factored in the production gaps observed in 2020, which were quite large above all for Germany (–10%). This is why we interpret only the gap for the fourth quarter of 2020 as being caused by the supply disruptions. According to our estimates for the second quarter of 2021, Germany's industrial production is likely to have been 5.1% below the level that would be aligned with an equilibrium relationship with orders. This output gap translates into a 1% drop in GDP. The corresponding figures for Austria are an estimated gap of 2.2% in the second quarter of 2020 and a GDP effect of –0.4%.

Our second analysis provides for a direct comparison of gross value added in the manufacturing industry as well as manufacturing output bottlenecks resulting from materials shortages and capacity constraints (as per the WIFO indicator). We estimate the underlying relationship with a sign-restricted VAR model, building on work by Vogt (2021) for Germany. This method

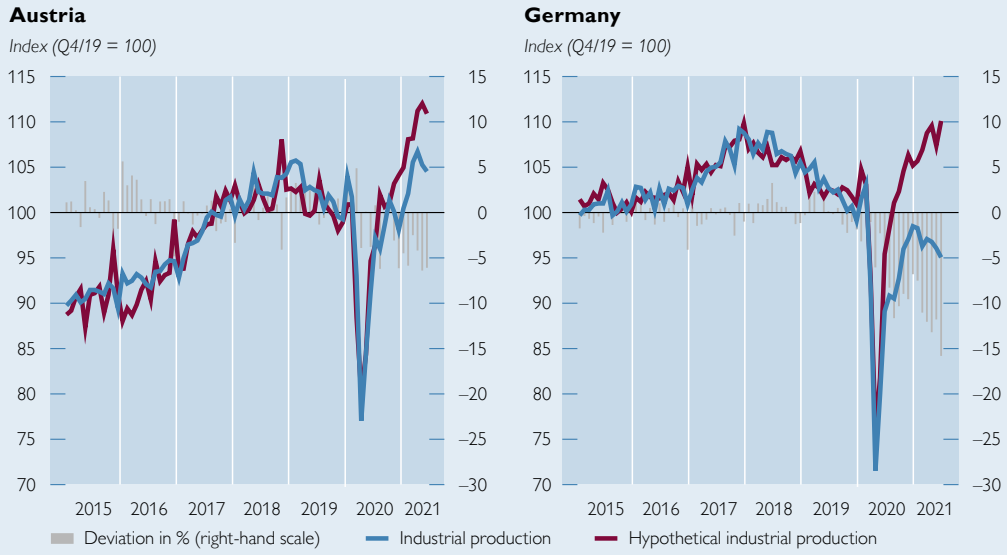
[5] *https://ooe.orf.at/stories/3119503/.*

[6] *https://www.raiffeisenresearch.com/servlet/NoAuthLibraryServlet?action=viewDocument&encrypt=49953909-11ca-4f7b-ac18-4b24dbe0b0af&mime=HTML&id=replaceme@bluematrix.com, https://produkte.erstegroup.com/Retail/de/ResearchCenter/Overview/Research_Detail/index.phtml?ID_ENTRY=230563, https://www.bankaustria.at/files/EMI%200821.pdf.*

[7] *Beckmann, J. and N. Jannsen. 2021. Bedeutung von Lieferengpässen für die laufende Produktion in Deutschland. IfW-Box 2021.09. In: Ademmer et al. 2021. Kieler Konjunkturberichte. Deutsche Wirtschaft im Sommer 2021, no. 80 (2021/Q2).*

Chart B1

Industrial production



Source: Statistics Austria, WIFO, OeNB calculations.

allows us to simulate the direct repercussions from the recent strong increase in commodity shortages on gross value added (and hence on GDP).

Table B1 quantifies the manufacturing output bottlenecks resulting from worsening materials shortages and capacity constraints for Austria for the second and third quarters of 2021. We find that these bottlenecks accounted for a GDP decline of 0.3% in the second quarter and 0.5% in the third quarter of 2021. For Germany, Vogt (2021)[8] arrived at corresponding effects: 1.5% in the second quarter and of 0.5% in the third quarter. Considering that Vogt (2021) simulates the bottleneck shock only for the second quarter and that the share of German firms suffering from supply disruptions continued to mount in the third quarter, these effects are likely to constitute a lower bound.

These two analyses imply that the impact of materials shortages on manufacturing output has been markedly stronger in Germany than in Austria. One possible explanation is that the automotive industry accounts for a higher share of the manufacturing sector in Germany than in Austria, and that car production has been hit particularly by the global scarcity of semiconductors, which is likely to persist until 2022. What may also matter is the relative position of manufacturing firms in the supply chain networks of the two countries. Germany's automotive industry is closer to the downstream side of production, i.e. closer to the finished products, whereas Austrian manufacturers tend to be clustered around upstream supply chain activities. Yet, supply interruptions and disruptions in early stages of the supply chain tend to cause strong effects downstream in the chain – a phenomenon known as whiplash or bullwhip effect in supply chain management.

Table B1

Impact of materials shortages on Austrian GDP

Deviation of real GDP from scenario without shortages	Increase in supply shortages in Q2 21	Q3 21	Total
	%		
Deviation in Q2 21	–0.3	×	–0.3
Deviation in Q3 21	–0.4	–0.1	–0.5

Source: OeNB calculations.

[8] *Vogt, G. 2021. Materialknappheiten bremsen Aufschwung. BVR Research Volkswirtschaft Kompakt. July 6. Berlin.*

5 August 2021: surge in overnight stays by foreign visitors

In July 2021, the number of overnight stays stagnated compared with 2020 among both domestic visitors (–1.9%) and foreign visitors (–0.3%) (–0.9% in total). Compared with the record summer of 2019, tourist overnight stays even dropped by 17.7%. This setback was driven by the sharp decline of overnight stays by foreign tourists (–28.6%), whereas the number of overnight stays by domestic tourists (+13.7%) exceeded the numbers recorded for July 2019. The numbers of overnight stays were closely aligned with the OeNB's projections made in late July.

For August 2021, data on tourist spending based on card payments point to a marked rise of overnight stays by foreign visitors; the OeNB expects a 27% increase compared with August 2020. This would imply that the number of overnight stays in August remained only 2% below the record levels measured in 2019. This increase is attributable above all to the much higher number of German tourists (about +15%) and Dutch tourists (about +50%) compared with the previous year, which compensated for the losses caused by overseas visitors continuing to stay away.

In contrast, the number of overnight stays by domestic tourists declined slightly compared with 2020 (–6%, July: –2%). At the same time, the figures were 16% higher in August 2021 than in 2019, when Austria's tourism industry reported the highest number of overnight stays on record. In sum, the OeNB expects the number of overnight stays to have been 15% higher in August 2021 than in August 2020 and 2% higher than in the record summer of 2019. The combined result for July and August is a year-on-year increase by 8% compared with the summer of 2020, which corresponds to a decline of 7% against 2019.

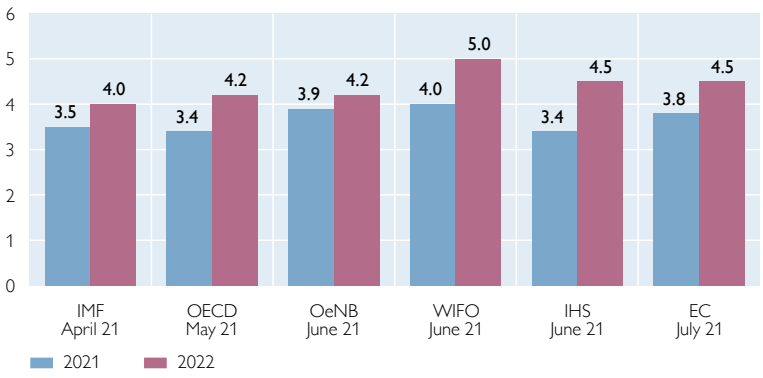
6 Economic projections see 4% to 5% output growth in 2022

Following the pandemic-related setback in 2020, the Austrian economy has been recovering briskly in 2021. Currently, real GDP growth in Austria is expected to reach between 3½% and 4% in 2021, and even slightly higher rates in 2022 (between 4% and 5%). Compared with the OeNB's June 2021 economic outlook, current economic indicators like the OeNB's weekly GDP indicator signal an upward risk to growth for the third quarter of 2021, whereas downside risks to growth emanate from the fourth pandemic wave in the fourth quarter of 2021.

Chart 2

Real GDP growth projections for Austria

Annual change in %



Source: OeNB, Austrian Institute of Economic Research (WIFO), Institute for Advanced Studies (IHS), OECD, IMF, European Commission (EC).

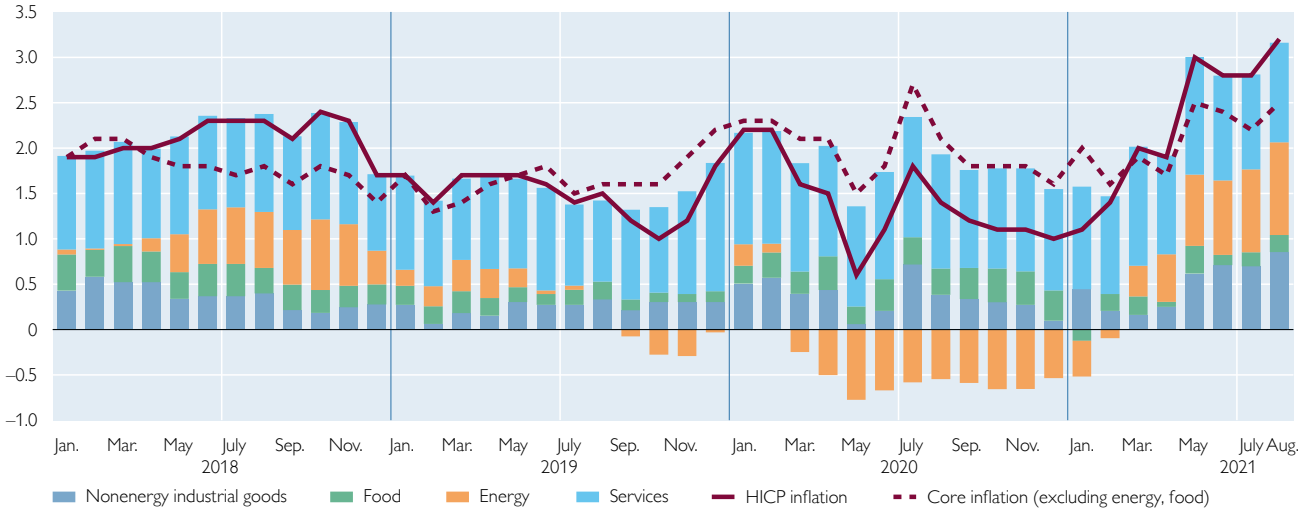
7 Inflation significantly on the rise since early 2021

Following a marked increase of HICP inflation in Austria in the first five months of the year, the inflation rate remained at 2.8% in June and July 2021 and then climbed to 3.2% in August. The rise in inflation measured in 2021 to date was mainly driven by rising energy

Chart 3

Contributions to Austrian HICP inflation

Annual inflation rates in %; contribution to inflation in percentage points



Source: Statistics Austria.

Note: The latest observations are for August 2021.

prices, which accounted for two-thirds of the increase. Close to one-third was attributable to nonenergy industrial goods and food, whereas the latest inflation rate for services did not change compared to the level measured in early 2021. Core inflation, which excludes services and nonenergy industrial goods, climbed to 2.5%, 0.5 percentage points beyond the January 2021 measure.

Following the lifting of pandemic-related containment measures, Statistics Austria was able to resume the collection of prices for all goods contained in the Austrian HICP basket in July 2021. In early 2021, Statistics Austria had still carried forward 20% of the relevant prices from the previous months, as the corresponding market prices were not available due to shutdowns.

Energy price inflation had climbed to 13.5% by August 2021, well above the rate observed for January 2021 (–5.3%). This increase reflects the surge in crude oil prices in recent months as well as the base effect of the decline in crude oil prices in the corresponding period of 2020. Within the energy price component, transport fuels and heating oil registered a significant uptick in prices, whereas the prices for other energy resources (gas, solid fuels, electricity, thermal energy) increased comparatively moderately. The annual rate of services inflation stood at 2.3% in August 2021 (January 2021: 2.3%). Since January 2021, the annual inflation rate has been accelerating above all for hospitality services, air tickets, sports and recreation services as well as cultural services. At the same time, rental price inflation rate went down markedly (August 2021: 0.4%; January 2021: 5.5%).

The annual rate of inflation for nonenergy industrial goods climbed to 3.0% in August 2021 (January 2021: 1.5%). This increase was driven above all by prices for clothing and footwear, furniture and furnishings as well as other durable consumer goods, such as vehicles, glassware and electrical household appliances. More recently, inflation pressures also arose from shifts in the pattern of clothing and footwear clearance sales. In 2020, shops had started to sell off excess inventory in May. Since seasonal clearance sales have been much weaker in 2021 than in 2020, base effects caused inflation to rise in this product segment. With regard to durable consumer goods, the uptick in inflation may reflect the pass-through of high commodity prices to end-user prices.

Food price inflation (including alcohol and tobacco) dropped considerably in early 2021 (January 2021: −0.5%) and amounted to 1.1% in August 2021. In recent months, above all the prices of meat and beverages have been going up markedly, possibly reflecting the reopening of hotels and restaurants in May 2021.

Analyses

How effective were measures introduced in the COVID-19 crisis in supporting household incomes?

Susanne Maidorn[1], Lukas Reiss[2]
Refereed by: Hans Pitlik, WIFO

We analyze the distributional effects of both, the COVID-19 crisis and the measures introduced to support household incomes, using the microsimulation model developed by the Office of the Fiscal Advisory Council (FISKSIM). In 2020, more than one-third of Austrian households were affected, at least temporarily, by unemployment, short-time work or losses in self-employed income. The fiscal measures to support household incomes clearly cushioned the financial impact of the crisis on households. They proved particularly effective in two ways: First, lower-income households benefited more (vertical effectiveness); second, within individual income brackets, those households that had experienced higher losses due to the COVID-19 shock benefited more strongly from support measures (horizontal effectiveness). This was achieved mostly by the establishment of the hardship fund and one-off payments to unemployed workers.

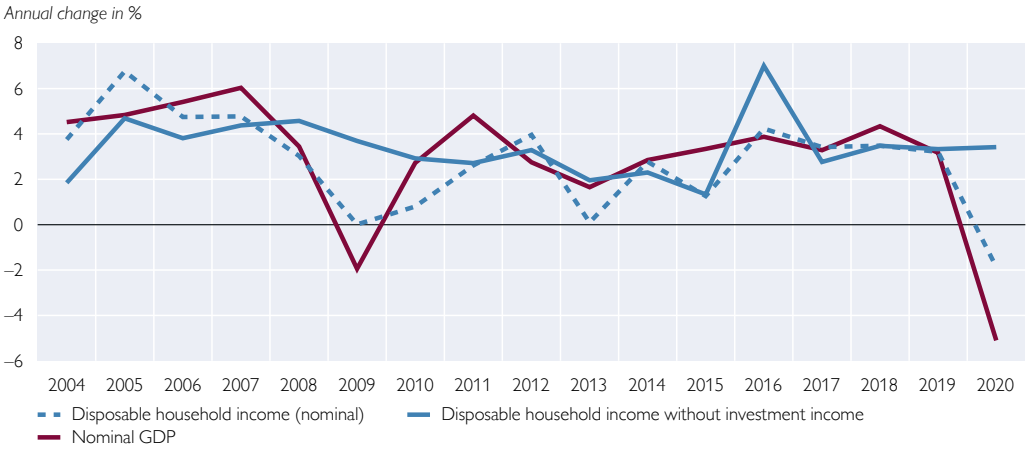
JEL classification: H53, D30
Keywords: fiscal stabilization measures, income distribution.

The macroeconomic shock triggered by the lockdown measures to contain the COVID-19 pandemic caused a slump in GDP in 2020 (chart 1, dark red line).

As a result, aggregate self-employed income decreased, more than 1,000,000 people were temporarily put on short-time work, and the number of unemployed averaged more than 400,000 over the year, which implied significant losses in

Chart 1

Nominal GDP and disposable household income



Source: Statistics Austria, Eurostat.

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employment income. In the aggregate, the compensatory fiscal measures and the automatic stabilizers offset the losses in household income in 2020.

If we adjust for capital income, which is both volatile and very unevenly distributed, the growth of aggregate disposable household income amounted to approximately 3½% in 2020, which roughly corresponds the long-term average (chart 1, blue line). That said, the degree to which households were financially affected varies strongly. Moreover, the packages to support household incomes included not only targeted measures like payments from the hardship fund or one-off payments for people on unemployment benefits. For instance, a cut in income tax and an additional one-off family allowance payment ("child bonus") also benefited households that did not experience income losses.

In this study, we analyze the effectiveness of the implemented measures with respect to the income distribution by looking at both their vertical and their horizontal effectiveness. We consider measures to be vertically effective if their relative effect in terms of the absolute amount of disposable household income was larger within each quintile than in the wealthier quintiles. Likewise, we consider measures to be horizontally effective if their relative effect within a quintile was larger among households that had experienced higher income losses caused by the COVID-19 shock than among households without income losses.[3]

The extent to which interventions to contain the pandemic restricted economic activity varied sharply across sectors. Therefore, we model the COVID-19 shock to the labor market on a sectoral basis, so that household incomes from economic activity in severly hit sectors suffered higher losses. We follow an approach broadly similar to that used by Baumgartner et al. (2020), who analyze the cyclical, fiscal and distributional effects of the measures adopted during the COVID-19 crisis, arriving at consistent results as regards the associated changes in disposable household incomes. However, while Baumgartner et al. (2020) look primarily at the distribution of support among households broken down by the latter's income levels, we also analyze the distribution among households in relation to actual income losses they experienced. Christl et al. (2021), who also examined the impact of the COVID-19 crisis and countermeasures, find that Austria was mostly successful in avoiding an increase in the risk of poverty[4]; without government measures, this risk would have risen notably. In our study, we take into account a wider range of measures, including, in particular, measures implemented to compensate for losses in self-employed income.

In the next section, we describe the fiscal measures we included in our analysis. In section 2, we discuss the methods used in the microsimulation model FISKSIM to adapt household data to the COVID-19 shock and to implement the associated government measures. After that, we analyze the distributional effects of the shock and the measures in the aggregate. The extent to which individual measures contributed to the effectiveness of the entire package of measures is shown in section 4, and section 5 concludes.

[3] *The degrees to which households were financially affected by the COVID-19 shock are defined in section 3. We look at financial effects in terms of income losses of households, not in terms of their ability to compensate potential losses through dissaving.*

[4] *Defined as the risk of households of a decrease in income beyond the poverty line of 60% of median eqivalized household disposable income.*

1 Overview of the analyzed fiscal measures

A significant part of the measures the Austrian government took in 2020 to cushion the impact of the COVID-19 crisis was intended to support households' disposable incomes and included a range of benefits for workers, unemployed people and families as well as a cut in the lowest rate of personal income tax, which was implemented earlier than originally planned. We included the following measures in the FISKSIM microsimulation model:

- *COVID-19 short-time work:* Employees working between 10% and 90% of normal hours received minimum pay based on replacement ratios of between 80% and 90% of their ordinary pay.[5]
- *Hardship fund (administered by the Austrian Economic Chambers):* One-person businesses, freelancers and micro businesses that had experienced a decline in sales by at least 50% compared with the same period in 2019 (in up to ten one-month assessment periods in 2020) were eligible to apply for grants of up to EUR 2,600. The 2020 assessment periods were between March 16, 2020, and January 15, 2021 (see Federal Ministry of Finance, 2020a).
- *AMA fund for farmers:* The AMA fund for farmers was set up in a similar way to the hardship fund, with grants amounting to 80% of the difference between the income from agriculture and forestry in 2020 compared to the same period in 2019 (Federal Ministry of Finance, 2020b).
- *Bridge fund and COVID-19 fund for artists:* These funds respectively provided for grants of up to EUR 14,000 for self-employed artists covered by the social insurance system and up to EUR 3,500 for artists that are entitled to unemployment benefits or earn very low incomes (Federal Ministry of Arts, Culture, Civil Service and Sport, 2020a and 2020b).
- *One-off payments for people on unemployment benefits:* The first payment amounted to EUR 450 per person, the second to up to EUR 450, depending on the number of days a person had already been on unemployment benefits (Parliament, 2020).
- *Increase of unemployment assistance* for the long-term unemployed who have become ineligible for unemployment benefits to the level of regular unemployment benefits.
- *Child bonus:* one-time payment of EUR 360 per child.
- *Increase in the supplement income limit for family allowance* and *extended entitlement to family allowance and student grants (because of the "neutral" semester).*
- *Family hardship fund and family crisis fund:* payments of up to EUR 3,600 for families affected by short-time work or unemployment after February 2020 or income losses as defined under the hardship fund (Federal Ministry of Labour, Family and Youth, 2020; Arbeiterkammer, 2021).
- *Personal income tax cut:* reduction of the lowest income tax rate from 25% to 20%.

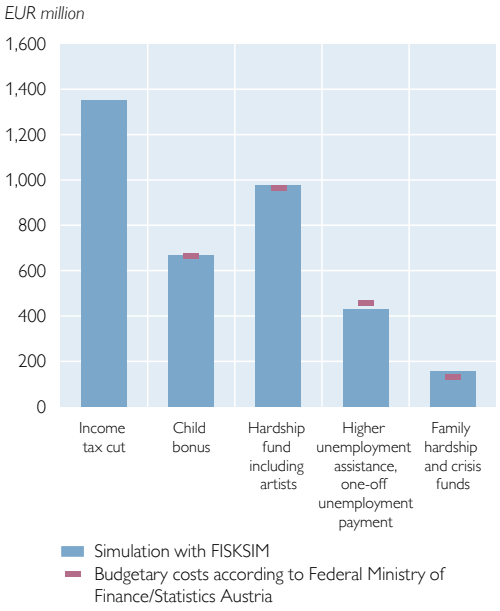
We only take into account measures that had a direct impact on households' disposable incomes.[6] We do not include the distributional effects of subsidies for

[5] *For reasons of simplicity, we use the COVID-19 short-time work scheme in force from June 2020 in the shock scenario with fiscal measures for all persons in a short-time work scheme. Under this scheme, employees received minimum pay regardless of actual hours worked (AMS, 2020). Modeling two different short-time work schemes would require additional assumptions on the allocation of workers on short-time work to the different schemes.*

[6] *Therefore, measures such as rent deferrals are not considered.*

Chart 2

Costs of COVID-19-related measures in 2020: simulation vs. budgetary costs



Source: Office of the Fiscal Advisory Council, OeNB, Federal Ministry of Finance, Statistics Austria.

Note: No administrative data available on the budgetary effect of the income tax cut.

companies beyond short-time work (i.e., in particular, fixed cost grants, compensation for lost sales), nor investment incentives for companies (through grants or tax relief) because these measures are not transfer payments to households, and therefore their effect on individual household incomes cannot be determined.

Short-time work is a special case in this context, given that it is difficult to tell to what extent government funds have benefited employers on the one hand and employees on the other.[7] We compared the new replacement ratios (see above) with those under the short-time work scheme that had been in force before March 2020 to calculate our main results. Also, in section 4 we use an additional scenario to describe the job-saving effect of short-time work.

In chart 2, we show the FISKSIM-simulated costs of the income tax cut as well as the unemployment and family benefit payments and grants from the hardship fund (blue columns) and compare these amounts with actual budgetary costs (red lines).[8] We see that the simulated values match the actual costs (to the extent that related data are available) very well.

2 Methodology[9]

Survey-based microdata do not yet include the pandemic shock on the job market and the resulting losses in earned income. The calculations carried out with the microsimulation model developed by the Office of the Fiscal Advisory Council (FISKSIM) currently are based on AT-SILC 2017–2019 data. Ordinarily, the gap between the most recent year of available data and the current year or a projected year can be closed by adjusting the weights applied to persons and households in the microdata to target values of official statistics or from forecast data. This is true if there are only marginal changes in employment, unemployment and earned incomes, which we tend to see in non-crisis times (Bachleitner and Maidorn, 2019, p. 6ff.). In 2020, however, both unemployment and short-time work as well as

[7] *In this context, it is interesting to note that in some countries, short-time work subsidies are classified as social transfers to households in the national accounts; in other countries, they are considered subsidies for employers. In line with established practice, Statistics Austria applies the latter variant for Austria.*

[8] *Chart 2 does not show the total costs of short-time work because the aggregate effects of this instrument's overhaul are difficult to quantify (see also section 4).*

[9] *For a detailed description of the simulation of the COVID-19 shock and the fiscal measures in FISKSIM, see annexes 1 and 2.*

losses in self-employed incomes increased to such an extent that adjusting weights would not suffice to integrate this increase in the data (Figari et al., 2014, p. 53), all the more so, as economic sectors were affected to varying degrees.

For our analysis, we therefore adjusted the EU-SILC 2017–2019 data to three scenarios:

1. a counterfactual scenario for 2020, which reflects developments according to the outlook prepared by the Austrian Institute of Economic Research (WIFO) in December 2019;
2. a shock scenario for 2020, which simulates the shocks to employed workers triggered by unemployment and short-time work and the income shocks to self-employed persons – for each section of the Austrian Statistical Classification of Economic Activities (ÖNACE); and
3. the factual scenario for 2020, which includes both the COVID-19-related shock and the fiscal measures to cushion its impact that had a direct effect on household incomes.

If we compare the counterfactual scenario with the shock scenario, we see the effect of the COVID-19 crisis including automatic stabilizers playing out, but we do not see the impact of the discretionary fiscal measures introduced to support household incomes. To identify this impact, we look at the difference between the factual scenario and the shock scenario.[10] Our analysis excludes subsidies for companies (in particular, fixed cost grants and compensation for lost sales), except for subsidies for short-time work schemes; these subsidies are implicitly included in the shock scenario, where they cushion the drop in self-employed income in 2020.

We implement the counterfactual (i.e. "no pandemic") scenario for 2020 on the basis of WIFO's economic outlook of December 2019 (Glocker, 2020), which projected real economic growth of 1.2% for 2020, by adjusting the weights (Bachleitner and Maidorn, 2019). This implied an increase in the number of actively employed and self-employed by 1.1% and 0.4%, respectively. The number of unemployed persons was projected to rise by 1.7%. We also extrapolate earned incomes on the basis of the WIFO outlook.[11] Details on the implementation of this simulation can be found in annex 1 and 2.

The drop in earned income in the wake of the crisis is attributable to three factors: a sharp increase in the number of people on short-time work, a big rise in unemployment and a steep fall in self-employed income (to varying degrees across sectors). There was also a marked decline in capital income in 2020[12], but we do not analyze its distributional effect for the following two reasons: First, household surveys tend to very much understate capital income, which is also very unevenly distributed; both these factors make an analysis much more difficult. Second, stock markets recovered quickly after their nosedive at the beginning of the pandemic. This means that an isolated assessment of the decline in capital income in 2020 would overestimate the pandemic-related financial losses for higher-income households.

[10] *The difference between the factual scenario and the shock scenario represents the static effects of the measures adopted to support household incomes; the multiplier effects (e.g. the slower increase in unemployment) of these measures are not taken into account.*

[11] *Self-employed incomes are extrapolated on the basis of their historical growth differential vis-à-vis nominal GDP growth.*

[12] *As suggested by aggregate data on household income (chart 1) and capital income tax revenues.*

3 Aggregate effect of COVID-19-related fiscal measures

Comparing the factual scenario with the shock scenario enables us to evaluate the distributional effects and the effectiveness of the pandemic-related fiscal measures. We show the results of the simulation in relation to hypothetical household incomes without the COVID-19 shock and broken down by quintiles of household incomes weighted by household size (household equivalence income).[13]

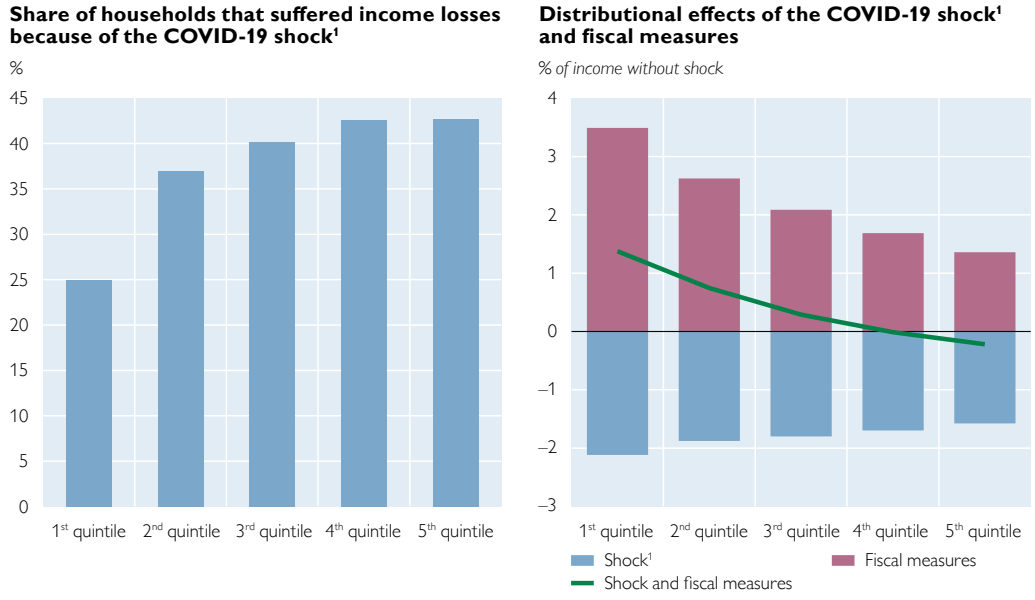
Our simulation shows that more than one-third of households in Austria experienced income losses due to the COVID-19 shock if the effect of the support measures is not factored in[14] (left-hand panel of chart 3). The share of households affected by pandemic-related income losses is similar in Albacete et al. (2021; p. 121), who also analyze differences in the extent to which households were financially affected by the COVID-19 shock, which depends, inter alia, on people's work status.

Overall, the COVID-19 shock would have reduced the average household income in the bottom quintile by around 2.1% (blue column in the right-hand panel of chart 3) if no fiscal measures had been taken. The relative drop in household income decreases slightly with rising incomes – from 1.9% in the second quintile to 1.6% in the fifth quintile. The calculated reduction in household income takes into account automatic stabilizers (unemployment benefits, short-time work pay under pre-pandemic schemes, lower tax liabilities for lower incomes).

Within quintiles, we see large differences: While many self-employed households and households affected by crisis-related unemployment experienced a sharp

Chart 3

How did the COVID-19 shock[1] affect income distribution?



Source: Office of the Fiscal Advisory Council, OeNB.

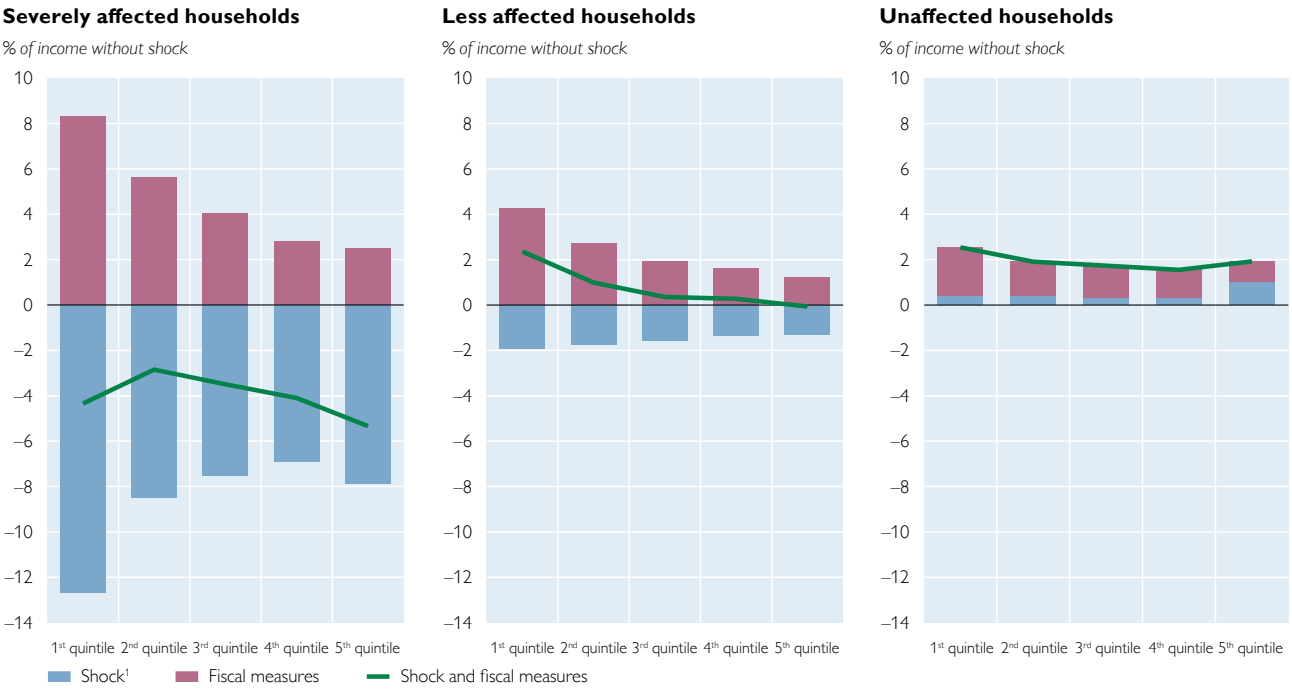
[1] *Including the effect of automatic stabilizers, pre-pandemic short-time work arrangements and support measures for the corporate sector.*

[13] *The weighting of persons follows the modified OECD scale: Main earners are assigned a factor of 1.0, other household members aged 15 and over 0.7, and all other household members 0.5.*

[14] *As suggested by data on household income (chart 1) and capital income tax revenues.*

Chart 4

Distributional effect of the COVID-19 crisis broken down by severity of shock impact[1]



Source: Office of the Fiscal Advisory Council, OeNB.

[1] Including the effect of automatic stabilizers, pre-pandemic short-time work arrangements and support measures for the corporate sector.

drop in incomes, there is a large number of households whose incomes were not directly affected by the pandemic (employees not affected by short-time work or COVID-19-related unemployment, pensioners without earned income). In the second to fifth quintiles, 37% to 43% of households were affected by income losses (left-hand panel of chart 3). In the first quintile, by contrast, due to a lower labor participation rate, only a quarter of households experienced income losses; the losses in this category were notably higher, though (chart 4).

Chart 4 shows the distributional effects of the COVID-19 shock and the related measures on households broken down by severity of shock impact. We split the households of each quintile into different groups, i.e. unaffected households that did not experience income losses due to the COVID-19 shock and households affected by pandemic-related income losses to different degrees; the latter are split along the median of relative income losses into two – equally large – groups: severely affected and less affected households (see also left-hand and middle panel of chart 4). The earned income of severely affected households in the bottom quintile dropped, on average, by around 13%, compared with 7% to 8½% in the other quintiles. In the group of less affected households, the relative losses did not vary much across the income distribution, ranging from 1.9% in the bottom quintile to 1.3% in the top quintile. At the same time, the incomes of unaffected households increased between 0.4% in the bottom quintile and 1.0% in the top quintile.

Thanks to the comprehensive set of fiscal measures (dark red columns in the right-hand panel of chart 3), the combined effect ("net effect") of the shock and fiscal measures on household incomes is even positive in the lower quintiles; in the two highest quintiles, incomes decreased somewhat (green line in the right-hand panel of chart 3). Severely affected households in the lower two quintiles were compensated, on average, for about two-thirds of their losses, while in the middle and upper quintiles, average compensation amounted to one-half and one-third, respectively. Hence, the average net effect on severely affected households' incomes was notably more uniform than the effect of the COVID-19 shock, ranging between –2.9% in the second quintile and –5.3% in the top quintile.

The impact of the fiscal measures on disposable income across household groups largely corresponds to that identified by Baumgartner et al. (2020). However, the set of measures covered by our analysis also includes the second one-off payment for people on unemployment benefits in December, the family hardship fund and the family crisis fund. As a result, the share of funds paid out to lower-income households is higher in our analysis, amounting to 26.5% in the bottom tercile, compared with 23.0% in Baumgartner et al. (2020).

4 How did individual instruments contribute to measures' overall effectiveness?

Overall, the discretionary fiscal measures were highly effective and well-targeted. Lower-income households benefited relatively more; households more severely affected by the COVID-19 shock received significantly more transfers in relation to their incomes compared to less affected households; and the latter received more than households whose incomes did not decline at all due to the COVID-19 shock (chart 4).

In the following, we describe the effects of individual instruments, looking at two different forms of effectiveness, i.e. instruments' impact

- in relation to household income (chart 5): Here we analyze *vertical* effectiveness, which requires that the relative effect of a measure is higher in each quintile than in the higher quintiles, and
- in relation to income losses caused by the COVID-19 crisis (chart 6): Here we analyze *horizontal* effectiveness, which requires that the relative effect of a measure within a quintile is larger among severely affected households than among unaffected households.[15]

The main instruments contributing to the measures' effectiveness in terms of income level were the extra funds paid out to those on unemployment benefits or unemployment assistance because such transfers make up a larger share in household income in the lower quintiles (chart 5).[16] In the bottom quintile, the effect of these measures on changes in income averaged 1.2 percentage points, compared with 0.3 percentage points in the middle quintile. In addition, the one-off child bonus had a larger percentage impact on lower-income households, accounting for, on average, 0.8 percentage points in the bottom and 0.4 to 0.1 percentage points in the second to fifth quintiles. Likewise, the impact of payments from the family

[15] *The sum of all columns (without the shaded areas representing "use of short-time work") in charts 5 and 6 corresponds to the difference between the dark red columns in the left-hand and the right-hand panel of chart 4 (severely affected and unaffected households, respectively).*

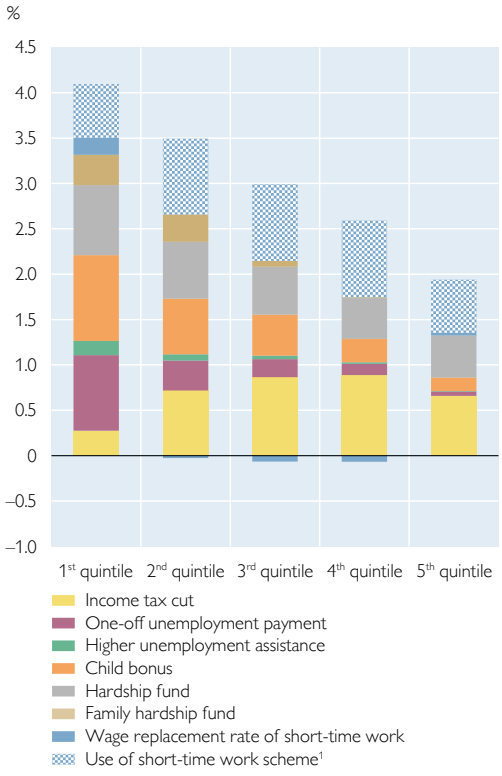
[16] *See also Christl et al. (2021), who arrive at very similar results regarding the effect of one-off payments for people on unemployment benefits or families in the lower part of the income distribution.*

hardship fund was significantly stronger in the lower quintiles because these payments were subject to income thresholds. While lower-income households, on average, also benefited more from the hardship fund, its effect was substantial also in the higher-income quintiles because of the higher share of self-employed. The COVID-19 short-time work scheme provides for higher replacement rates for lower-income earners compared with pre-pandemic schemes, thereby increasing household incomes in the bottom quintile by an average 0.2%; we do not see this positive effect, on average, in the other quintiles. At the same time, the percentage impact of the income tax cut was smaller for the bottom income quintile than for medium- to high-income households, who benefited more from the reduction of the lowest income tax rate.

The measures' effectiveness in relation to income losses caused by the COVID-19 shock is expressed by the difference in the effects on severely affected households compared to unaffected households (chart 6). For severely affected households, the hardship fund turned out to be the most important measure, next to short-time work and its job-saving effect (see below). In the bottom quintile, severely affected households received more transfers than unaffected households: the difference amounted to 6.2% of the former's household income; 3.4 percentage points were attributable to payments from the hardship fund. The one-off payment

Chart 5

Distributional effect of fiscal measures broken down by instruments



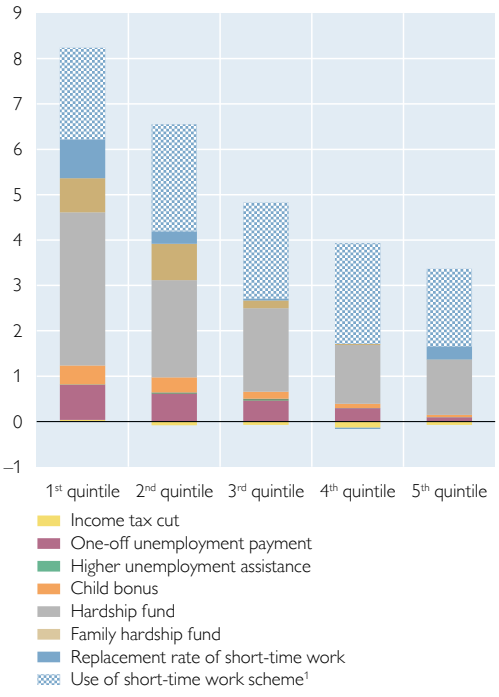
Source: Office of the Fiscal Advisory Council, OeNB.

[1] This effect is excluded in charts 3 and 4.

Chart 6

How did fiscal measures impact on households severely affected by the COVID-19 shock?

Difference in impact as compared to households without income losses, percentage points



Source: Office of the Fiscal Advisory Council, OeNB.

[1] This effect is excluded in charts 3 and 4.

for people on unemployment benefits were also targeted at households hit particularly hard by the crisis, but the payment also benefited households affected by unemployment not caused by the crisis. Likewise, households affected by the crisis benefited to a larger extent from the child bonus because households with children were more likely to experience income losses than households without children (above all, due to pensioner households without children, which hardly lost any income at all). Given that the purpose of the family hardship fund was to compensate people for actual income losses (similar to the hardship fund), its effect was also relatively strong for the lowest two quintiles.

That said, we see the high effectiveness of the set of fiscal measures only if we compare its relative effect among the severely affected, less affected and unaffected household groups; we do not see it, if we compare the *net effect* of the COVID-19 shock and the measures among these groups. In particular, we find that the negative effect of the COVID-19 shock was larger than the positive effect of the measures among severely affected households in the quintile averages (chart 4).

We paid particular attention to the COVID-19 short-time work scheme, which was much more employer friendly compared to similar pre-pandemic schemes so as to provide stronger incentives for companies to preserve jobs (in particular, employers were exempt from paying social security contributions, and the scheme also provided for more flexibility in reducing working hours). In some cases, the minimum pay an employee is entitled to under the COVID-19 short-time work scheme may be lower than under previous schemes (especially if both the regular pay and the number of hours worked are relatively high), which implies that the effect of the new replacement rates was even slightly negative for some (above all in the fourth quintile, see charts 5 and 6). Still, the job-saving effect of the COVID-19 short-time work scheme was very high for all household income groups. An additional shock scenario illustrates this effect: it assumes that if the scheme had not been adjusted as a response to the COVID-19 shock, use of short-time work would have been lower by half, and unemployment would have been correspondingly higher. The shaded blue columns illustrate that in this case, the estimated effect of the fiscal measures would have been ½ to 1 percentage point higher (chart 5)[17] and that average household incomes would have been ½ to 1 percentage point lower. This effect is higher still if we look at differences in

Table 1

How did individual measures affect horizontal and vertical effectiveness?

	Vertical effectiveness	Horizontal effectiveness
Income tax cut	–	~
One-off unemployment payment	++	+
Higher unemployment assistance	++	~
Child bonus/family allowance	++	+
Hardship fund	+	++
Family hardship fund	++	++
Replacement rate of short-time work	+	+
Use of short-time work scheme	~	++

Source: Office of the Fiscal Advisory Council, OeNB.

Note: Relative to household income, measures benefit lower-income households and/or households more severely affected (in financial terms) by the COVID-19 shock much more (++), more (+), more or less equally (~), less (–) than higher-income households and/or households that have not been affected financially by the COVID-19 shock.
Meaning of "benefit much more (++)" in terms of vertical equity: in percentage terms, the 1st quintile benefits at least twice as much as the overall average, and the 2nd quintile by at least 50% more than the overall average.
Meaning of "benefit much more (++)" in terms of horizontal equity: at least in the first four quintiles, measures benefit households severely affected by the COVID-19 shock at least twice as much as the quintile average.

[17] *These shaded blue columns show the additional effect of this assumption on the total amount paid out under the measures; in other words, the effects of higher unemployment on the total amount of payments under other measures (in particular, higher one-off payments for people on unemployment benefits and a smaller effect of the income tax rate cut) are directly set off.*

income between households severely affected by the crisis and unaffected households, amounting to 2½ to 3 percentage points (chart 6; these effects are not shown in charts 3 and 4). Table 1 offers an overview of the vertical and horizontal effectiveness of the measures under analysis.

5 Conclusions

The fiscal measures implemented to cushion the impact of the COVID-19 crisis in Austria prevented a steep drop in aggregate household incomes in 2020. The measures proved effective in two ways: both lower-income households and households that had experienced particularly large income losses benefited more on average and relative to their incomes.

We show that especially the measures aimed to compensate for actual COVID-19-related losses were horizontally effective; these measures included the hardship fund and the family hardship fund. This also applies indirectly to the use of short-time work arrangements, which helped avoid higher income losses caused by unemployment. Vertical effectiveness was best achieved through measures aimed to support especially lower-income households (e.g. family hardship fund) or funds paid only to households affected by unemployment, which are more often found in the lower quintiles.

At the same time, other measures aimed to increase overall consumer demand instead of providing support specifically to those affected by the crisis; these measures included the reduction of the lowest income tax rate, which was put into force earlier than originally planned, and the child bonus. Interestingly, the child bonus also achieved relatively good vertical and horizontal effectiveness (see also table 1) because it accounted for a larger part of household income in the lower quintiles and because families with children were affected by the crisis more severely due to their higher share of earned icome from labor market participation compared to e.g. pensioner households. The reduction of the lowest income tax rate was the only measure we found to be neither vertically nor horizontally effective.

References

Albacete, N., P. Fessler, F. Kalleitner and P. Lindner. 2021. How has COVID-19 affected the financial situation of households in Austria? In: Monetary Policy and the Economy Q4/20–Q1/21. OeNB. 111–130.

AMS (Public Employment Service Austria). 2020. Bundesrichtlinie Kurzarbeitsbeihilfe (KUA-COVID-19). BGS/AMF/0702/9931/2020.

AMS (Public Employment Service Austria). 2021. Kurzarbeit sichert nachhaltig Arbeitsplätze und Know-how. Special labor market analysis. January 2021.

Arbeiterkammer. 2021. AK Gerechtigkeitscheck der Regierungsarbeit im ersten Corona Jahr. Vienna.

Bachleitner, A. and S. Maidorn. 2019. Das Mikrosimulationsmodell des Büros des Fiskalrates (FISKSIM). Interaktionseffekte ausgewählter Transferleistungen in Österreich. Vienna.

Baumgartner, J., M. Fink, C. Moreau, S. Rocha-Akis, S. Lappöhn, K. Plank, A. Schnabl and K. Weyerstrass. 2020. Wirkung der wirtschaftspolitischen Maßnahmen zur Abfederung der COVID-19-Krise. Mikro- und makroökonomische Analysen zur konjunkturellen, fiskalischen und verteilungspolitischen Wirkung. WIFO.

Christl, M., S. De Poli, D. Kucsera and H. Lorenz. 2021. COVID-19 and (gender) inequality in income: the impact of discretionary policy measures in Austria. JRC Working Papers on Taxation and Structural Reforms 05/21.

Federal Ministry of Arts, Culture, Civil Service and Sport. 2020a. Richtlinie für die Gewährung von Überbrückungsfinanzierungen im Rahmen des Bundesgesetzes über die Errichtung eines Fonds für eine Überbrückungsfinanzierung für selbständige Künstlerinnen und Künstler.

Federal Ministry of Arts, Culture, Civil Service and Sport. 2020b. Richtlinien für die Gewährung von nicht rückzahlbaren Beihilfen aus dem COVID-19-Fonds gemäß § 25b iVm § 25c Abs. 3a Künstler-Sozialversicherungsfondsgesetz.

Federal Ministry of Finance. 2020a. Richtlinie zur Regelung der Auszahlungsphase 2 im Rahmen des Härtefallfonds für Ein-Personen-Unternehmen, Freie Dienstnehmer und Kleinstunternehmen, BMF - II/10.

Federal Ministry of Finance. 2020b. Richtlinie gemäß § 1 Abs. 4 Härtefallfondsgesetz für Einkommensausfälle bei land- und forstwirtschaftlichen Betrieben sowie Privatzimmervermietungen, BMF - II/9.

Federal Ministry of Labour, Family and Youth. 2020. Richtlinien für die Corona(Covid-19)-Hilfe aus dem Familienhärteausgleich.

Figari, F., A. Paulus and H. Sutherland. 2014. Microsimulation and Policy Analysis, ISER Working Paper Series.

Glocker, C. 2020. Schwäche der Weltwirtschaft dämpft Konjunktur in Österreich. Prognose für 2020 und 2021. WIFO-Monatsberichte 1/2020.

Parliament. 2020. Parlamentskorrespondenz Nr. 1238 vom 20.11.2020: Nationalrat: Arbeitslose erhalten im Dezember weitere Einmalzahlung von 450 Euro.

Annex 1: The simulation of the COVID-19 shock in detail

According to reports by the Public Employment Service Austria (AMS), around 1.2 million people in Austria received support through COVID-19 short-time work arrangements in 2020. To calculate the average reduction in working hours across ÖNACE 2008 sections of economic activities, FISKSIM uses a special AMS (2021) analysis as the basis for calibrating data from the microcensus labor force survey of the second quarter of 2020.[18] In the entire economy, working hours declined by an average of 43% in 2020; the reduction was significantly higher in accommodation and food services (62%), compared with 33% and 43% in manufacturing and wholesale and retail trade. We assume the distribution of lost working hours within a section of economic activity to be normally distributed, with the mean corresponding to sector averages and the standard deviation amounting to half of the gap between averages and the permitted highest or lowest reduction of working hours (i.e. 10% and 90%).[19]

The given target value of the number of people on short-time work in each sector is obtained by randomly sampling payroll employees in the SILC data on the

[18] *The average reduction in working hours in each ÖNACE 2008 economic sector is based on information on regular working hours and hours worked, provided that short-time work was the reason for the reduction in working hours.*

[19] *In phases I and II of COVID-19 short-time work until September 30, 2020.*

basis of their information about their employer's NACE sector[20]. Apart from that, no other correlation between the probability of short-time work and, for instance, an employee's pay or position in the company is assumed, as no such correlation can be derived from microcensus data. The average duration of short-time work is calculated on the basis of a breakdown of AMS payments by economic activity, the number of persons on short-time work, and short-time work subsidy per person calculated on the basis of SILC data and taking into account the reduction of working hours. This yields an average duration between around two months (e.g. in manufacturing) and around four months (e.g. in accommodation and food services).

Under the counterfactual scenario (without the COVID-19 pandemic), we calculated, on the basis of the WIFO economic outlook of December 2019, the number of people on unemployment benefits and unemployment assistance to have averaged around 148,000 and around 155,000, respectively, in 2020. According to AMS data, in 2020, an average of around 202,000 persons received unemployment benefits and around 190,000 persons received unemployment assistance; compared with the counterfactual scenario, these numbers are around 54,000 and 35,000, respectively, higher. The number of additional persons on unemployment benefits for each sector was generated on the basis of the monthly unemployment statistics by sector from the stock of counterfactual employment taking into account information on the NACE sector of the relevant companies; the probability of unemployment was modeled contingent on gross incomes. The number of additional persons on unemployment assistance was generated from the counterfactual stock of persons on unemployment benefits.[21]

A shorter duration of unemployment is assumed for some of the additional people on unemployment benefits. Their number and the duration of unemployment was derived from the monthly stock of unemployed by economic sectors, in particular from the drop in unemployment seen in the months May to August compared to the high recorded in April 2020. We thus obtain an average duration of approximately three months with only minor sector-specific fluctuations. For all other benefits recipients, the duration of unemployment was assumed – on the basis of SILC data – to be four months.[22]

The COVID-19 shock scenario without fiscal measures uses the tax and transfer regime (including short-time work scheme) that had been in place until March 2020. Under the phase II COVID-19 short-time work scheme, which entered into force in June 2020, support was higher the lower beneficiaries' hourly pay and number of hours worked were. This, in turn, may imply less support in certain cases under the new scheme. At the same time, the new scheme was more attractive for employers: The public purse covers employer and employee social security contributions and the minimum pay rule means that employers are required to pay

[20] *Generating the short-time work status by random sampling provides a good approximation in each sector. Due to the large number of persons on short-time work in 2020, weights are adjusted to ensure an exact alignment with the target values.*

[21] *Hence, the target value of additional people on unemployment benefits to be generated increases by the number of additional people on unemployment assistance.*

[22] *According to SILC data, people are on unemployment benefits for an average of 3.4 months. However, this may be an underestimation because months during which a person was both employed and unemployed are counted as employment months.*

only the replacement rate and not the full hourly wage for actual hours worked. We can therefore assume that the COVID-19 short-time work scheme contributed more to saving jobs than previous schemes. Hence, the COVID-19 shock scenario without fiscal measures is calculated in the following two variants: in the first variant, all persons on COVID-19 short-time work are assumed to be in the pre-pandemic short-time work scheme; in the second variant, half of this group is unemployed. The latter implies an additional 120,000 jobless on average over the year.

The decline in self-employed income was derived from quarterly national accounts data broken down by economic activity. The subsidies (which, like the data for all individual sectors, are only part of not yet published annual national accounts data) were calculated on the basis of data on the compensation for lost sales and short-time work by sector. The change in self-employed income under the 2020 shock scenario compared with 2019 is assumed to be a normal distribution with a mean[23] corresponding to the adjusted change in a sector's net operating surplus[24].

Annex 2: The simulation of the fiscal measures in detail

Some measures are implemented in FISKSIM through the tax and transfer systems implemented in the model, e.g. the income tax rate cut, the child bonus, one-off payments to people on unemployment benefits and the increase of unemployment assistance. In order to implement payments from the hardship fund in FISKSIM, the model limits the group of self-employed to one-person businesses, freelancers and micro businesses, relying on structural business statistics. The maximum number of businesses eligible for support within a sector is derived under the assumption that these businesses employ fewer than ten people. For the implementation in FISKSIM we use an approximation of the average income of businesses in this group. On this basis, it is assumed that applications are submitted by those self-employed in the AT-SILC data whose incomes are at similar levels[25] and who, taking into account income thresholds, experienced the highest income losses.[26] In combination with data from the monthly advance VAT returns and PRODCOM statistics on monthly sales, these data yield the number of self-employed eligible for support as well as the number of applications.[27] This is a crude approximation of

[23] *Empirically deriving the standard deviation of, e.g. the distribution of self-employed incomes in previous years yields implausible results, therefore a standard deviation of 10% was assumed.*

[24] *Most SILC data lack information about the NACE sectors of the self-employed. For this reason, sectors were assigned on the basis of occupational activities or functions, where possible; for instance, assemblers as well as construction workers and builders were assigned to ÖNACE 2008 F ("construction"), professionals or comparable workers and engineers in information and communications technology were assigned to ÖNACE 2008 J ("information and communication"). In all other cases, economic sectors were assigned according to the distribution resulting from information about both categories, e.g. for managers.*

[25] *This means that the income is within two standard deviations of self-employed income of the sector in the SILC data.*

[26] *The income losses serve as a proxy for sales losses. The criteria for hardship fund payouts follow a similar approach: by looking at the return on sales in the reference period, a fixed relationship between sales and income is used to calculate income losses in the assessment period on the basis of lost sales.*

[27] *Self-employed in economic sectors for which no structural business statistics data are available are assumed to employ fewer than ten persons. These sections of economic activities are ÖNACE 2008 MN "professional, scientific, technical and other business activities," PQ "education, human health and social work activities" and RS "arts, entertainment and recreation, other service activities."*

the number of applications and the sum of hardship fund payouts, which, despite numerous assumptions, is sufficiently empirically founded to reflect the impact of fiscal measures on self-employed income in the analysis thanks to the AT-SILC data on self-employed income.

For payouts from the bridge fund and the COVID-19 fund for artists, FISKSIM also assumes that those self-employed that experienced the highest losses in income apply for support. For the bridge fund, only payouts to persons whose self-employed activity is their main economic activity are taken into account, whereas for the COVID-19 fund, only payouts to persons on very low income or unemployment benefits or assistance are included.

Corporate equity finance in Austria – impediments and possible improvements

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Refereed by: Thomas Url, WIFO

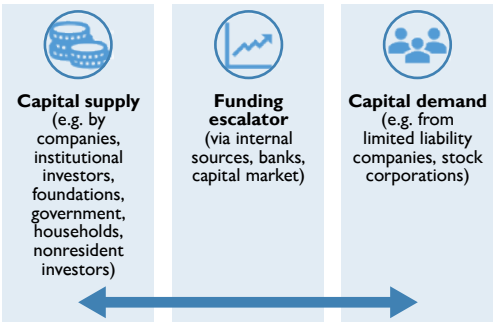
This study examines the state of play of equity financing in Austria and highlights challenges Austrian companies face in raising equity capital. The equity ratios of Austrian companies had been improving steadily before the onset of the COVID-19 pandemic, which has been weighing considerably on corporate equity levels. The decrease of equity levels would, however, be about twice as high in the absence of the support measures taken to alleviate the economic effects of the pandemic. The bulk of Austrian companies' equity is sourced from the rest of the world, while the domestic financial sector plays only a minor role in providing equity funding. Impediments to raising capital externally include business owners' reluctance to share control with external investors, information deficits and data gaps as well as differences in the tax treatment of debt and equity ("debt bias"). Equity supply is limited because investors lack information on the economic situation of capital-seeking companies and because investments in unlisted companies are less liquid. Together with representatives of national and international institutions and market participants, we identified ways to strengthen the equity base of Austrian companies. Cases in point are providing both tax incentives and intermediation support for equity finance and establishing public-private partnerships.

JEL classification: E61, G1, G2, G32
Keywords: corporate finance, equity, institutional investors

The economic setback triggered by the COVID-19 pandemic has affected different economic sectors to different extents. In some sectors, the related containment measures have caused massive sales losses, which has had a direct impact on corporate liquidity and equity levels. As Austrian companies were facing frictions between capital supply and demand even before the current economic crisis, numerous economic policy actors have been calling for measures to strengthen the equity base of companies. This would improve the balance of supply and demand (figure 1) and generate a range of favorable macroeconomic effects.

Figure 1

Matching capital supply and demand



Source: OeNB.

In this study, we give an overview of the equity structure of Austrian companies, or nonfinancial corporations to be conceptually precise. We highlight challenges in raising equity capital and present ways to increase equity finance. Our goal is to provide more compre-

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hensive data and a better understanding of the underlying mechanisms, explain the issues in more detail and share best practices from other countries.

The study is structured as follows: In section 1, we present data on the equity ratios of Austrian companies before and during the COVID-19 pandemic. In section 2, we look at equity ownership structures to answer the question: who is investing in Austrian companies? Section 3 discusses the concept of the funding escalator and frictions between capital supply and demand. In section 4, we outline possible avenues for strengthening corporate equity in Austria and present international best practices. Section 5 summarizes.

1 Understanding the facts: equity ratios of Austrian companies

1.1 Pre-crisis equity ratios were improving but bottom quartile ratios remained weak in an international peer comparison

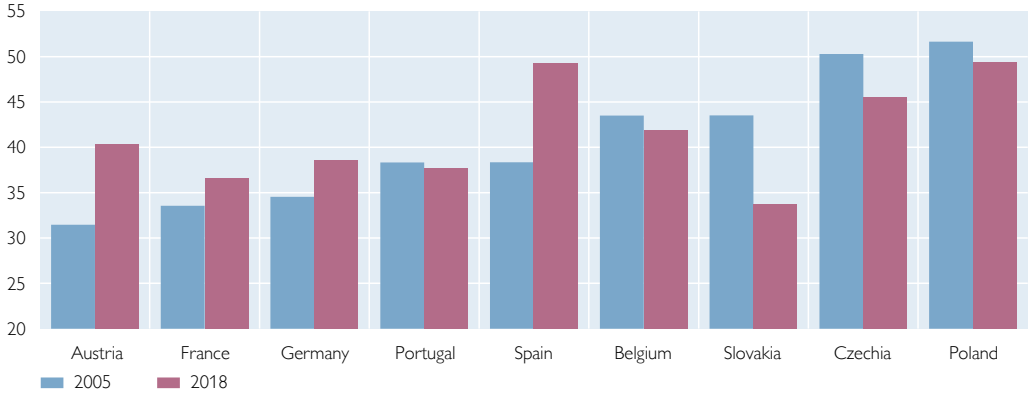
Before the onset of the COVID-19 crisis, the equity ratios of Austrian companies had been improving steadily, rising from an average ratio of 31.5% in 2005 to 40.4% in 2018, based on BACH data.[2] Among the nine countries for which BACH data are available from 2005, Austria moved up from rank 9 to rank 4 in this period (chart 1).[3]

Breaking down corporate equity structures by business sectors enables us to identify vulnerable areas in Austria (chart 2). Using weighted averages for 2018, we see that the corporate equity ratios measured for Austria were broadly aligned with the ratios measured for other countries in most business sectors (other than the hospitality sector). However, Austrian companies performing in the bottom

Chart 1

Corporate equity ratios (2005 and 2018)

Equity capital in % of total assets



Source: BACH database.

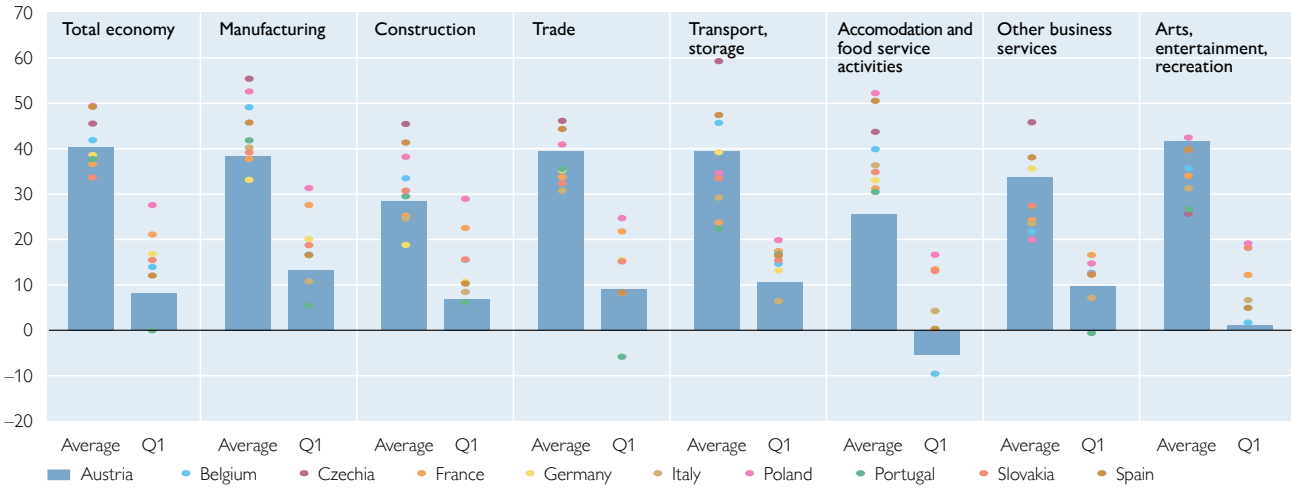
[2] *BACH is a database of aggregated and harmonized accounting data of nonfinancial companies from 12 European countries. It covers a broad range of business sectors (more than 100 variables for over 80 NACE divisions) with breakdowns by four company size classes. All variables are available as weighted averages and quartiles (https://www.bach.banque-france.fr/?lang=en).*

[3] *The comparatively high equity ratios of Czech, Polish and Slovak companies in 2005 may be a reflection of then still underdeveloped debt financing in these countries rather than companies' conscious efforts to maintain high equity ratios.*

Chart 2

Equity ratios in selected business sectors: Austria compared with peer countries (2018)

Equity capital in % of total assets



Source: BACH database.

Note: Q1 = bottom quartile.

quartile tended to be negative outliers. In other words, Austrian companies in the bottom quartile face heightened insolvency risk from debt overhang. Overall, only about 10% of all insolvencies in Austria result from debt overhang problems, whereas 90% of all insolvencies arise from liquidity issues. The propensity for liquidity problems is driven above all by small companies, which account for 89% of all companies covered by the BACH database. Of all size classes, the best equity capital ratios are in all countries attributable to medium-sized companies (with an annual sales volume of between EUR 10 million and EUR 50 million) and large companies (with an annual sales volume of more than EUR 50 million). This holds true in particular for companies in the bottom quartile. Among the companies in the bottom quartile, Austrian medium-sized companies are closer to the lower end while large Austrian companies tend to be aligned with the average of the other countries under review.

Apart from the BACH data, which are aggregated balance sheet data, we also draw on corporate data from the Sabina database, which provide for a more granular view of the corporate equity structure in Austria.[4] Based on the Sabina data, we see that 17.4% of all Austrian companies had a negative equity balance in 2018. The share of companies with a negative equity balance was particularly high among companies in the hospitality industry (32.1%) and companies providing arts, entertainment, recreation and other services (28.4%).

[4] *The Sabina database, maintained by Bureau van Dijk, provides balance sheet data on more than 130,000 individual Austrian companies. The average equity ratio for the economy as a whole (39.9%) matches the results derived from the BACH database (40.4%); the figures diverge marginally when broken down by sector.*

Table 1

Equity ratio by sectors (Sabina data for 2018)

	Equity ratio by quartiles				Share of companies with an equity ratio of		Share of firms with	Number of companies	Average assets (EUR thousand)
	Average	Bottom quartile	Median	Third quartile	< –30%	< 0	Cash and bank < 0		
Total	39.9	8.7	37.7	71.1	9.9	17.4	2.5	129,239	5,506
Agriculture (A)	55.5	6.1	29.5	63.3	7.6	16.2	0.1	956	2,549
Mining (B)	50.3	16.4	42.1	70.0	10.1	14.4	35.0	303	20,774
Manufacturing (C)	45.9	15.1	39.2	66.5	8.8	14.0	0.1	10,981	14,402
Energy supply (D)	36.1	2.7	18.8	50.5	6.8	20.9	0.2	1,527	33,016
Water supply, waste management (E)	32.1	16.7	40.5	67.6	6.1	11.6	28.0	621	7,585
Construction (F)	31.4	10.8	36.1	64.9	6.8	14.2	0.1	15,648	2,426
Trade (G)	42.7	11.1	38.4	69.5	12.0	17.8	0.1	27,337	4,067
Transport and storage (H)	32.7	6.3	29.2	58.4	10.6	19.6	0.2	4,672	10,631
Accomodation and food service activities (I)	26.3	–14.9	19.2	51.5	20.4	32.1	0.2	8,782	1,984
Information and communication (J)	44.6	14.2	49.3	77.3	12.9	17.6	0.1	7,877	2,815
Real estate activities (L)	38.8	2.3	24.6	73.7	5.8	19.4	13.7	21,261	7,674
Scientific and technical activities (M, excl. head office activities)	49.5	25.9	58.3	83.9	6.9	10.4	0.1	18,427	1,537
Support service activities (N)	27.5	10.7	36.3	67.0	10.3	16.3	0.2	5,505	5,059
Education (P), health and social actitivies (Q)	30.9	9.4	37.4	70.6	12.1	18.2	0.1	2,287	1,805
Arts, entertainment, recreation (R), other services (S)	28.8	–8.2	29.1	65.3	19.4	28.4	0.2	3,055	2,410

Source: Sabina database, OeNB calculations.

1.2 OeNB insolvency model reveals substantial impact of pandemic support measures on corporate equity levels

In this section, we present the results of simulations run with the OeNB's insolvency model.[5] Specifically, we calculated two COVID-19 scenarios, one with and one without support measures,[6] and cross-checked the resulting estimates with a counterfactual scenario without COVID-19 in order to isolate the pandemic impact.

The results show that the pandemic-related crisis had a major impact on corporate equity in Austria. In the absence of support measures and when we factor out the effects of COVID-19, the equity level of Austrian companies would have been EUR 25 billion lower in 2020. The support measures diminish the decline in equity to EUR 17 billion, thus improving equity availability by EUR 8 billion in 2020 (chart 3). Equity losses until 2022 add up to EUR 47 billion (without support measures) or EUR 34 billion (with support measures).

However, note the caveat that these results must not be interpreted as equity finance forecasts, as the insolvency model simulations are conditional on the validity of numerous restrictive assumptions, and as they contain only the losses

[5] *Puhr, C. and M. Schneider. 2021. Have mitigating measures helped prevent insolvencies in Austria amid the COVID-19 pandemic? In: Monetary Policy and the Economy Q4/20–Q1/21. OeNB. 77–110.*

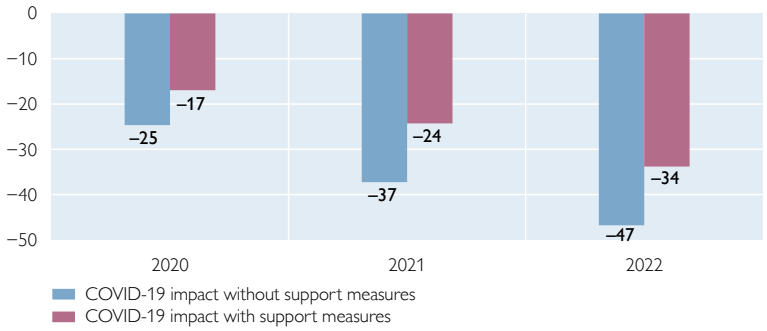
[6] *The following support measures were taken into account: short-time work, fixed cost grants I and II, capital injections into NACE I companies, VAT cuts for NACE I and R companies, compensation for sales lost in November and December 2020, compensation for losses, forbearance measures, loan guarantees, deferral of social security contributions and taxes, suspension of bankruptcy petitions against companies by public health insurance funds and tax offices, suspension of mandatory insolvency filings by overindebted companies.*

resulting from the projected decline in sales. Moreover, the simulations do not reflect the (substantial amount of) capital transfers from the household sector and from nonresidents observed in 2020, which means that the decline is overstated. The estimated pandemic-related decline in equity is also likely to constitute an upper bound as our insolvency model does not factor in any corporate investments.[7] Gross fixed capital formation by companies contracted by 3.9% in 2020 in view of lost sales. In other words, lower investment levels cushioned losses in sales to some extent, causing the impact of the COVID-19 pandemic on capital ratios to be smaller in actual fact than implied by the model.

Chart 3

Impact of the COVID-19 pandemic on corporate equity levels in Austria

EUR billion (Compared with a scenario without COVID-19)



Source: authors' calculations with the OeNB insolvency model.

According to the OeNB's financial accounts data, corporate equity levels contracted by EUR 5.5 billion in 2020. While this figure provides a benchmark, it cannot be used to cross-check the simulation results because of underlying conceptual differences. The insolvency model results are based on simulated monthly balance sheet data. The financial/national accounts framework, by contrast, uses a point-in-time approach to calculate equity levels. Moreover, the two frameworks differ with regard to the coverage of companies. Last but not least, the insolvency model maps the simulated capital losses against a counterfactual scenario without the pandemic, whereas the financial accounts data reflect annual changes.

2 Corporate equity ownership in Austria

One starting point for identifying possible strategies to strengthen corporate equity in Austria is to establish the underlying investor structure. In other words, we need to know how much of the companies' equity is currently being held by which economic sectors. To this effect, we provide a breakdown of the equity raised by Austrian companies from the individual financing sectors, using year-end 2020 data. The overview is based on the financial accounts data that the OeNB compiles. The financial accounts capture the flow of funds between the individual sectors of the economy, including the flow of funds between different units of the same sector, and the resulting stocks using unconsolidated data. For the purpose of this paper, we exclude the equity stakes of Austrian companies in other Austrian companies, presuming that a large share of such financing is intragroup financing. Both the financial accounts and the national accounts are based on the definition of

[7] *The OeNB's insolvency model was developed to quantify the impact of the COVID-19 pandemic on the insolvency risk of Austrian companies. The model is fed with corporate balance sheet as well as profit and loss data. For the sake of simplicity, the model uses static balance sheet structures, i.e. it does not reflect any investment made by the individual companies. The effect of this simplifying assumption on insolvency probabilities is limited, as vulnerable companies are unlikely to make big investments. Yet, this assumption has the side effect of overly driving up the profits, and hence the capital ratios, of thriving companies. That said, the impact of investment on capital ratios is limited: while investments affect cash flow performance, their impact on profit and capital is limited to the amount of depreciation and amortization.*

nonfinancial corporations. Specifically, nonfinancial corporations include stock corporations, limited liability companies and cooperatives as well as partnerships, such as limited partnerships or sole proprietorships with more than 50 employees and/or sales or more than EUR 10 million (OeNB, 2018). While being published in a timely manner, financial accounts data are available only for the corporate sector as a whole, without any breakdowns by firm characteristics like size, business sector or the like.

According to financial accounts data, the amount of equity held by Austrian nonfinancial corporations totaled EUR 353 billion at the end of 2020 (table 2).[8] Stocks accounted for about 30% of this amount (quoted shares: 20%, unquoted shares: 10%). The by far bigger part, namely 70%, was attributable to other equity. Other equity refers to equity held in companies that have not been set up as stock corporations.[9]

2.1 Equity ownership structures in Austria at the end of 2020

The bulk of Austrian corporate equity tends to be sourced from the rest of the world. At the end of 2020, nonresident investors accounted for 44% of the (consolidated) equity of Austrian companies. The share of nonresident investors exceeded 40% for all three types of equity instruments discussed here. According to the OeNB's securities statistics, three-quarters of all quoted shares acquired by nonresident investors qualified as portfolio investment. 14% of corporate equity was held by the government sector, with the average masking large differences among individual financing instruments. The government share was as high as 43% for unquoted shares but below 6% for other equity. Households[10] held close to 24% of Austrian corporate equity (mostly in the form of other equity) at the end of 2020, but only close to 14% of all quoted shares issued by Austrian companies. Private foundations held close to 12% of corporate equity, typically in the form of other equity. Taken together, domestic households and private foundations accounted for somewhat more than 35% of the consolidated equity of Austrian nonfinancial corporations. This figure masks considerable differences when it comes to individual financing instruments: The combined share, for instance, ranged from about 44% for other equity to 19% for quoted shares. Private foundations apart, which are classified in the financial sector, the amount of equity sourced from the financial sector is limited. Banks (or monetary financial institutions (MFIs), to be conceptually precise) provided only 1.7% of all corporate equity (but 52% of consolidated corporate debt) at the end of 2020. The share of institutional investors (insurance companies, mutual funds and pension funds) in total corporate equity also added up to 1.7%. (Even quoted shares accounted for just 4.6% of their portfolio.) Last but not least, other financial corporations (including holding companies and special purpose entities) supplied 3.7% of total corporate equity in Austria, mostly by investing in unquoted shares and other unquoted equity.

[8] *The figure at which we arrive for equity held by nonfinancial corporations (EUR 353 billion) differs from the amount shown on the OeNB's website (EUR 428 billion) for two reasons: we used consolidated figures and excluded the equity stakes of Austrian companies in other Austrian companies.*

[9] *Stocks are valued at current market prices in line with international national accounts conventions, whereas other equity is shown at book value.*

[10] *Including nonprofit institutions serving households.*

Table 2

Corporate equity and debt ownership in Austria

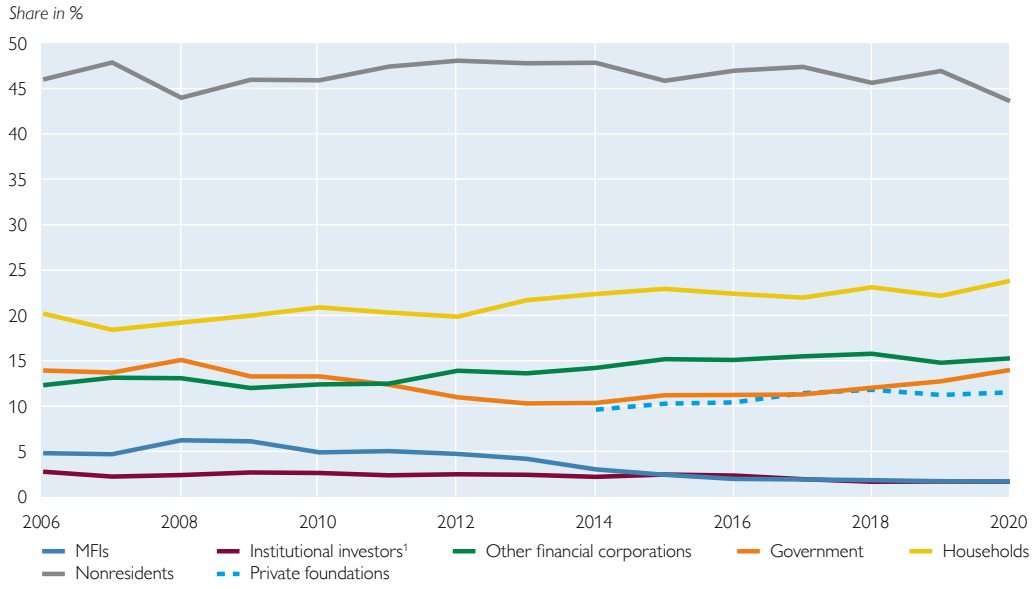
	MFIs	Institutional investors	Other financial corporations incl. holdings and SPEs	Private foundations	Government sector	Households and nonprofit institutions serving households	Rest of the world	All sectors
	Assets in EUR million (end-2020)							
Quoted shares	*466*	*3,271*	*735*	*4,105*	*20,160*	*9,691*	*32,809*	*71,237*
Unquoted shares	*1,016*	*453*	*1,850*	*1,166*	*14,937*	*1,476*	*14,209*	*35,108*
Other equity	*4,475*	*2,145*	*10,648*	*35,409*	*14,262*	*72,864*	*106,893*	*246,695*
Total equity	5,957	5,869	13,232	40,680	49,359	84,031	153,911	353,039
Total debt	179,597	6,249	5,887	294	25,281	15,383	112,410	345,100
Debt and equity	185,553	12,118	19,119	40,974	74,640	99,414	266,321	698,139
	Share of individual sectors in corporate equity in %							
Quoted shares	*0.7*	*4.6*	*1.0*	*5.8*	*28.3*	*13.6*	*46.1*	*100.0*
Unquoted shares	*2.9*	*1.3*	*5.3*	*3.3*	*42.5*	*4.2*	*40.5*	*100.0*
Other equity	*1.8*	*0.9*	*4.3*	*14.4*	*5.8*	*29.5*	*43.3*	*100.0*
Total equity	1.7	1.7	3.7	11.5	14.0	23.8	43.6	100.0
Total financial assets of individual sectors (EUR million)	1,178,334	347,777	134,193	55,465	301,092	779,071	847,298	3,643,228
of which: corporate equity (%)	*0.5*	*1.7*	*9.9*	*73.3*	*16.4*	*10.8*	*18.2*	*9.7*

Source: OeNB (financial accounts).

Note: Based on consolidated figures = capital of nonfinancial corporations minus (asset-side) debt instruments held by the nonfinancial corporations sector. MFIs (monetary financial institutions) = the OeNB, credit institutions and money market funds; SPEs = special purpose entities.

Chart 4

Equity ownership of Austrian nonfinancial corporations



Source: OeNB (financial accounts).

[1] Insurance companies, mutual funds, pension funds.

The (consolidated) capital structure of Austrian companies has remained broadly unchanged since 2006 (the first year for which the respective data are available; chart 4). The share of capital sourced from the rest of the world hovered around 45% in the period under review. At the end of 2020, this share was about 2 percentage points below the share measured for 2006. The MFI share of corporate equity dropped from 4.8% to 1.7%. The arising gap was filled by households (whose share of corporate equity went up by 3.6 percentage points between 2006 and 2020) and other financial corporations (plus 3 percentage points, including private foundations). Between 2014 and 2020, which is the subperiod for which data on private foundations are available separately, the share of private foundations remained broadly stable.

In order to assess potential options to increase equity finance in Austria, we also need to understand the role corporate equity plays as a source of financial investment for individual economic sectors. For most sectors, its relevance is comparatively low (table 2). The only two exceptions are private foundations, which had invested close to three-quarters of their financial assets into Austrian corporate equity at the analysis date, and to some extent also households, with a corresponding share of close to 11%. In contrast, institutional investors had put only 1.7% of their financial assets into corporate equity at the end of 2020, and banks only 0.5%. This compares with a share of slightly more than 18% of Austrian corporate equity sourced from nonresident financial investors.

2.2 On the role of institutional investors

Institutional investors serve to channel other people's money saved through, e.g., insurance policies and private pension plans into financial instruments traded in capital markets. In Austria, institutional investors have been playing a minor role in corporate equity ownership (table 2), above all when it comes to investment in corporate stocks of these institutional investors. This can be explained with the generally small volume of assets invested in stocks. According to financial accounts data, Austrian institutional investors (mutual funds, insurance companies, pension funds) had invested only 10.2% of their assets in quoted shares at the end of 2020 (table 3[11]). Moreover, among the stocks held by institutional investors, shares issued by Austrian companies are of minor relevance. Most of the stock portfolio (87.7%) is attributable to foreign shares, compared with just 8.7% issued by domestic nonfinancial corporations (which accounted for 0.9% of institutional investors' total assets). Pension funds tend to invest in mutual fund shares rather than in corporate stocks directly. According to the financial accounts, Austrian pension funds had put 91% of their total assets into mutual funds at the end of 2020, while holding almost no stocks directly. When we include indirect share investment through domestic mutual funds, the share of stocks increases to about 14% (EUR 3.9 billion at the end of 2020). Here too, almost all of the shares held had been issued by nonresidents, with shares issued by residents accounting for a mere 0.6% of all pension fund assets.[12] The mutual fund shares held by insurance

[11] *The table contains data that are not part of the regular release of financial accounts data that the OeNB provides on its website.*

[12] *We are unable to provide a corresponding breakdown for foreign mutual funds.*

Table 3

Quoted shares held by institutional investors

	Held by			
	Mutual funds	Insurance companies	Pension funds[1]	Total
	EUR million (end-2020)			
Total	34,325	1,156	0	35,481
Domestic issuers	3,336	1,012	0	4,348
Nonfinancial corporations	2,554	717	0	3,271
Other domestic sectors	782	295	0	1,077
Foreign issuers	30,989	144	0	31,133
	% of institutional investors' total assets			
Total	17.5	0.9	0.0	10.2
Thereof: nonfinancial corporations	1.3	0.6	0.0	0.9
Total assets	196,089	124,236	27,451	347,776

Source: OeNB (financial accounts).

[1] *Typically investing in mutual fund shares, pension funds hold shares indirectly.*

companies comprised quoted shares worth EUR 3.6 billion, of which EUR 1.6 billion related to shares issued by domestic companies.[13]

The limited role of institutional investors in providing corporate equity in Austria is in no small part due to the structure of Austria's pension insurance system. The pool of assets that is available for investment in capital markets is much larger in countries with funded pension systems than in countries with pay-as-you-go pension systems (like Austria). Furthermore, the asset allocation of institutional investors may be affected by the low degree of market capitalization and liquidity that characterizes the Austrian stock market. Austria's stock market is comparatively small and dominated by small-cap stocks and little free-float ownership. In the MSCI World Index, for instance, Austrian stocks carry a weight of less than 0.1%. In this vein, the small share of investment in Austrian stocks is also a reflection of the prudence principle guiding insurance companies and pension funds in investing the assets entrusted to them. Last but not least, the comparatively small volumes traded on the Austrian stock market also result in low levels of liquidity. In the absence of adequate liquidity, especially larger institutional investors will not be able to acquire the volumes required for their portfolios in a timely manner.

3 Corporate funding escalator and frictions between equity supply and demand

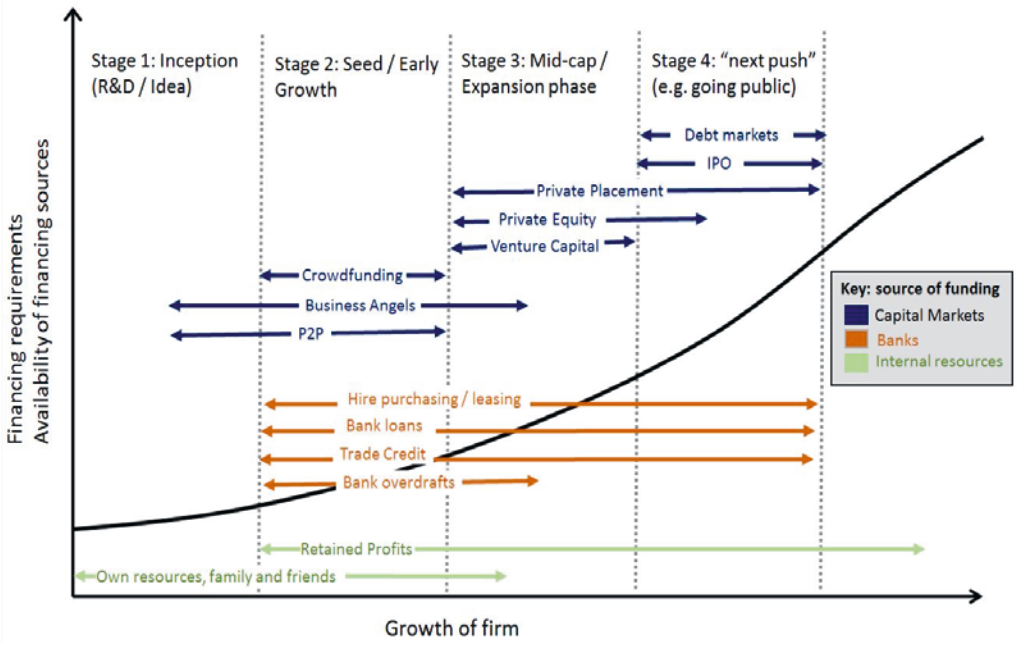
3.1 Equity sourcing in an international comparison

Securing adequate funding for initial expansion plans is often a big challenge for business start-ups, and risk capital financing is underdeveloped in Europe compared with other markets, such as the United States or Israel. Start-ups typically progress through a number of funding rounds, repeatedly realigning the interests

[13] *Money invested by households in mutual funds is classified neither under contributions to insurance policies nor under money invested in dedicated pension plans.*

Figure 2

Funding escalator



Source: European Commission.

of founders and owners as they grow in a process that has been represented as a funding escalator (figure 2). At the bottom of the funding escalator, funding comes from the founder, family and friends; after that, in the early growth stage, banks, business angels or crowdfunding platforms start to provide external funding.

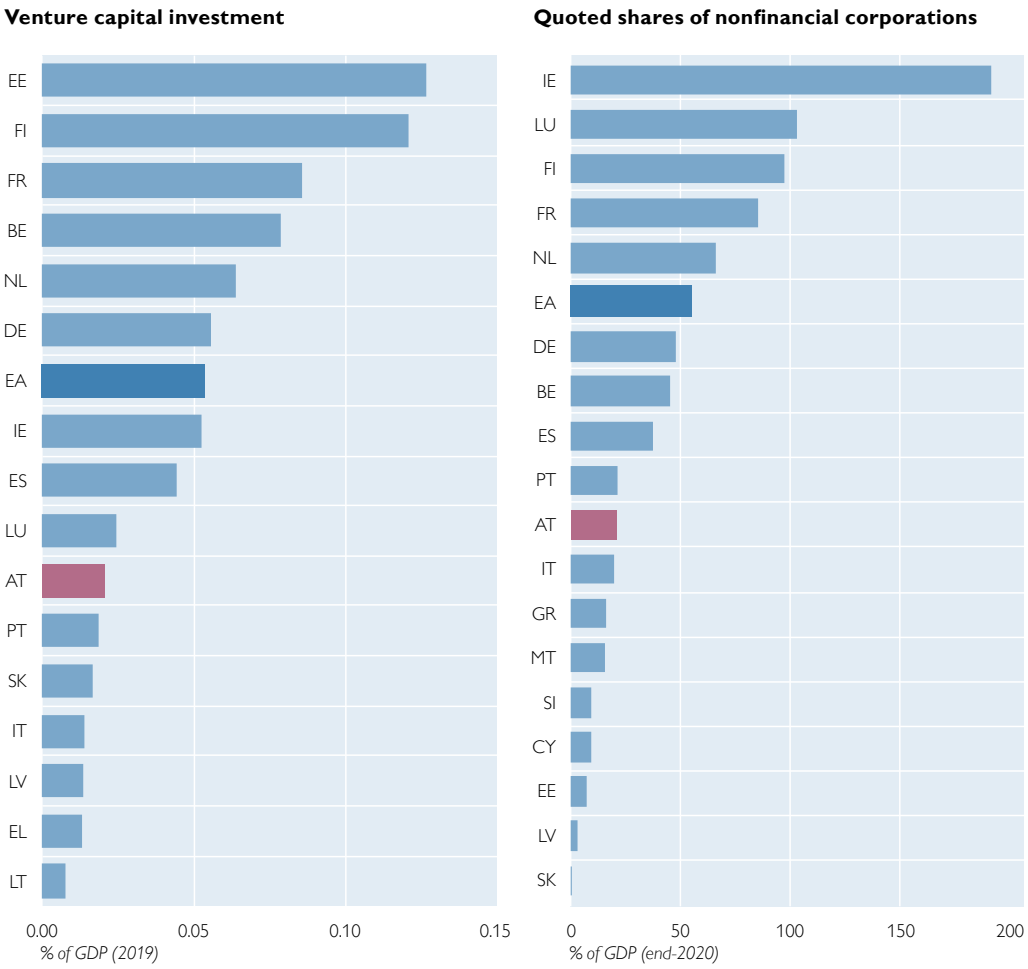
Compared with other countries, Austrian businesses make only limited recourse to the range of equity financing instruments available for the various stages of the business life cycle; they tend to rely on bank loans instead. This holds true for both venture capital financing, which is geared to start-ups and new businesses in the early stages of expansion, and the option to tap the stock market by issuing shares, which is an instrument of choice for mature businesses (chart 5).

Venture capital investment in Austria was equivalent to 0.02% of GDP in 2019 according to OECD data. This is only slightly more than one-third of the euro area average and the measure for Germany. Given the relatively low share of equity in the financial assets held by the nonfinancial sectors – and the even smaller share in the financial assets of the financial sectors – the scarcity of risk capital financing in Austria is unlikely to be due to a lack of funds. Likewise, it is unlikely to result from a lack of subsidy options, since many support mechanisms are in place and many more have been made available in the past decade.

Austria's relative position in the euro area is not that much different when it comes to quoted shares. According to data derived from the ECB's Statistical Data Warehouse, the market value of shares issued by Austrian nonfinancial corporations at domestic and foreign stock exchanges was equivalent to 21.1% of GDP at the end of 2020. This was less than half of the euro area average and of the German equivalent.

Chart 5

Use of equity instruments



Source: OECD, ECB.

3.2 Potential frictions between equity supply and demand in Austria

3.2.1 Background

At the European level, the issue of raising corporate finance, and of funding small and medium-sized enterprises (SMEs) in particular, has for instance been addressed as part of the EU's efforts to deepen the capital markets union.[14] Policy-makers have acknowledged the complexity of the issue and communicated their understanding that individual measures will not suffice to make a difference. Making substantial progress will require an integrated mix of measures.

[14] *"A Capital Markets Union for people and businesses – new action plan" (COM(2020) 590 final), providing details on 16 actions on which the European Commission commits itself to achieve three key objectives: making financing more accessible to European companies, making the EU an even safer place for individuals to save and invest long-term, and integrating national capital markets into a genuine single market.*

From an investor's supply-side viewpoint,[15] several issues are important when providing capital apart from yield targets, namely factors like taxation, the investment horizon and exit options but also factors that go beyond the traditional investment focus, such as environmental, social and governance (ESG) criteria. Yield targets may relate to both the current yield and the yield investors can realize when selling their equity stake in a company.

From the equity demand viewpoint, it is above all the following considerations that matter: asset value at issuance (balance sheet view vs. economic view of capital), purpose of equity financing (raise additional capital, fill liquidity gaps, etc.), repurchase privileges, governance, disclosure requirements and possible drag-along rights and obligations of existing and new shareholders.

In a stocktaking exercise for identifying challenges for Austrian businesses in raising equity finance and inviting a debate on possible solutions, we conducted a structured OeNB survey among the following relevant stakeholders: the Austrian Economic Chambers (WKO), Wiener Börse, Austria Wirtschaftsservice Gesellschaft mbH (aws[16]), Austrian Private Equity and Venture Capital Organisation (AVCO) and AustrianStartups. In addition, OeNB officials met up with representatives of international institutional investors (BlackRock, Allianz Capital Partners and International Finance Corporation) as well as major Austrian banks. Summing up, we found broad agreement among these stakeholders with a view to the existing impediments to raising capital. The evaluation highlighted above all the following aspects: (1) difficulties of business start-ups in raising adequate financing in growth stages, (2) tax discrimination between debt and equity, and (3) a lack of financial knowledge.

In the following, we outline the frictions between capital supply and demand in greater detail.

3.2.2 Impediments to demand for equity

The kind of impediments that exist for demand for capital and the severity of the challenges depend on a number of factors. These factors include the size of the business, ownership and management structures and the level of internal development as well as the sector in which a company is doing business. Other factors of relevance are the (un)availability of collateral (such as real estate vs. intellectual property), how well the business has been performing and the purpose for which it seeks to raise capital (establishment, growth, recovery, etc.), ownership preferences and the legal form of the company and whether it is growth- or subsistence-oriented.

Impediments to raising capital externally that were brought up again and again include:

- reluctance among business owners to step aside and allow for significant external control;

[15] *For insights into the decision-making process of institutional investors, see e.g. the "Study on the drivers of investments in equity by insurers and pension funds" (2019) produced by Deloitte Belgium and CEPS for the European Commission.*

[16] *The main focus of aws, a public sector entity, is on providing services to innovative enterprises and academic researchers to facilitate the establishment and development of technology start-up firms and to foster the use of high tech in Austria.*

- information deficits among business owners with regard to their options for raising external capital and how these solutions might work;
- data gaps arising from accounting and internal reporting deficiencies at SMEs, as a result of which the information expectations of external investors cannot be met in a timely manner;
- different tax treatment of debt and equity;
- availability of alternatives such as trade credits, subordinated loans and favorable bank lending.

3.2.3 Impediments to equity supply

Getting investors on board may be more difficult for business owners in the absence of adequate incentives for investment. A lack of incentives for investment may be due to information deficits on the part of investors (which is especially relevant at the SME level), deal size (investment volumes may be too small for investors) and the comparatively lower degree of liquidity associated with investments in unlisted companies. Investors may also be less savvy about particular economic sectors, and the absence of peer groups for capital-seeking companies may cause price expectations and risk tolerance to diverge. Furthermore, in the interest of safeguarding financial stability and adequate consumer protection, institutional investors like nonbanks and banks must also comply with regulatory requirements and possibly supervisory restrictions.

3.2.4 What are the regulatory requirements for nonbank financial intermediaries investing in risk capital/equity instruments?

Under current legal framework conditions, nonbank financial intermediaries[17] may invest in a broad range of venture capital or equity instruments. Actual investment activities must be compatible with internal investment rules and regulatory upper exposure limits where applicable. In the prevailing low-yield environment, equity instruments have become more popular among investors, but in absolute figures the amount of funds invested by nonbank financial intermediaries remains limited. Diversifying assets to include equity instruments may make sense for nonbank financial intermediaries, subject to the ownership rights conferred and potential liquidity issues. Other considerations relate to the preservation of portfolio asset quality, given that insurance companies, pension funds and provident/severance funds manage money saved for retirement and care or as a means of protection from financial loss.

With regard to the role pension funds may play in increasing equity financing, it should be noted that the second pillar of Austria's pension system is comparatively small. Moreover, the Austrian pension funds invest only limited amounts in shares and tend to invest in foreign rather than domestic shares. This, in turn, is in no small part due to the comparatively limited market capitalization and liquidity of the Austrian stock market. As long as this is the case, any effort to strengthen the role of pension funds is likely to benefit corporate equity financing in Austria only to a relatively small extent. Moreover, the asset allocation rules for pension funds ought to be changed only with a view to enhancing retirement provision.

[17] *The nonbank sector includes undertakings for collective investment in transferable securities (UCITS), alternative investment funds, corporate provident/severance funds, pension funds and insurance companies.*

3.2.5 Regulatory requirements for the financial sector: banks must back investments in nonfinancial companies with own funds

Banks holding shares and other equity issued by nonfinancial corporations must set aside minimum amounts of capital to cover that risk. The risk weights banks need to apply to calculate the minimum capital requirements depend on their approach to measuring credit risk (standardized approach vs. internal ratings-based (IRB) approach) and on the actual risks incurred.

At present, the IRB approach is being applied by just five Austrian banks, using average risk weights ranging from 190% to 370% for equity holdings. All other Austrian banks have adopted the standardized approach, typically using a risk weight of 100% (Article 133 of the Capital Requirements Regulation – CRR). Under this approach, a higher risk weight, namely 150%, must be assigned to investments in venture capital firms and investments in private equity (Article 128 CRR, exposures associated with particularly high risks). Other risk weights apply for exposures to financial companies, exposures in the form of units or shares in collective investment undertakings or if public sector guarantees apply. Moreover, under the supervisory review and evaluation process, banking supervisors may require banks to hold additional capital ("Pillar 2") for risks arising from equity holdings deemed not covered or insufficiently covered by the aforementioned minimum capital requirements ("Pillar 1").

The final Basel III framework, which is scheduled to apply from January 1, 2023, onward, will change the risk weighting of equity holdings. Specifically, Basel III provides for the migration of equity holdings to the standardized approach; the IRB approach will no longer be permitted. Due to concerns about a feedback loop between financial institutions and the real economy and to account for the higher risk of loss of equity, the risk weight applicable under the standardized approach for credit risk will be increased from currently 100% to 250%. Speculative unlisted equity exposures will receive a higher risk weight of 400% under the final Basel III framework. However, the applicable risk weights will depend on the specific implementation of the Basel III reforms in the EU.

4 Possible measures to increase corporate equity ownership in Austria

In talks with representatives of national and international institutions,[18] we discussed a range of economic policy and regulatory measures to strengthen the equity base of companies, with a focus on tax incentives and different types of equity holdings, which will be presented below. Moreover, we highlight two international approaches to supporting the availability of equity finance for small and medium-sized companies.

A number of proposals put forth included providing better tax incentives for investing in risk and equity capital. A suggestion brought up repeatedly was to put an end to the tax bias toward debt by allowing fictitious interest on equity to be deductible (for a discussion of this proposal, see box 1). Another idea that was proposed repeatedly was an equity investment allowance for early-stage investments (in the amount of about 50% of the capital invested). Another proposal was to widen the time span for which losses arising from equity holdings may be carried

[18] *The World Bank, the Austrian Economic Chambers, Wiener Börse, aws, AVCO, AustrianStartups, etc.*

forward or anticipated (e.g. three years in either direction). Last but not least, it was also suggested to re-introduce a one-year holding or speculation period during which securities investment gains should not be subject to the withholding tax on investment income.

Box 1

Notional interest deduction – a tax incentive for equity financing?

For Austrian businesses, equity proves more expensive than debt as the return on these types of finance is taxed differently ("debt bias"). The current system allows tax deductions of interest payments from the tax base but not of equity costs. Among the larger euro area countries, Italy, Belgium and Portugal have already introduced notional interest deduction by means of an allowance for corporate equity (ACE) in corporate taxation. These countries currently have a so-called soft ACE regime in place, where equity increases are multiplied by an appropriate nominal rate of interest ("allowance rate"). The resulting amount may then be deducted from the tax base.[19] Naturally, the scope of such favorable treatment varies according to the allowance rate. Due to the low level of interest rates in general, larger businesses in Belgium even had a marginally negative notional return on equity in 2020 (European Commission, 2021).

In the early 2000s, Austria had likewise enacted preferential tax treatment for corporate equity, which was subsequently replaced by a general corporate income tax reduction in 2005 for incorporated firms and a profit allowance for unincorporated firms in 2010.[20] To mitigate the debt bias and stimulate equity financing, it would also be possible to restrict tax deductions of interest payments on debt. Yet in practice, measures taken in this respect mostly target tax avoidance strategies of corporations.[21] In Austria, the following interest payments are nondeductible: interest paid on intragroup equity acquisitions or to parent companies abroad, provided the foreign applicable tax rate is below 10%.[22]

[19] *Belgium had previously implemented a hard ACE regime, taking into account the full stock of equity.*

[20] *A study recently commissioned by the Ministry of Finance discusses the possibility of introducing an ACE (Köppl-Turyna et al., 2021).*

[21] *It would be very difficult to implement a general nondeductibility of interest payments. If interest income were still taxable in this case, there would be a very heavy tax burden on the financial sector. On the other hand, if income on interests was also tax-free, financial companies would be undertaxed.*

[22] *Furthermore, the EU Anti-Tax Avoidance Directive (ATAD) contains an interest limitation rule ensuring that net interest payments over 30% of EBITDA (i.e. earnings before interest, taxes, depreciation and amortization) are not deductible for larger businesses.*

Table 4

Selected studies investigating the impact of tax measures on equity finance

Authors	Country	Measures	Impact on equity
Petutschnig and Rünger (2017)	Austria	Corporate/personal income tax rules (2000–2003)	Yes
Petutschnig and Rünger (2016)	Austria	Half tax rate on personal income (2004–2009)	~
Petutschnig (2018)	Austria	Interest limitation rules	Yes
Panier et al. (2013)	Belgium	Hard ACE	Yes
Princen (2012)	Belgium	Hard ACE	Yes
Campenhout and Caneghem (2013)	Belgium	Hard ACE (SMEs only)	No
Branzoli and Caiumi (2018)	Italy	Soft ACE	Yes

Source: authors' compilation.

Note: ACE = allowance for corporate equity.

Empirical studies generally suggest that notional interest deduction is effective (table 4), but the effect on SMEs is somewhat disputed.[23] The latter might also be attributable to the fact that the respective rules tend to be very complicated in order to prevent tax avoidance (see for example Zangari, 2014).

Lowering corporate taxation in general, like Austria did in the 2000s, would be a possible alternative to reducing the fiscal debt bias. Given its general nature, this measure could, however, only achieve the same effect on the capital position as a soft ACE (favorable treatment of incremental equity) at the expense of a much bigger loss in tax revenues. Notional interest deduction, in turn, would also benefit unincorporated firms (provided they use double entry bookkeeping), thus ensuring legal form neutrality.

A drawback that applies to general tax cuts and notional interest deductions alike is that both measures would above all entail higher retained earnings, which is why the equity situation of individual businesses would only improve at a slow pace. A much faster effect could be achieved by introducing tax incentives for investors to encourage investments in certain equity instruments. But such a measure would also have significant drawbacks. Measures related to corporate taxation are specifically geared toward Austrian businesses, while tax measures aimed at investors would also have to favor international companies (at the same time, investments of international taxpayers in Austrian businesses would not receive favorable treatment). Moreover, such measures are likely to have a highly uneven distributional effect[24] and would thus hamper progressive income taxation.

The suggestions relating to the role of intermediation support for equity finance included a number of suggestions to promote venture capital funds. A proposal made repeatedly, along the lines suggested by Keuschnigg and Sardadvar (2019), was to create an Austrian fund of funds which would invest in target funds set up to provide equity to start-ups and SMEs during the growth stage. Austrian institutional investors might be nudged to start investing in this asset class with accompanying public sector guarantees that would be remunerated at market rates. Public sector

[23] *In this respect, the studies by Petutschnig and Rünger (2016, 2017), among others, deliver interesting results. Using a mostly corporation-based dataset, they found that a small tax advantage significantly affected the increase in equity in the early 2000s (in incorporated and unincorporated firms). However, an analysis of a follow-up regulation favoring to a much greater extent unincorporated firms only, concludes that even though this regulation did indeed bring a rise in equity, the increase was not more pronounced than that seen for corporations.*

[24] *In the 1980s, high-income earners benefited disproportionately from extremely generous tax benefits for investments in certain equity instruments.*

guarantees would lower the refinancing costs of the fund and make it more attractive for institutional fund investors. Role models for state-backed funds supporting equity finance exist; in France, such a fund was launched in 2021 (see box 2).

Another possible way to go would be one or more banks stepping forward, issuing private equity fund shares or supporting or sponsoring SME funds. The UK Business Growth Fund, launched already in 2011, is a case in point (see box 2). Another option to step up the provision of equity might be to introduce new types of collective investment vehicles: SICAVs (Société d'investissement à capital variable) or SICAFs (Société d'investissement à capital fixe). They would invest in SMEs or start-ups of all shapes and forms. Finally, as also mentioned repeatedly, institutionalizing and expanding the COVID-19 start-up relief fund launched by aws (see footnote 16) should also make a difference.

Box 2

Selected initiatives promoting equity financing

Equity capital initiative in France

The goal of the French equity capital initiative is to support SMEs through a "Fonds de prêts participatifs," i.e. a fund offering quasi-equity in the form of participative loans. In other words, this fund is meant to support businesses that, while having been hit by the economic crisis, still operate on healthy business models. The fund is financed via insurance companies and institutional investors, which bear the costs of fund management and receive 4.5% to 5.5% interest on participation capital. The French government guarantees losses of up to 30% of the fund's assets. The state guarantee is remunerated by investors at between 0.9% and 1.8% of the nominal participation capital. Five large banks offer issuance support to businesses, assess the credit quality and bring 90% of the newly issued participation capital into the fund while keeping 10% on their balance sheets. For these services, they receive a fund management fee and fee-based income. The maturity period of participation capital is limited to eight years. The whole program amounts to EUR 20 billion.

UK Business Growth Fund

The UK Business Growth Fund (BGF) was established in 2011 by five large banks (Barclays, HSBC, Lloyds, RBS and Standard Chartered) on the basis of a political initiative with the aim to strengthen the funding of SMEs in the UK and Ireland. Since then, the fund has invested more than GBP 2.7 billion in over 420 businesses and supported 110 exits. From its very outset, BGF has built a regional model with a wide network suitable for distributing large amounts of investments among SMEs. Its business model is based on a pre-selection of growth companies (average compound annual growth rate of 5.1%) whose annual sales range from GBP 2.5 million to 100 million and that require substantial funding but whose founders do not wish to give up control yet. An investment committee makes decisions on investments independently of the owners. The investment volume typically ranges from GBP 5 million to 10 million and BGF owns a 10% to 40% minority share of each company. A BGF representative sits on the board to ensure close monitoring of the companies. BGF also has a network of 6,000 non-executive managing directors and industry experts ready to provide support and advice to SMEs. Earnings from exits are reinvested. Considering itself a long-term investor, BGF does not lay down any rules for exits, however. In view of the long investment horizon, the expected return on investment is lower than in the case of traditional private equity investors (some 10%, on average). BGF has already joined the ranks of the world's largest financing vehicles for young businesses. Meanwhile, the model has also been exported to Ireland, Canada and Australia, partly with governments getting involved too.

In the interest of addressing market imperfections, equity finance-promoting funds as discussed above might also be launched as private-public partnerships, geared at supporting Austrian SMEs in predefined sectors, for instance tech companies. This role could either be taken on by new entities or by vehicles that exist already at the general and regional government levels, such as Österreichische Beteiligungs AG (ÖBAG, managing companies partially or fully owned by the Republic of Austria) or regional government holding companies. Another option would be to expand existing support schemes, like tech catalyst funding provided by aws. Last but not least, one option might also be the creation of silent partnerships by converting publicly guaranteed loans into equity.

5 Summary

Before the crisis triggered by the COVID-19 pandemic, corporate equity capital ratios had been improving steadily in Austria. In 2018, domestic corporate capital ratios were well aligned with international averages, except for the lowest quartile, where Austrian companies had significantly lower capital ratios than peer companies in other countries under review. Equity ownership is broadly diversified across all economic sectors: the rest of the world (44%), households (24%), the government sector (14%) and private foundations (12%). International comparisons show that the role of both quoted shares and venture capital is limited in Austria.

According to the OeNB's insolvency model, the crisis triggered by the COVID-19 pandemic has had a marked impact on corporate equity levels in Austria. Reflecting all support measures known at the time of writing, the insolvency model implies that capital ratios are likely to drop by an average of 6.2 percentage points until 2022. In the absence of the support measures, the decline would be even twice as high, i.e. 12.4 percentage points.

Raising corporate equity is subject to numerous impediments in Austria, on both the supply and demand side. Supply-side impediments include, among other factors, information deficits, deal size issues, low market liquidity, legal and regulatory framework conditions. Demand-side impediments include concerns among owners about losing control, information deficits and data deficiencies or tax discrimination.

Discussions with relevant experts and market participants highlighted a number of options to strengthen equity finance. Suggestions that were made repeatedly include creating tax incentives, strengthening intermediation support for equity finance and building public-private partnerships. Beyond Austria, we find a number of examples for how to ensure better access to equity finance for small and medium-sized enterprises with public sector initiatives. In this paper, we highlight above all the UK Business Growth Fund and the equity finance support program adopted more recently in France.

References

Branzoli, N. and A. Caiumi. 2018. How effective is an incremental ACE in addressing the debt bias? Evidence from corporate tax returns. Taxation Papers 72. Directorate General Taxation and Customs Union, European Commission.

Campenhout, Geert and T. Caneghem. 2013. How did the notional interest deduction affect Belgian SMEs' capital structure? Small Business Economics 40(2).

European Commission. 2020. Crowdfunding. https://ec.europa.eu/newsroom/fisma/items/667392

European Commission. 2021. Direct taxes – Corporate Income Tax (for Belgium). Taxes in Europe Database. https://ec.europa.eu/taxation_customs/tedb/taxDetails.html?id=25/1609455600

Hölzl, W. 2020. Die österreichischen Unternehmen in der COVID-19-Pandemie. Ergebnisse der Sonderfragen des WIFO-Konjunkturtests. WIFO-Konjunkturtest Sonderausgabe 2020(1). https://www.wifo.ac.at/jart/prj3/wifo/resources/person_dokument/person_dokument.jart?publikationsid=65990&mime_type=application/pdf

Keuschnigg, C. and S. Sardadvar. 2019. Wagniskapital zur Finanzierung von Innovation und Wachstum. Wirtschaftspolitisches Zentrum Studie. http://www.wpz-fgn.com/wp-content/uploads/RFTE_Wagniskapitalfinanzierung_20190604.pdf

Köppl-Turyna, M., W. Schwarzbauer, J. Berger and L. Strohner. 2021. Maßnahmen zur Stärkung des Eigenkapitals – Studie zu den Maßnahmen zur Stärkung von Eigenkapital mit speziellem Fokus auf steuerliche Absetzbarkeit von fiktiven Eigenkapitalzinsen. Study commissioned by Austria's finance ministry.

OeNB. 2018. Gesamtwirtschaftliche Finanzierungsrechnung (Finanzielle Sektorkonten der VGR) nach ESVG 2010. Handbuch zu Definitionen, Quellen und Berechnungsmethoden. https://www.oenb.at/dam/jcr:509e5d0d-fbd3-4419-9aea-faca7d90e375/gfr_finanzielle-sektorkonten_handbuch-2018-06.pdf

OeNB. 2020. Betroffenheit der österreichischen Unternehmen durch die COVID-19 Pandemie nach Branchen. Konjunktur Aktuell – Berichte und Analysen zur wirtschaftlichen Lage. April 2020.

Panier, F., F. Perez-Gonzales and P. Villanueva. 2013. Capital structure and taxes: What happens when you (also) subsidize equity? Mimeo, Stanford University.

Petutschnig, M. 2018. Die Auswirkung von § 12 Abs 1 Z 10 KStG auf die Fremdkapital-Quoten österreichischer Kapitalgesellschaften. ÖStZ 2018/904.

Petutschnig, M. and S. Rünger. 2016. Die Wirkung von steuerlichen Maßnahmen zur Förderung von Eigenkapital – Eine Analyse am Beispiel Österreich. BFuP – Betriebswirtschaftliche Forschung und Praxis 68(4). 359–378.

Petutschnig, M. and S. Rünger. 2017. The Effects of a Tax Allowance for Growth and In-vestment – Empirical Evidence from a Firm- Level Analysis. WU International Taxation Research Paper Series 2017-09. Vienna University of Economics and Business.

Princen, S. 2012. Taxes do Affect Corporate Financing Decisions: The Case of Belgian ACE. Cesifo Working Paper 3713.

Udell, G. F. 2015. Issues in SME access to finance. European Economy (2)61.

Zangari, E. 2014. Addressing the Debt Bias: A Comparison between the Belgian and the Italian ACE Systems. European Commission Taxation Papers – Working Paper 44/2014.

The impact of climate change on monetary policy

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The challenges of climate change will affect all areas of economic policy, including monetary policy. Rising temperatures, extreme weather events and the political, social and technological responses to climate change may have significant effects on prices, output, productivity or credit markets. Central banks need to reflect these effects in their assessment of risks to price stability, their projections of economic developments and their analyses of financial markets. The mandate of the Eurosystem defines price stability as the primary objective of monetary policy, but it also mentions the support of general EU economic policies, including those aiming at environmental protection. In this contribution, we describe the implications of climate change for price stability, for the future conduct of monetary policy and for central banks' balance sheets. While monetary policy may play a role among the possible economic policy reactions to climate change, we contrast this role with more effective policy responses. Monetary policy has several instruments at its disposal: changes in the collateral framework, asset purchases and disclosure of climate-related information. Monetary policy implementation is subject to operational constraints, e.g. the principle of market neutrality, which need, however, to be balanced against central bank objectives and must take market inefficiencies into account. Our considerations square well with the ECB's recently presented action plan to include climate change considerations in its monetary policy strategy.

JEL classification: E52, Q54
Keywords: Climate change, carbon transition, monetary policy, central banks, Eurosystem

Climate change is one of the fundamental challenges to the economy that can affect prices, aggregate demand, and the balance sheet of both financial intermediaries and central banks. Many central bankers have identified climate change as a source of risks to financial stability and price stability. Already in 2015, Mark Carney, then Governor of the Bank of England, addressed the "tragedy of the horizon" in a seminal speech, referring to the problems financial markets face in correctly pricing climate-related risks. Since she became President of the European Central Bank (ECB), Christine Lagarde has stressed the importance of climate change for economic policymakers. Her fellow ECB Executive Board member Isabel Schnabel (2021a) explained what central banks could do to contribute to the global fight against climate change, and Frank Elderson (2021) emphasized the effects of climate change on credit markets and bank supervisors. Other members of the Governing Council of the ECB[2] have also contributed to the debate on whether central banks should take climate change into account and, if so, on how best to incorporate climate-related risks or climate change-mitigating efforts into their policy framework. As a result of the ECB's recent monetary policy strategy review, the Governing Council emphasized its commitment to ensuring that the Euro-

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[2] *See, for example, Holzmann (2021), Villeroy de Galhau (2021), Visco (2021) or Weidmann (2021).*

system fully takes into account, in line with the EU's climate goals and objectives, the implications of climate change and carbon transition for monetary policy and central banking.

This paper presents the possible consequences of climate change for monetary policy in general and for the euro area in particular as well as its effects on the Eurosystem's monetary policy objectives and instruments and its future policy space. We will only deal with financial stability aspects of climate change if they affect monetary policy transmission; climate-related financial stability risks have been addressed in previous OeNB publications (e.g. Pointner and Ritzberger-Grünwald, 2019). However, we will try to assess the scope for action central banks may take in coordination with other policymakers, who bear the principal responsibility for tackling climate change and its consequences. This question is of particular importance for the Eurosystem, which has a clear mandate to maintain price stability in the euro area, but is also obliged to support the general economic policies in the European Union without prejudice to this primary objective. In this respect, the Governing Council of the ECB recently announced an action plan, including a road map, to further incorporate climate change considerations into its policy framework (ECB, 2021).

Some effects of climate change might even reduce central banks' policy space as climate change impacts the natural rate of interest by reducing productivity and driving up savings, although countervailing effects that are related to technological progress spurred by transition polices must be taken into account. Rising uncertainty about future economic outcomes makes it more difficult for monetary policymakers to identify temporary and structural changes in the economy.

This article is structured as follows: Section 1 explains why climate change and its economic consequences are a concern for central banks and how the Eurosystem's mandate addresses environmental issues. In section 2, we discuss economic policy options available to tackle climate change and identify the appropriate role monetary policy might play in this context. Section 3 briefly addresses the risk management of climate-related financial risks by central banks and financial intermediaries. Section 4 presents some monetary policy instruments that could be used to tackle climate change and section 5 concludes.

1 The relevance of climate change for central banks

Climate change can affect price stability, the transmission mechanism of monetary policy and the balance sheet of central banks. A comprehensive overview of climate-related risks to price stability is given by Batten et al. (2020) or by the Network for Greening the Financial System (NGFS) (2020). Most obviously, rising global temperatures and more frequent extreme weather events will probably impact the production structure of economies and therefore have effects on prices. Climate change will affect agriculture, as crops and livestock are sensitive to temperatures and weather conditions. Agricultural prices have already been notoriously volatile in the past and have therefore also been of concern in inflation forecasts. If the physical risks of climate change, i.e. the risks of direct damage to physical assets (e.g. buildings and roads), materialize, they not only reduce output in a particular period, as Dietz and Stern (2015) emphasize, but can also lower production capacity in the economy at least temporarily, if e.g. firms must be rebuilt, and in the long run, if corporations must channel their available funds to

repair investment instead of promoting productivity-enhancing R&D. Heat waves can diminish labor productivity via negative health effects, too. Storms that destroy railroads or droughts that reduce the water levels of rivers have a negative effect on trade. While negative effects on productivity are expected to dampen the long-term equilibrium interest rate, increasing capital demand for green investments might counterbalance the downward pressure on interest rates.

The transition to a climate-neutral economy will most likely affect the price of energy and transport and have indirect effects on the prices of other goods. Central banks with an inflation target will closely monitor developments like the introduction of a carbon tax and integrate them into their analyses of inflation dynamics. Climate change and the side effects of climate policies could also disrupt financial markets and thus disturb the transmission channel of monetary policy, which relies on functioning bond markets and banks' ability to pass on monetary policy decisions to the real economy.

Finally, central banks hold assets for different purposes (e.g. reserve management, collateral, nonstandard monetary policy measures) and these assets are prone to revaluation due to climate change or climate policies; therefore, central banks should include an assessment of climate change risks in their own risk management.

The consequences of climate change might alter the structural parameters in central banks' economic models. Most central banks rely on macroeconomic models which incorporate the long-term relations between demand, supply and prices. Climate change and the reactions of policymakers and markets to global warming can alter the supply side of an economy, and shifts in consumers' preferences can cause secular changes to the deep parameters, such as intertemporal preferences or risk aversion, on which these macroeconomic models are built (as can other secular trends like demographic changes). Currently, not many central banks integrate climate change in their economic models. Models used by climate economists, such as integrated assessment models (IAMs), often lack a representation of monetary transmissions channels, whereas macroeconomic models do not incorporate economic damage resulting from climate change so far.

The radical uncertainty triggered by climate change might also alter the economic modeling framework. Traditionally, macroeconomic models employed by central banks assume a maximization rule applied by social planners, firms or households that strive to maximize the expected value of their future output, profits or utility while being subject to certain constraints. Krogstrup and Oman (2019) emphasize that climate change rises uncertainty about the expected outcomes of economic activities to new levels where the probabilities for catastrophic events become nonnegligible. Such catastrophic and often irreversible events include the thawing of permafrost, which could release huge amounts of greenhouse gases (GHGs) or cause ocean streams to change course. Bearing this in mind, policymakers dealing with climate change should adopt a risk management approach inspired by value-at-risk (VaR) models, which means maximizing future outcomes under the constraint that the risk of catastrophic and irreversible climate change remains below an agreed percentile. Broeders and Schlooz (2021) discuss the effects of climate change as a driver of fundamental uncertainty on central bank policy and propose to apply the precautionary principle to cope with potentially irreversible outcomes that cannot be estimated ex ante with meaningful

precision. The precautionary principle states that under radical uncertainty, additional mitigating policies are justified to lower the likelihood of, and the damage resulting from negative shocks to central banks' balance sheets and their policy objectives. Concluding their analysis, Broeders and Schlooz (2021) present practical examples in the field of central bank risk assessment, risk mitigation and the disclosure of climate-related information.

1.1 Conducting monetary policy in view of climate change

Not only will monetary policymakers take climate change into account when assessing risks to price stability, but also when choosing the appropriate monetary policy instruments. Both the assessment of risks and the choice of policies must reflect economic developments in the euro area, leaving out idiosyncratic shocks at the national or regional level. Given the size of the euro area, the economic effects of climate change may differ significantly from region to region. The European Environment Agency (2017) presented climate change impacts for the main biogeographical regions in Europe, pointing out that while in the Mediterranean region (Greece, Italy, Portugal and Spain) rising temperatures might lead to droughts and wildfires, the Atlantic region (Ireland, western France, Belgium, the Netherlands and northern Germany) might suffer from heavy precipitation and an increasing risk of coastal and river flooding; some regions might even benefit from higher average temperatures as heating costs would go down and harvests would improve. The regional impact of climate change could boost or reduce economic outcomes, which means that economic heterogeneity might possibly make the conduct of monetary policy more complicated. The diversity of the economic effects of climate change and the concomitant risks to price stability will challenge monetary policy in large countries like the USA or China, too. But these countries have established functioning risk-sharing mechanisms (e.g. fiscal federalism) which allow them to better absorb idiosyncratic regional shocks.

The effects of climate change could also reduce central banks' future room for policy maneuver. The impact of global warming on economic output is not limited to acute damage by storms, floods or droughts. Climate change may also reduce productivity growth. Economides and Xepapadeas (2018) describe climate change as a new propagation mechanism for total factor productivity (TFP) shocks, with GHG emissions lowering productivity in the long run given repeated climate-related damage. In their model, carbon taxes could dampen growth in the short run, but in the long run output would be higher as negative TFP shocks from climate change would be absent.

The increasing uncertainty about the effects of climate change could increase precautionary savings and thus lower effective demand and drive up risk premia in financial markets. The stranding (i.e. devaluation) of assets due to climate change or climate policies might trigger financial losses for banks and hamper monetary policy transmission. Dafermos et al. (2018) model the effects of unmitigated climate change over a period of 100 years, including not only the stronger depreciation of capital and lower growth rates due to climate-related damage but also the rebalancing of households' portfolios from corporate bonds toward deposits and governments securities that is triggered by higher economic uncertainty. According to their simulations, this climate-induced asset price deflation

would cause corporate bond yields to rise strongly after 2080[3]. Bylund and Jonnson (2020) show that such an increase in uncertainty has a dampening impact on the equilibrium interest rate because it strengthens precautionary saving. If climate change depresses the interest rate level, negative shocks to the economy (some of which may be triggered by climate change itself) bear a higher risk of bringing policy rates close to the effective lower bound. Under these circumstances, it seems likely that monetary policy must rely on nonstandard instruments more often. Unfortunately, such effects would be reinforced if fiscal policy was also constrained in its capacity to stabilize the economy due to high debt levels, which in turn might also be caused by additional public expenditure for climate change adaptation or mitigation measures.

Climate change can also affect the transmission of monetary policy to the real economy. When central bankers change their monetary policy stance, they rely on financial intermediaries to pass on their policy impulse to firms and households. Since banks are a major source of funding in the euro area, the credit channel is of utmost importance for monetary policy transmission. Banks are exposed to climate-related risks via their assets. The impact of climate change may destabilize credit markets by driving up default probabilities, reducing liquidity or causing reputational damage. Damage caused by climate change can erode the value of collateral and reduce borrowers' debt servicing capability, which in turn increases the probability of default and the numbers of nonperforming loans (NPLs). Climate policies like the introduction of carbon taxes may reduce debtors' revenues or depress the value of their investments, creating stranded assets.[4] Battiston et al. (2020) provide an assessment of the exposure of Austrian banks to transition risks based on the classification of climate policy-relevant sectors, but as the European Systemic Risk Board (ESRB, 2021) concludes, the quality and comparability of data is still wanting, especially with respect to the disclosure of firm-level data or forward-looking scenario analyses.

1.2 Strategic implications of climate change for central banks

Climate change can affect both the demand and the supply side of an economy. Positive demand shocks accelerate both inflation and GDP growth at the same time; hence an inflation-targeting central bank would react by raising interest rates to curb inflationary pressures and prevent an overheating of the economy. Supply shocks trigger price increases and dampen GDP growth; therefore, a restrictive monetary policy response which aims to maintain price stability would lead to a widening of the output gap. The Eurosystem's objective is to keep prices stable in the medium term, inter alia, because a medium-term focus allows monetary policy to react flexibly to different shocks and it takes into account the effective lags with which monetary policy decisions affect prices.

A climate-related demand shock could happen if consumer preferences changed, e.g. if consumers seriously reduced their demand for fossil-fueled vehicles. In such a case, workers in the automotive industry would become unemployed and

[3] *In contrast to the financial effects of transition policies like the introduction of carbon taxes, the effects of unmitigated climate change would occur later but are assumed to be irreversible.*

[4] *Combined with an initial green investment push, steadily rising carbon prices could shift the economy to a higher equilibrium by reducing uncertainty. Additional positive economic effects of carbon pricing come, for instance, from increased energy efficiency (see e.g. IMF, 2020).*

domestic demand would decline, as would consumer prices. An accommodative monetary policy reaction would stimulate growth and employment and furthermore facilitate investment in the necessary structural changes in the manufacturing sector.

The introduction of a carbon tax would rather act as a negative supply shock, depending on its pass-through and the use of revenues (see section 2.3). Energy prices would go up immediately and follow the pass-through to other production sectors, driving up inflation more broadly. Simultaneously, output would be reduced. Output losses are difficult to estimate in this scenario, however, as they crucially depend on the redistribution of carbon tax revenues. Euro area monetary policy would – given its medium-term orientation, which was only recently confirmed by the Eurosystem – be concerned by these price increases only if there were second-round effects from carbon taxes or if a carbon tax was introduced over an extended period. Many policy proposals suggest such an extended introduction phase for carbon taxes to give firms more time to adjust to new prices. In accordance with its secondary objective, namely to support the general economic policies in the EU, the Eurosystem could decide to let singular carbon tax-induced price increases happen without changing its monetary policy stance as long as there is no indication that these price increases would fuel a broader-based acceleration of inflation over the medium term. Such a strategy would rely crucially on the Eurosystem's capability to identify the sources of price increases correctly.

In an analysis of different monetary policy strategies, McKibbin et al. (2020) run simulations of the effects of climate change on inflation and output, based on a multi-sector multi-region model. They compare pure inflation targeting with flexible inflation targeting and nominal GDP targeting strategies with respect to their effects on prices, output and carbon emissions. Whereas a purely inflation-targeting central bank would change its monetary policy if, and only if, inflation deviated from its inflation target, a flexible inflation-targeting central bank follows a Taylor rule with non-zero weight on the output gap[5]. Under nominal GDP targeting (or nominal income targeting), the central bank attempts to stabilize nominal GDP growth; this means that negative supply shocks that reduce economic output and stimulate prices at the same time would induce less vigorous monetary policy reactions than under inflation targeting. McKibbin et al. (2020) find that among the three monetary policy regimes, purely inflation targeting central banks react more strongly to the introduction of carbon taxes, causing a more substantial reduction in output while keeping inflation close to target, while flexible inflation targeting would allow for a modest temporary increase in inflation that would significantly reduce output losses, and nominal GDP-targeting results in the highest tax-induced inflation spike and the smallest output loss. But interestingly, carbon emissions would be reduced most effectively under pure inflation targeting, whereas flexible inflation targeting and nominal GDP targeting would result in a lower reduction of carbon emissions because they allow for output stabilization.

[5] *A purely inflation-targeting central bank would change its policy rate at time t it according to the rule* $i_t = i_{t-1} + a(\pi^e - \pi^*)$ *with* π^e *being the expected inflation rate and* π^* *the inflation target. Under flexible inflation targeting, the reaction function looks more like* $i_t = i_{t-1} + a(\pi^e - \pi^*) + \beta(y^e - y^*)$ *with* $y^e - y^*$ *denoting the output gap and* $\beta > 0$.

Moving the focus from the primary objective of price stability to the secondary objective of supporting the EU's general economic policies, it is clear that policymakers other than central banks are more directly in charge of fighting climate change. Governments have more effective instruments at their disposal, e.g. environmental regulations, taxation or industrial policies (see following section). Coordinating these different policies properly will improve the outcomes. There is the political risk that the burden of climate action is shifted to central banks, which are less exposed to the electoral process, when democratically elected politicians try to avoid passing unpopular laws, e.g. laws introducing carbon taxes. Nevertheless, independent central bankers should refrain from transgressing the boundaries of their competence, as the public might see this as an unwarranted "mission creep." Villeroy de Galhau (2021) explicitly rejects such allegations, emphasizing the relevance of climate change for price stability and for the smooth implementation of monetary policy. However, monetary policy cannot compensate for delayed or insufficient policy reactions by national policymakers. Therefore, it is important to discuss transparently about who can contribute what and whose actions and policies are most effective.

1.3 Climate change and the mandate of the Eurosystem

In the Treaty on the Functioning of the European Union (TFEU), the European System of Central Banks (ESCB) is tasked with pursuing the primary objective of maintaining price stability. Article 127 TFEU specifies that *"without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union as laid down in Article 3 of the Treaty on European Union (TEU)."* We described above how climate change may affect prices and inflation and, thus, the primary objective of the ESCB. In addition, it is paramount for any central bank to protect its balance sheet from the financial risks caused by climate change. In the current interest rate environment, with policy rates close to the effective lower bound, the central bank's balance sheet has become a more relevant monetary policy instrument than before. Asset purchase programs have led to unprecedented expansions of central banks' balance sheets, and the acquired assets face different degrees of climate risks. Managing these risks cautiously and efficiently is also a form of complying with the primary objective as it contributes to maintaining the full operability of the monetary policy instruments the ESCB needs to fulfill its mandate.

According to Article 3 Treaty on European Union (TEU), the EU *"shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance."* Evidently, the mandate of the ESCB proposes a clear hierarchy insofar as price stability is its primary objective. This means that, from any set of policy options, monetary policymakers should choose the option that contributes most to price stability, no matter how much this affects other objectives stated in Article 3 TEU. If two or more policy alternatives contribute equally to price stability, they can be prioritized according to their support of the secondary objectives.

However, the Treaty does not rank the objectives identified in Article 3 TEU. Prioritizing these objectives is an inherently political choice for which the ESCB

has neither a democratic mandate nor the necessary competence. Such political choices are reserved for institutions that are directly accountable to the electorate, which can democratically express their approval or rejection of the choices made. It should be noted in this context that among the reasons why central banks have been granted independence is that they have one primary objective and do not engage in political deliberations that would necessitate more democratic accountability than is currently exercised. Therefore, any prioritization among the secondary objectives should closely follow the guidance provided by the political organs of the EU, i.e. the Council of the European Union and the European Parliament. It is in the interest of these political organs to express unequivocally any priorities they have agreed upon. However, the Eurosystem itself will independently decide how to support prioritized objectives and assess whether such support is feasible without prejudice to price stability.

Monetary policy is not capable of equally supporting all the objectives enumerated in Article 3 TEU. Some of them might come closer to the original field of expertise of central bankers than others. As for the *"protection and improvement of the quality of the environment,"* central banks have recently gained expertise in analyzing the economic and financial risks of climate change because of their function as financial supervisors[6]; hence, it could be argued that this objective is closer to their practical experience than others.

The mandate obliges the Eurosystem to support the general economic policies in the EU and not to design its own policies in these areas. Before central banks can decide on how to best support these general economic policies, they must be defined and implemented. Therefore, with respect to climate change, central banks are not policymakers but policytakers. The sooner the competent authorities decide upon the appropriate policies to fight climate change, and the more detailed these policies are, the better the Eurosystem can support them within the limits of its mandate. Arguably, the EU has already outlined its priority with the European Green Deal[7]. Finally, the fight against climate change is singled out against all other objectives listed in Article 3 TEU given the irreversibility and potentially catastrophic impact of climate change. Some of the arguments listed here tend to support the view that the Eurosystem should prioritize action against climate change.

2 Economic policies to support climate change mitigation

The main objective in fighting climate change is to limit global warming to well below 2 degrees Celsius, preferably to 1.5 degrees Celsius, compared to preindustrial levels, as agreed in the Paris Agreement. The EU has announced ambitious measures to achieve this target. Most important among them is the reduction of GHG emissions, which should be halved by the year 2030 and allow the EU to

[6] *See, for example, the activities by the Central Banks and Supervisors Network for Greening the Financial System (NGFS).*

[7] *Whether the European Green Deal itself, or its gradual implementation, are precise enough to give unequivocal guidance for Eurosystem monetary policy is a political issue we must leave open here. Filling the "democratic authorization gap," however, is a balancing act (Jourdan and Beckmann, 2021). If the EU institutions followed the British example in explicitly specifying the secondary mandate (HM Treasury, 2021), they might encounter a problem with central bank independence.*

become carbon neutral by 2050. This carbon transition must be financed by both private and public investments.

2.1 Setting a carbon price

Markets are unable to price efficiently the effects of GHG emissions on our climate due to negative externalities and other market failures. Changing market prices by introducing a Pigouvian tax that internalizes the external costs of GHG emissions may support their required reduction in a technologically neutral and cost-effective manner as well as in accordance with the polluter pays principle. In practice, this effect could be achieved by either introducing a carbon tax or an emissions trading system. Both policies could raise the price of emissions up to a level where it covers the full social costs of its negative externality, thereby correcting market failures. While a tax determines higher prices (e.g. of oil) and allows the market to decide upon the demanded volumes, a trading scheme defines a limited volume of goods per period and allows the market to determine their prices. European energy producers and large manufacturing firms are already subject to the EU's Emissions Trading Scheme (ETS), which was introduced in 2005. The responsibility for carbon taxes rests with the national fiscal authorities; to avoid market turmoil, a harmonized introduction across the EU would be reasonable. In addition, and to avoid "carbon leakage,"[8] these measures should be complemented by a carbon border adjustment mechanism, which defines charges on imports and rebates on exports that account for the carbon content of imported goods and carbon price differences. The obvious aim of these policies is to change the relative prices between different modes of production according to their emission intensity. The same effect can also be achieved by reducing subsidies for emission-intensive energy generation.

However, it should be noted that pricing externalities is not a magic bullet that solves all the economic and social challenges of climate change. As Stern and Stiglitz (2021) put it, *"it is a fundamental mistake to begin the analysis of climate change under the premise that, but for the mispricing of emissions, the economy is efficient."* They refer to several problems, such as moral hazard, which becomes an issue when economic agents expect that large climate-related losses might be covered by the government, or imperfect capital markets where credit rationing prevails, which leads to underinvestment in climate-neutral technologies as these only offer uncertain returns. Initiatives by financial market regulators and supervisors, including central banks, address some of these issues by increasing transparency, setting standards and preventing green washing. A prominent example is the *European Commission's Action Plan on Financing Sustainable Growth with the EU taxonomy for sustainable activities* at its core. The EU taxonomy is a classification system defining environmentally sustainable economic activities (European Commission, 2021). With the above caveats in mind, carbon pricing policies will be an important component of public policies supporting carbon transition, even though they will be accompanied by other tools.

[8] *Carbon leakage occurs when emission-intensive production is outsourced to countries under other jurisdictions and the respective products are imported as a way to avoid having to comply with the regulatory treatment of emissions.*

2.2 Energy efficiency-enhancing regulations

Policymakers could also choose regulatory approaches to reduce emissions. These so-called "command and control" measures include e.g. the implementation of strict energy standards for goods and processes or an outright ban of certain technologies with negative climate impacts. From an economist's viewpoint, such regulatory approaches are inferior to a Pigouvian tax because they limit the choice of consumers and producers, which means that outcomes will deviate from those achieved by a more efficient market solution. On the other hand, if time is of the essence, these measures might be more effective since taxation and the subsequent market process might take a while to establish a new efficient equilibrium; a banned technology will cease emitting any carbon as soon as the ban enters into force. Clearly defined energy standards also have the advantage that they help shape the market, an effect which may go beyond the initial legal applicability of the imposed standards. The EU is a large market and if its consumers will only buy products that comply with certain energy standards, even foreign producers might adjust their goods to these standards to stay in the market.

2.3 Political economy aspects of climate-related economic policies

Carbon taxes, the reduction of subsidies and regulatory limitations of emissions will have income and wealth effects for households and firms. As we have seen from the yellow vest protests in France, the introduction of carbon taxes can have significant political and social repercussions. Therefore, climate policies should be designed in a forward-looking manner and take into account redistributive effects. In 2019, an initiative by US economists[9] proposed introducing a carbon tax the revenues of which should be returned directly to US citizens so they would benefit from a "carbon dividend," which would, in turn, improve public acceptance of the new tax. With regard to material regulations of GHG emissions, it should be borne in mind that their effects and their acceptance strongly depend on whether carbon-free alternative technologies are available and at what price. Many sustainable modes of energy generation, such as photovoltaics or wind power, have become highly efficient over the past few years and could easily substitute emission-intensive technologies (IRENA, 2021), provided that sufficient energy storage capacity is created to balance supply fluctuations. On the other hand, banning (new) combustion engine cars might hit less wealthy people disproportionally hard as long as low-cost public transport alternatives are not available.

2.4 Green industrial policy

Expanding the production-possibility frontier toward more carbon-neutral technologies should be one of the aims of industrial policy. The policy options mentioned above (e.g. carbon tax, regulations) are likely to induce changes in demand, which in turn will trigger investments in new technologies. Recalibrating a country's innovation system is an intricate process and a risky business. Mission-oriented industrial policies as proposed by Mazzucato and McPherson (2018) could support the economy in carbon transition by funding basic research, subsidizing innovators or offering public guarantees for the development of carbon-neutral prototypes. In

[9] *Information on this initiative was published by the Climate Leadership Council; its signatories comprise all living former chairs of the Federal Reserve and 27 Nobel laureate economists.*

contrast to current policies aimed at strengthening the innovative capacities of all economic sectors, this approach would explicitly give preference to technologies that foster climate change mitigation and adaptation. More targeted R&D funding should enable the corporate sector to supply climate-neutral products earlier and more cheaply, thus making the transition process more palatable to the public.

Stern and Stiglitz (2021) also stress the interdependence of tax policies and green industrial policy. They show that introducing higher carbon prices earlier would have the benefit of prompting earlier innovations. Both innovation and the diffusion of innovative technologies are path dependent; therefore, incentivizing firms to focus their R&D expenditure on emission-saving technologies and to adopt new energy systems early on would yield a double dividend.

Comparing all the discussed policies in terms of efficacy generates a hierarchy of instruments. The objective of fighting climate change is achieved most effectively by curbing the demand for emission-intensive goods. If the prices of these goods actually reflect their negative externalities, households and firms will reduce their demand for emission-intensive goods. Complementing positive price signals by active innovation policies that foster climate-neutral innovation augments the climate policy mix. Regulatory limits or bans on particular goods or technologies can curb GHG emissions very swiftly, but entail higher social costs, especially if emission-free substitutes are not available or only available at high prices.

3 Tackling climate-related financial risks

An important element of carbon transition is transforming the energy-related capital stock in the economy. This will require much higher investments in energy efficiency and new technologies. According to estimates by the European Commission[10], the EU will need to invest an additional EUR 350 billion annually until 2030.

If financial institutions include the risks of climate change when calculating their risk-adjusted returns, the relative prices of climate-neutral and polluting assets would change in favor of climate-neutral assets. In response to these challenges, the Network for Greening the Financial System (NGFS), an association of central banks and financial supervisors, was launched in 2017, aiming to help accelerate the scaling-up of green finance and to develop recommendations regarding central banks' role in the fight against climate change.

Accounting for climate-related financial risks requires the disclosure of climate-related information such as data on the carbon intensity of production or the location of assets, which is often still unavailable. One of the main objectives of the NGFS and of private sector initiatives like the Task Force on Climate-related Financial Disclosures (TCFD)[11] is the integration of climate risks into the customary risk management procedures of financial institutions. This requires the dissemination of available monitoring and assessment methods and the disclosure of the relevant data. Whereas the methods for monitoring climate risk exposures are already well established and scientific progress is ongoing, the availability of the relevant data is lagging behind. Although financial institutions emit compara-

[10] *See European Commission (2020).*

[11] *The TCFD was established by the Financial Stability Board in 2015 and tasked with developing voluntary and consistent climate-related financial risk disclosures for well-informed investment, lending and insurance decisions.*

tively little GHGs in their own operations, their exposure to climate-related risks can be significant due to loans to emission-intensive firms.

Integrating climate risks into risk management standards for banks and other financial institutions has a double benefit. It would make potential credit losses and market liquidity changes more predictable. And by prompting changes in relative asset prices of climate-neutral and GHG-emitting companies, it could also contribute to improving the funding costs for green firms and thus act as a catalyst for economic transformation. Nevertheless, this approach would have a rather limited effect on the overall transition to a climate-neutral economy compared to that of introducing effective carbon taxes, implementing regulatory changes that limit GHG emission or pursuing mission-oriented technology policies. The effect would be comparatively small because it would affect only the marginal funding conditions to the extent that banks and other financial intermediaries are able to price climate-related risks appropriately. Carbon taxes, by contrast, can change the retail prices of goods and, thus, effective demand for these goods. Still, green financial regulatory policies are an important measure in addition to green fiscal and industrial policies, as they might correct present market failures.

Financial regulation can only change the marginal cost of funding for firms and households. However, clear rules and guidance on climate risk management can prevent the financial sector from mispricing emission-intensive assets. Whereas the contribution of financial regulation to fighting climate change might be small, such rules can significantly improve the resilience of financial institutions. In any case, although the various policy levels may be complementary, the positive effects of introducing a carbon tax cannot be substituted by financial regulation, whose purpose is altogether different.

Box 1

Market neutrality and climate change

According to the Treaty on the Functioning of the European Union (TFEU), the ESCB shall act in accordance with the principle of an open market economy with free competition, favoring an efficient allocation of resources. This is a general rule the Eurosystem must also comply with when implementing monetary policy. In practice, exercising market neutrality has been considered an appropriate approach for the Eurosystem when it comes to respecting the principle of an open market economy. Market neutrality is understood to minimize the impact of monetary policy on relative prices and to curtail unintended side effects on market functioning. The objectives of exercising market neutrality are to preserve the price discovery mechanism (see below) and to limit distortions in market liquidity. If there is a conflict between monetary policy objectives and the principle of an open market economy, monetary policy interference must be justified and proportional. This means that the intended measures are required to achieve monetary policy objectives and may not go beyond what is necessary.

Price discovery is the process of incorporating all information relevant to the valuation of an asset in its market price. Central bankers do not pretend to have better information than market participants and therefore try to avoid causing a change in relative asset prices. These must remain the outcome of the free play of market forces. This restraint, on behalf of central banks, is difficult to justify in the presence of market failures. The risks that arise to future cash flows from climate change should be incorporated in asset prices. The European Systemic Risk Board (ESRB, 2020) finds that the exposure of assets to climate-related risks is not reflected in their prices and that financial intermediaries do not consider climate change sufficiently in their market risk assessment. The price discovery mechanism is also disturbed

because issuers of financial assets fail to appropriately disclose their exposure to climate-related risks. Despite the efforts of the Task Force on Climate-related Financial Disclosures (TCFD) to compile and publish methods for the disclosure of these risk exposures, only a small minority of firms are willing to apply them.[12] Risk exposures that are not disclosed properly cannot inform the price discovery process. Policies that incentivize firms to assess and disclose their exposures would therefore improve the functioning of the price discovery mechanism. Eligibility under the expanded asset purchase programme (APP) requires having at least one credit rating provided by an external credit assessment institution that is accepted under the Eurosystem credit assessment framework. But most of these credit ratings do not take climate-related risks into account.

If central banks departed from market neutrality, however, they may encounter difficulties in the implementation of monetary policy. A lack of market liquidity increases transaction costs and reduces the efficiency of an open market economy. If Eurosystem asset purchases were biased toward assets that contribute to the mitigation of climate change (e.g. green bonds), the markets for these assets might suffer from excess demand because the supply of green bonds is rather small compared to the volumes required for monetary policy implementation. Moreover, a special focus on rather small market segments would limit the effectiveness of monetary policy operations.

The Eurosystem has already decided to moderate its practice of market neutrality in compliance with the principle of proportionality. The eligibility criteria for asset purchases result in bond holdings that do not reproduce the market allocation exactly. For example, under the public sector purchase programme (PSPP), sovereign bonds were purchased according to the ECB capital key and not according to their market share as would have been suggested when exercising market neutrality. Schnabl (2021b) argues that "in the presence of market failures, adhering to the market neutrality principle may reinforce pre-existing inefficiencies that give rise to a suboptimal allocation of resources." Therefore, she recommends replacing the market neutrality principle by a market efficiency principle that actively acknowledges the existence of welfare-reducing market failures.

4 Monetary policy instruments and climate change

While monetary policy is impacted by climate change and climate action, it might need to react to this impact. Subject to individual central banks' mandates, monetary policy could even actively contribute to climate policies. The various instruments in the monetary policy toolkit differ with regard to the effectiveness of their risk-oriented (protective) and climate-policy-oriented (proactive) approaches. In practice, however, the distinction between protective and proactive approaches is blurred. Considering both types of approaches, the NGFS (2021) reviewed several options available to central banks to factor climate-related risks into their operating framework.[13] Following their review, table 1 presents 12 options of how central banks could adjust their main operational functions when implementing monetary policy in four fields: credit operations, collateral policies, asset purchases, and risk assessment and disclosure. We added this last field although the measures listed here are not monetary policy instruments on their own, but rather tools to make monetary policy instruments more effective.

[12] *Due to the lack of reliable disclosures, credit ratings cannot reflect these risks appropriately.*

[13] *For a less comprehensive comparison of options, see Krogstrup and Oman (2019) or Breitenfellner et al. (2019).*

Table 1

Options for monetary policy instruments in dealing with climate change

Instruments / criteria	Monetary policy effectiveness	Climate mitigation	Effectiveness in risk protection	Operational feasibility
Credit operations				
Adjust counterparties' eligibility	−−	+	+	?
Adjust pricing to reflect collateral composition	−	+	?	−
Adjust pricing to reflect counterparties' climate-related lending (green funding support)	?	++	?	−
Collateral policies				
Adjust haircuts to climate-related risks	?	+	+	−
Negative screening (e.g. exclude coal mining)	−	+	+	?
Positive screening (e.g. favor green bonds)	+	++	−	?
Align collateral pools with climate-related objective	?	++	+	−
Asset purchases				
Tilt purchases (climate risk at issuer or asset level)	?	++	+	−
Negative screening (e.g. exclude nondisclosers)	−	+	+	?
Risk assessment and disclosure				
Adapting climate-related credit ratings	?	+	+	+
Climate stress test of balance sheets	+	+	++	+
Disclose climate-related information on central bank assets and collateral	?	+	++	+
Incorporate climate-related risks into macroeconomic models	+	?	+	+

Source: NGFS, OeNB.

Note: Potential impact: ++ strongly positive; + positive; ? minimal; − negative; − − strongly negative.

The options presented in table 1 are evaluated with regard to four criteria: their monetary policy effectiveness, their contribution to climate mitigation, their effectiveness in risk protection and their operational feasibility. This evaluation is based on qualitative expert judgment and should not be interpreted as a recommendation of any of the listed measures.

4.1 Targeted credit operations

As one way to include climate considerations in monetary policy, banks' loan portfolios could be assessed with respect to their environmental impact, and incentives could be provided to encourage the extension of loans to low-carbon activities. Central banks have already experimented with various schemes of targeted credit easing programs to revive banks' lending to households and firms.[14] Similarly, by conducting targeted green refinancing operations, central banks could provide liquidity at preferential terms if banks extended credit for low-carbon activities or for projects that sustain carbon transition.[15]

[14] *Starting in 2014, the ECB, for instance, issued various rounds of targeted longer-term refinancing operations (TLTROs) in which interest rates on the borrowing of participating banks became more attractive the more loans (except mortgages) these banks issued to nonfinancial corporations and households.*

[15] *A concrete example is the preferential capital requirement program for green housing loans in place in Hungary (MNB, 2019).*

There are three specific options in this field:

- *Adjusting counterparties' eligibility:* Central banks could make access to lending facilities conditional on counterparties' disclosure of climate-related information or on the carbon intensity of their investments.
- *Adjusting pricing to reflect the composition of pledged collateral:* Central banks could charge a relatively lower interest rate to counterparties that pledge a higher proportion of low-carbon assets as collateral or set up a credit facility (potentially at concessional rates) accessible only against low-carbon assets.
- *Adjusting pricing to reflect counterparties' climate-related lending:* Central banks could make the interest rate for central bank lending facilities conditional on the contribution of counterparties' lending (relative to an appropriate benchmark) to climate change mitigation and/or the decarbonization of their business models.

Research suggests that conventional green policies in the form of emission-based interest rates set by the central bank provide effective incentives for decarbonizing the economy and reducing climate-related damage. Böser and Colesanti Senni (2020) conduct a simulation exercise showing that monetary policy instruments can induce the adoption of cleaner technologies across the entire economy and reduce the economy's expected emission intensity. Nevertheless, we should not underestimate the problems related to the operational complexity of such measures, as these might pose risks to the effectiveness of monetary policy. For instance, central banks would need to apply a catalog of clear definitions of what constitutes sustainable finance, such as the *EU taxonomy for sustainable activities* currently developed by the European Commission. Another option would be to use ratings related to firm's climate or, more broadly, environmental, social, and corporate governance (ESG) performance. The low correlation of various rating scores, however, reflects the wide discretion in constructing such indicators on the one hand and data gaps on the other (Berg et al., 2020).[16]

4.2 Collateral policies

Collateral protects central bank borrowing in case of counterparty default. Collateral frameworks define the set of eligible collateral that financial institutions can use in operations with central banks as well as the haircuts imposed. Eligibility in central bank operations affects the rate of repurchase agreements (repos), liquidity and the price of an asset in the secondary market. Central banks use several eligibility criteria for collateral, with credit ratings determining the credit quality and haircuts applied. Eligible assets can be pledged to borrow liquidity from central banks, which creates incentives to issue larger quantities of those assets. Therefore, it is useful although ressource-intensive to thoroughly assess potential biases favoring high-carbon assets within central banks' collateral framework. The individual options in this context are:

- *Adjusting haircuts to better account for climate-related risks:* Haircuts could be calibrated beyond what might be required from a traditional risk mitigation perspective in order to promote the market for sustainable assets. Central banks could increase the haircuts of carbon-intensive issuers or assets. Conversely, they could lower haircuts for more climate-aligned issuers or assets.

[16] *The same reasoning, however, applies to traditional ratings as well, and these are used for collateral purposes nevertheless.*

- *Negative screening:* Central banks could exclude collateral assets that are otherwise eligible on the basis of their issuer-level climate-related risk profile for debt securities or on an analysis of the carbon performance of their underlying assets for pledged pools of loans or securitized products.
- *Positive screening:* Central banks could accept sustainable collateral that would otherwise not be eligible to incentivize banks to fund projects that support environmentally friendly activities (e.g. green bonds or sustainability-linked assets).
- *Aligning collateral pools with a climate-related objective:* Central banks could require counterparties to pledge collateral in a way that it complies with climate-related objectives at an aggregate pool level.

The example of China shows the potential that greening a central bank's collateral framework offers. Since mid-2018, the People's Bank of China (PBoC) has included green financial bonds in the pool of assets eligible as collateral for its medium-term lending facility. Macaire and Naef (2021) show that this policy move increased the "greenium," i.e. the yield spread between green and nongreen bonds, by 46 basis points. Dafermos et al. (2021) view the Eurosystem collateral framework as biased toward carbon-intensive sectors (see also box 2). To help realign the implementation of monetary policy with the European Green Deal, they propose to reduce the weighted average carbon intensity of the collateral framework. Their results show that even an aggressive calibration of haircuts will not significantly reduce the carbon intensity of the ECB's collateral list, unless the eligibility criteria are rebalanced toward greener bonds.

However, since haircuts deal with liquidity risk, they might not be ideal tools for providing climate policy incentives while keeping monetary policy effective. Moreover, screening strategies could have different impacts on issuers depending on their size, or they could create distortions across asset classes.

4.3 Asset purchases

The environmental implications of quantitative easing (QE) programs have sparked a debate about the choice of assets purchased under such programs, which resulted in two reform proposals:

- *Tilting purchases:* Central banks could rebalance their asset purchases according to climate-related risks and/or criteria applied at the issuer or asset level.
- *Negative screening:* Central banks could exclude some assets or issuers from their purchases if these fail to meet climate-related criteria.

The effectiveness of both types of measures could be questioned on the following grounds: In theory, asset purchases not only reduce the yields of assets directly purchased by the central bank, but also the yields of all other assets since investors rebalance their portfolios by purchasing other assets to replace the QE securities they sell to the central bank. If this portfolio-rebalancing channel works efficiently, the choice of particular assets purchased by the central bank should be irrelevant for any price effect (assuming perfect substitutability). So, even if corporate bond purchases pose higher climate risk to a central bank's balance sheet, they may not significantly skew overall investment toward high-carbon sector assets in the economies concerned. Insufficient empirical evidence of such portfolio rebalancing effects undermines doubts about the economic relevance of the choice of assets and their carbon content, however.

Ferrari and Nispi Landi (2020) study the effects of "green QE," which temporarily tilts a central bank's balance sheet toward bonds issued by firms in non-polluting sectors. They find that for green QE to be effective, there must be imperfect substitutability between green and brown bonds. While a temporary green QE helps mitigate emissions, it has only limited effects on reducing the stock of pollution. Battiston and Monasterolo (2019) show that weights the ECB introduced for carbon-intensive companies that diversify their portfolio toward low-carbon investments would support the transition to green finance in line with market neutrality and decrease the ECB's exposure to potentially carbon-stranded assets. However, this would imply that the ECB considers to negatively discriminate carbon-intensive economic activities in line with the European Commission's EU taxonomy, whose legal implementation is still pending.

While the carbon intensity of central bank's corporate bond portfolios has attracted a lot of attention, QE asset purchases are typically dominated by sovereign bonds. Their environmental impact can be assessed on the basis of governments' decarbonization commitments. Sveriges Riksbank (2020) has divested municipal bonds issued by high-emitting provinces in Canada and Australia. On a positive note, several European governments have started issuing sovereign green bonds. The environmental effectiveness of such bonds is questioned, however, especially by countries with high emission intensity (Hardy, 2020). In contrast, Monasterolo and Raberto (2017) find that large-scale purchases of green sovereign bonds help develop a green bond market, accelerate transition by green investment and reduce the risk of stranded assets for the financial system.[17] The environmental materiality of bonds issued by supranational institutions such as the European Investment Bank (EIB) is less controversial. Labeled "the EU climate bank," the EIB (2020) announced that it would increase its support to climate and environmental action to levels that exceed 50% of its overall lending activity by 2025 while ensuring that the remainder of its lending is in line with the Paris Agreement.

4.4 Risk assessment and disclosure

The final group of measures should be seen as preconditions to sustainable monetary policy rather than as monetary policy instruments themselves. They are usually less controversial because their aim is to protect monetary policy and central banks from the intrinsic risks of climate change. These measures are:[18]

- *Adapting climate-related credit ratings:* Central banks could contribute to the transparent and consistent incorporation of climate-related financial risks in credit ratings. This includes a careful choice of credit rating agencies considering their sustainability assessment capabilities and the development of minimum standards in internal ratings.
- *Climate stress test of central bank balance sheets:* Central banks could assess their risk exposure to climate change and enhance their climate risk assessment capabilities.
- *Disclosing climate-related information on central bank assets and collateral:* Central banks could comply with TCFD recommendations and the respective policies

[17] *However, if such moves are not matched by ambitious decarbonization policies in the real economy, the development of green asset bubbles cannot be excluded.*

[18] *See also the need to incorporate climate-related risks into macroeconomic models described in section 1.*

such as the EU legal framework which is currently being developed (e.g. the Corporate Sustainability Reporting Directive – CSRD). Beyond that, central banks could also require climate-related disclosure for assets to qualify as eligible collateral and for asset purchases.

Without exhausting the list of advantages and disadvantages of the individual measures presented above, this section concludes with three general observations:

1. Central banks may first need to take steps with regard to the assessment and disclosure of climate-related risks. These steps should improve understanding for additional actions taken at a later stage.
2. Moving further to core monetary policy instruments, it should be kept in mind that corporate bonds and in general exposure to the private sector are more often used as collateral while the purchase programs are heavily dominated by sovereign bonds. Thus, despite public debates being focused on purchasing programs, any preferential treatment within the collateral framework may be more effective in the long run, particularly in times when nonstandard measure may not be active.
3. All measures listed have in common that, apart from having a direct impact on climate and carbon risks in the central bank's balance sheet, they also send a powerful signal encouraging private financial markets to adapt to carbon transition.

Box 2

How carbon biased is the Eurosystem's monetary policy?

Sustainability-concerned NGOs, think tanks and researchers have sparked a lively debate on an alleged carbon bias of the Eurosystem's monetary policy instruments, in particular in relation to the corporate sector purchase programme (CSPP).[19] Dafermos et al. (2020) find that the four most carbon-intensive economic sectors account for roughly 62.7% of the outstanding amount of bonds purchased by the Eurosystem. However, their share in all euro area nonbank corporate bonds is just 45.5% and their contribution to gross value added (GVA) is only 29.1%. Jourdan and Kalinowski (2019) calculate that 63% of assets bought through the CSPP were issued by firms operating within the most strongly carbon-emitting sectors: extraction and distribution of fossil energy sources, car manufacturing and equipment, other energy-intensive sectors, and utilities. Battiston and Monasterolo (2019) develop a benchmark of the euro area corporate bond market that mimics the CSPP eligibility criteria. They show that the CSPP closely follows the benchmark dominated by fossil fuel and carbon-intensive companies. Regarding Austria, Hanzl et al. (2020) estimate that 62% of the corporate bonds available for the ECB's purchase program in October 2020 were issued by the oil, gas and plastic industries. Interestingly, more than a year earlier, the comparable share of these industries was only 42%. Matikainen et al. (2017) provide a sectoral analysis of the CSPP that also suggests a skew toward high-carbon sectors. Using publicly available information, they calculate that 62.1% of ECB corporate bond purchases take place in the sectors of manufacturing and electricity and gas production, which alone are responsible for 58.5% of euro area greenhouse gas emissions. Renewable energy companies are not represented at all in ECB corporate bond purchases, while oil and gas companies make up an estimated 8.4% of its CSPP portfolio.

At the other end of the scale, sectors and activities aligned with climate objectives represent a tiny fraction of the CSPP. Across all sectors, the share of green bonds according to Jourdan and Kalinowski (2019) accounts for some 7% of the CSPP portfolio. De Santis et al. (2018),

[19] *See e.g. Barkawi (2017), Monnin (2018) and Schoenmaker (2019).*

however, note that the Eurosystem holds close to 20% of the CSPP-eligible green corporate bond universe and even 24% of the green PSPP[20]-eligible universe (sovereigns, agencies and supranational institutions). They also state that purchase programs have diminished the spreads for eligible green bonds at a steady pace while driving up their net issuance. Green bonds have grown tenfold in five years, despite their small share of just 1% in the overall bond supply denominated in euro. Following these market dynamics would call for stepping up purchases of low-carbon bonds in line with the growing share of green bonds in eligible bonds in general.

Analyzing the Eurosystem's collateral framework, Dafermos et al. (2021) suggest that its current form favors bonds issued by carbon-intensive sectors. They verify a carbon bias in the collateral rules for corporate bonds, given that these favor carbon-intensive companies disproportionately. These firms issue 59% of the corporate bonds the ECB accepts as collateral, while their overall contribution to EU employment and GVA is less than 24% and 29%, respectively. Four large fossil fuel companies rely on bonds subsidized by the ECB collateral framework for more than half of their overall financing.

The observed bias toward carbon-intensive sectors in the ECB's asset purchases may reflect the current capital intensity of these sectors and the size of firms operating in these sectors. In that case, the bias could conform to the market neutrality principle, which, however, would confirm serious doubts about the allocative efficiency of financial markets regarding externalities that are usually not priced. Thus, the question arises whether the Eurosystem should consider other criteria besides the supposedly "neutral" market allocation in the eligibility rules and the determination of weights for its asset purchases and collateral framework (Schnabel, 2021b).

5 Concluding remarks

Climate change is a fundamental challenge to macroeconomic stability. As such, it also affects the objectives and instruments of monetary policy. The Eurosystem's mandate defines maintaining price stability as the Eurosystem's primary objective. This implies that it must monitor the climate-related risks to price stability and assess their impact on the monetary policy transmission mechanism and on central banks' balance sheets. To do so, monetary policymakers inter alia rely on scenario techniques, given that the macroeconomic impact of climate change is still mostly uncharted territory. In addition to pursuing its primary objective, the Treaties also commit the Eurosystem to support the European Union's general economic policies that aim, inter alia, at environmental protection without prejudice to price stability. However, "central bankers do not sit in the driver's seat of climate policy" (Holzmann, 2021). This seat is occupied by governments, which can and should introduce carbon prices and other policies that directly correct the market failure causing climate change.

Carbon taxes, emissions trading schemes, direct regulations or green industrial policies can support the transition to a carbon-neutral economy more effectively and efficiently than monetary policy. In turn, a well-managed transition would reduce the risks to financial market stability and thus help central banks achieve their objectives in line with their mandate. Whatever approach central banks choose, financial market supervision and monetary policy will complement but never replace governments' decarbonization efforts.

[20] *Public sector purchase programme.*

Different monetary policy strategies have different implications for climate change. Even for inflation-targeting regimes, simulations indicate significant differences in outcomes with respect to inflation, output stabilization and the reduction of GHG emissions. A similar variance in climate outcomes also applies to different monetary policy instruments. The framework for credit operations, collateral policies, asset purchases or asset quality assessment and disclosure could be adjusted to reflect the risks of climate change and to contribute to the greening of the financial system. A risk-oriented (or protective) approach on central bank climate action seems to be a good starting point and basis for pragmatic consensus. In this spirit, the ECB's new monetary policy strategy statement states that climate factors will be incorporated in future monetary policy assessments. According to the statement, the design of the ECB's monetary policy operational framework will be adapted in relation to climate-related disclosures, risk assessment, corporate sector asset purchases and the collateral framework (ECB, 2021). Sveriges Riksbank (2020) has shown that risk-orientation can go very far by implementing a rigorous sustainability strategy for its asset purchases and foreign exchange reserve management. The Bank of England (2021), in turn, is now moving ahead with an ambitious proactive strategy to explicitly support an orderly economy-wide transition to net zero GHG emissions by 2050 through its quantitative easing measures. While the direction of the path is clear, the speed of actions toward "net zero central banking" will continue to be matter of discussion (Robins et al., 2021). Eventually, all public and private economic actors will have to contribute according to their capabilities to achieving a climate-neutral economy by the mid-21st century.

References

Barkawi, A. 2017. Why monetary policy should go green. Retrieved March 21, 2019 from the Financial Times.

Bank of England. 2021. Options for greening the Bank of England's Corporate Bond Purchase Scheme. Discussion Paper. May.

Batten, S., R. Sowerbutts and M. Tanaka. 2020. Climate Change: Macroeconomic Impact and Implications for Monetary Policy. In: Walker T. et al. (eds.). Ecological, Societal, and Technological Risks and the Financial Sector. Palgrave MacMillan. 13–38.

Battiston, S., M. Guth, I. Monasterolo, B. Neudorfer and W. Pointner. 2020. Austrian banks' exposure to climate-related transition risk. In: Financial Stability Report 40. OeNB. 31–44.

Battiston, S. and I. Monasterolo. 2019. How could the ECB's monetary policy support the sustainable finance transition?" FINEXUS Working Paper. University Zurich.

Breitenfellner, A., W. Pointner and H. Schuberth. 2019. The potential contribution of central banks to green finance. In: Vierteljahrshefte zur Wirtschaftsforschung. 88(2):55–71

Böser, F. and C. Colesanti Senni. 2020. Emission-based Interest Rates and the Transition to a Low-carbon Economy. CER-ETH Economics working paper series 20/337.

Broeders, D. and M. Schlooz. 2021. Climate change uncertainty and central bank risk management. In: Journal of Risk Management in Financial Institutions. Vol. 14, 2. 121–130

Bylund E. and M. Jonnson. 2020. How does climate change affect the long-run real interest rate? Economic Commentaries No 11. Sveriges Riksbank.

Carney, M. 2015. Breaking the tragedy of the horizon – climate change and financial stability. Speech at Lloyd's of London on September 29.

Climate Bonds Initiative. 2019. Greening the Financial System: Tilting the playing field – The role of central banks. Report in conjunction with the SOAS Centre for Sustainable Finance and WWF.

Dafermos, Y. D. Gabor, M. Nikolaidi, A. Pawloff and F. van Lerven. 2021. Greening the Eurosystem collateral framework – How to decarbonize ECB's monetary policy.

Dafermos, Y. D. Gabor, M. Nikolaidi, A. Pawloff and F. van Lerven. 2020. Decarbonising is easy – Beyond market neutrality in the ECB's corporate QE. New Economics Foundation, October.

Dafermos, Y., M. Nikolaidi, G. Galanis. 2018. Climate Change, Financial Stability and Monetary Policy. Ecological Economics 152. 219–234.

De Santis, R. A., K. Hettler, M. Roos and F. Tamburrini. 2018. Purchases of green bonds under the Eurosystem's asset purchase programme. ECB Economic Bulletin 7/18. November.

Dietz S. and N. Stern. 2015. Endogenous Growth, Convexity of Damage and Climate Risk: How Nordhaus' Framework Supports Deep Cuts in Carbon Emissions. Economic Journal. 125(583). 574–620.

ECB. 2021. ECB presents action plan to include climate change considerations in its monetary policy strategy. Press release. July 8.

Economides, G. and A. Xepapadeas. 2018. Monetary Policy under Climate Change. CESifo Working Paper 7021.

EIB. 2020. EIB group climate bank roadmap 2021–2025. November 2020. European Investment Bank.

Elderson, F. 2021. Patchy data is a good start: from Kuznets and Clark to supervisors and climate. Keynote speech at the ECB-EBRD joint conference on "Emerging climate-related risk supervision and implications for financial institutions."

European Commission. 2021. Sustainable finance. https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en

European Commission. 2020. Stepping up Europe's 2030 climate ambition. Investing in a climate-neutral future for the benefit of our people. Brussels. COM(2020) 562 final.

European Environment Agency. 2017. Climate change, impacts and vulnerability in Europe. An indicator-based report. EEA Report No 1/2017. Luxembourg.

ESRB. 2020. Positively green: Measuring climate change risks to financial stability. June 2020.

ESRB. 2021. Climate-related risk and financial stability. ECB/ESRB Project Team on climate risk monitoring. Frankfurt.

Ferrari, A. and Nispi Landi, V. 2020. Whatever it takes to save the planet? Central banks and unconventional green policy. ECB Working Paper 2500.

Hanzl, L., O. Picek and J. Tölgyes. 2020. Wie „grün" sind die EZB-Käufe österreichischer Unternehmensanleihen? Policy Brief 23. Momentum Institut.

Hardy, D. C. 2021. European Sovereign Green Bonds and Long-term Policy Commitment. European Political Economy Project, St Antony's College, Oxford. slides presented on 24 May 2021.

HM Treasury. 2021. Remit for the monetary policy committee (MPC). Publishing service of the UK Government.

Holzmann, R. 2021. CESEE's second transition – challenges on the road to low carbon economies. Welcome Remarks to the 87th East Jour Fixe of the Oesterreichische Nationalbank. June 17.

IMF. 2020. World Economic Outlook.

IRENA. 2021. Renewable Power Generation Costs in 2020. International Renewable Energy Agency.

Jourdan, S. and M. Beckmann. 2021. Why green monetary policy is legal and legitimate. Blog comment. Positive Money Europe. https://www.positivemoney.eu/2021/03/green-monetary-policy-legal-legitimate/

Jourdan, S. and W. Kalinowski. 2019. Aligning Monetary Policy with the EU's Climate Targets. Policy Note. Veblen Institute for Economic Reforms and Positive Money Europe.

Krogstrup, S. and W. Oman. 2019. Macroeconomic and financial policies for climate change mitigation: A review of the literature. IMF Working Paper 19/185.

Lagarde, C. 2021. Climate change and central banking. Keynote speech at the ILF conference on Green Banking and Green Central Banking

Macaire, C. and A. Naef. 2021. Impact of Green Central Bank Collateral Policy: Evidence from the People's Bank of China. SocArXix. Open Archive of the Social Sciences. https://osf.io/preprints/socarxiv/cmwpn/

Matikainen, S., Campiglio, E. and Zenghelis, D. 2017. The climate impact of quantitative easing. Policy Paper, Grantham Research Institute at LSE.

Mazzucato, M. and M. McPherson. 2018 The Green New Deal: A bold, mission-oriented approach. UCL Institute for Innovation and Public Purpose Policy Brief 04

McKibbin, W., A. Morris, P. Wilcoxen and A. Panton. 2020. Climate change and monetary policy: issues for policy design and modelling. Oxford Review of Economic Policy. Volume 36. Number 3. 579–603

MNB. 2019. MNB introduces a Green Preferential Capital Requirement Programme. Press release Magyar Nemzeti Bank. 18 December 2019.

Monasterolo, I. and M. Raberto. 2017. Is There a Role for Central Banks in the Low-Carbon Transition? A Stock-Flow Consistent Modelling Approach (November 21).

Monnin, P. 2018. Central Banks and the Transition to a Low-Carbon Economy. CEP Discussion Note.

NGFS. 2020. Climate Change and Monetary Policy. Initial takeaways. Technical document prepared by the "Scaling up Green Finance" workstream. June.

NGFS. 2021. Adapting central bank operations to a hotter world: Reviewing some options. Report of the Network of Central Banks and Supervisors for Greening the Financial System.

Pointner, W. and D. Ritzberger-Grünwald. 2019. Climate change as a risk to financial stability. In: Financial Stability Report 38. OeNB. 30–45.

Riksbank. 2020. Sustainability strategy for the Riksbank. Decided on 16 December.

Robins, N., S. Dikau and U. Volz. 2021. Net-zero central banking: A new phase in greening the financial system Policy report. LSE. Grantham Research Institute and SOAS. March.

Schnabel, I. 2021a. From green neglect to green dominance? Intervention at the "Greening Monetary Policy – Central Banking and Climate Change" online seminar. Organised as part of the "Cleveland Fed Conversations on Central Banking."

Schnabel, I. 2021b. From market neutrality to market efficiency. Welcoming address at the ECB DG-Research Symposium "Climate change, financial markets and green growth".

Schoenmaker, D. 2019. Greening monetary policy. CEPR working paper.

Stern, N. and J. Stiglitz. 2021. The Social Cost of Carbon, Risk, Distribution, Market Failures: An Alternative Approach. NBER Working Paper No. 28472.

Villeroy de Galhau, F. 2021. The role of central banks in the greening of the economy. Speech 11 February. Paris.

Visco, I. 2021. Financing carbon neutrality. Remarks at the roundtable on financing carbon neutrality, BOAO Forum for Asia Annual Conference. 20 April 2021

Weidmann, J. 2021. Climate risks, financial markets and central banks' risk management. Speech at the Green Swan 2021 Global Virtual Conference. 2 June.

Event wrap-up

Gender, money and finance

48th OeNB Economics Conference in cooperation with SUERF and the JVI (May 20/21, 2021)

Petia Niederländer, Doris Ritzberger-Grünwald, Karin Turner-Hrdlicka[1]

In an epochal shift of consciousness, women finally started to be recognized in the past century for their social, political, economic and cultural contributions to society. Over time, people and policymakers have come to understand that addressing gender[2] inequality is critical to global progress. The OeNB's 48th Economics Conference, organized in cooperation with *SUERF – The European Money and Finance Forum, and the Joint Vienna Institute*, offered an opportunity to evaluate remaining gender gaps from a money and finance point of view.

In a nutshell, session 1 addressed the question how to achieve more gender-inclusive visions of and answers to our current challenges in economic policymaking. The discussions in session 2 confirmed that increased female participation can have a decisive influence on central bank policies. Session 3 delved into the debate about the relationship between gender and risk-taking. Session 4 addressed, among other topics, persistent gender differences in financial literacy, also in the context of the COVID-19 pandemic.

In kicking off the event, *Barbara Kolm* (OeNB Vice President), highlighted the paradox that while the economic fallout of the pandemic had disproportionately hit sectors with high female employment shares and/or prevented many women from continuing to work given increased childcare duties,[3] women were strikingly underrepresented in public task forces created to tackle these very challenges: a survey of 115 national COVID-19 committees in 87 countries shows that only 3.5% of these task forces had gender parity, while more than 80% were led by men.[4]

Judging from the fate of Shakespeare's fictitious sister whom Virginia Woolf had invented for her 1929 book, *A Room of One's Own*, to describe the unthinkable obstacles faced by young women attempting to express their genius at the time, Kolm acknowledged that we have come a long way. And still, there are lessons to be learned from metaphorical sisters of our day and age: "…if it had been Lehman Sisters rather than Lehman Brothers, the world might well look a lot different today."[5] In this vein, she ended with the clarion call: "Let's get to work!"

Session 1: Gender and economic policy making

Before inviting *Christine Lagarde* (ECB President) and *Kristalina Georgieva* (IMF Managing Director) to share their personal, professional, and institutional experiences in an interview with *Claire Jones* (Financial Times), OeNB Governor

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[2] *Naturally, the term gender encompasses more than the simple dichotomy male vs. female.*

[3] *See European Commission (2021) for European evidence and Alon et al. (2020) for the corresponding data on the USA.*

[4] *See Van Dalen et al. (2020) and the book by Caroline Criado Perez (2019) entitled "Invisible Women – Exposing Data Bias in a World Designed for Men."*

[5] *Christine Lagarde: Ten Years After Lehman – Lessons Learned and Challenges Ahead – IMF Blog (September 5, 2018).*

Robert Holzmann recalled that the research is very clear: It takes inclusive and diverse teams to arrive at better policy decisions, as different genders exhibit statistically different decision-making characteristics.[6] The research is equally clear that gender inequality and gender gaps often depend on nurture, rather than nature. Persistent stereotypes are known to lock in inefficient equilibria due to path dependence and the intergenerational transmission of certain cultural values.[7] Status quo bias can prevent even very highly qualified women from ascending the ranks. Breaking the "glass ceiling" requires bottom-to-top empowerment encompassing targeted fiscal, social and labor market policies as well as educational initiatives.[8]

Why are so few women in top jobs and what can be done to change that?

Considering the scarcity of women in top jobs, Lagarde offered three explanations. First, women are underrepresented in the pool of talent: among macroeconomics and finance graduates and post-grads, men outnumber women by far. Second, scientific evidence and coaching experience have shown a bias against women, which may even be an unconscious one, at recruitment and promotion levels. Third, all efforts notwithstanding, it is hard for women to reconcile their career aspirations with the wish to have a family.

Can things be done to change that? Yes. The ECB is trying hard by setting targets on a very granular level, but also by focusing on new entrants, having committed to fill 50% of all vacancies at all levels with women by 2026. For this to happen, the ECB relies on role models, godmothers and godfathers, leadership training and diversity ambassadors. Beyond the organization, the ECB is funding scholarships for prospective post-master level students who are female and in situations of financial hardship.

Challenges and solutions for a better involvement of women

With regard to better involving women, Georgieva singled out three critical challenges. First, the pandemic-related crisis will leave some deep scarring: For example, in Africa, where internet penetration is only 50%, many children will have lost more than a year of schooling when they arrive in the beyond-COVID world. Even more significant, the crisis has tipped the scales against young people, low-skilled workers and women – a dangerous divergence that can tear the fabric of society. Second, after the 2009 financial crisis, we concentrated on the resilience of the banking sector, Georgieva argued. And it has paid off. But that concept of resilience did not include the nonbanking financial institutions; and it doesn't recognize that climate is a big source of shocks yet to come. Thus, we have to build resilience in a more comprehensive manner, which is much more likely to happen with women at the decision table. Third, who is the big winner of this crisis? It is the digital economy, where women have yet to carve out their place. Only 10% of fintech owners and board members are women. And that holds back access to digital technology for women.

[6] *See Profeta (2020), in particular chapter 5, for an excellent summary of relevant research on this topic; and Gerling et al. (2005) for an extensive survey on group decision-making.*

[7] *For example, see Alesina et al. (2013), and for the monetary policy context, Diouf and Pépin (2017).*

[8] *See for example Del Boca and Locatelli (2008).*

Lagarde and Georgieva also confirmed their own responsibility and involvement. At the IMF, Lagarde had built the pipeline of women for managerial roles, and now, under Georgieva, the IMF has increased the share of female directors from 25% to close to 40%. But most importantly, the IMF is very actively engaged in building capacity in financial authorities, especially on the issue of gender-based budgeting, partly also through training provided through the Joint Vienna Institute. And, for the first time in history, the IMF has appointed a senior adviser on gender.

Turning to the room and need for gender-related policymaking coming out of the crisis, Georgieva identified three problems that need to be addressed: labor market participation of women and their ability to contribute to the economy (through a supportive tax regime and gender-based budgeting); the homemaking work women do and what can be done to even the playing field between men and women; and policies related to gender-based violence.

On the importance of role models

Very personal memories were shared in response to the question how important female role models had been in their careers. Georgieva named Chancellor Angela Merkel as a visionary of inclusion and recalled an eye-opening first encounter, when she was "called to the rescue" to bring some gender diversity to a meeting of (all male) World Bank leaders with a mixed-gender German delegation, headed by Merkel as Germany's then environmental minister. Lagarde named role models for female resilience (her mother; having raised four children on her own as a widow) and for female leadership (the only female partner at Baker McKenzie at the time she joined the international law firm). More generally, both agreed that "women are there to support women."

Eye-openers during the pandemic and final takeaways

In terms of the biggest eye opener regarding gender and economic policymaking, Georgieva shared that she had been shocked most by how easy it was for gender equality to go backward during the pandemic. Lagarde had not anticipated the big impact on mental health. And the pandemic showed how fragile we are, and how care and empathy are needed for mutual support.

From the audience, Lagarde was asked about the low-interest rate world and if women, who are more cautious, are missing out. Lagarde cited an encouraging study which showed that women actually outperformed men – because women took a longer-term view of investment, trading at a somewhat lower frequency. (See also session 3 below.) Georgieva added that women tend to be more inclusive and more willing to listen to different points of view before coming to closure.

Regarding takeaways, Lagarde said that the way out was to support women and to strengthen their confidence whenever needed, recommending the book *The confidence code: the science and art of self-assurance – what women should know.* Georgieva cited Eleanor Roosevelt: "'Women are like tea bags. You don't know how strong they are until you put them in hot water.' So, my message to young women: jump into this hot water. You are strong!" With a view to pandemic-related policymaking, Lagarde concluded, "I would say just one thing: put people first." To which Georgieva added: "Disaggregate your data. You need to understand how policies affect different groups of people, how they affect women. And then base your response on what you learn."

Session 2: Central bank decisions by committee: does gender matter?

The motivation for session 2 – and indeed for the conference as such – was an observation made by many women, including the session chair, *Doris Ritzberger-Grünwald* (OeNB Director of Economic Analysis and Research): "Having another woman present 'makes such a big difference' to the tone of a discussion and how decisions are made," as ECB Executive Board Member Isabel Schnabel, often the only woman in meetings, had put it in a Financial Times interview (2021). The session profited from both academic input and the participation of three high-ranking central bankers, from France, Iceland, and Serbia.

Facts and figures – where do we stand?

Paola Profeta (Professor at Bocconi University) presented the main findings of her own research (Masciandaro et al., 2020) on the presence of women in top central banking positions (monetary policy committees or governor/deputy governor level) in more than 103 countries. She and her co-authors found a large heterogeneity, with Canada and Sweden being in the lead with full gender balance, followed by Serbia and Bulgaria. From 2002 to 2016, the share of women in monetary policy committees increased from 11% to 16%, and the share of female governors and deputy governors rose as well. The largest increase was found in North America, whereas in Europe conditions remained broadly unchanged.

Of the three explanatory variables tested – gender gap index, staff gender ratio and central bank independence – Masciandaro et al. (2020) only found the staff gender ratio to have a significant positive influence on the share of women in top central banking positions. Thus, a policy conclusion would be that we should start at the bottom, having more women in these institutions in general. Ritzberger-Grünwald agreed but added that many (vice) governors had joined their central banks from other organizations.

Contributing the Nordic view, *Rannveig Sigurdardóttir* (Deputy Governor, Central Bank of Iceland) explained that Iceland had a relatively good starting point, with a female staff ratio of approximately 50% of staff, family-friendly workplaces and equal pay implemented at the central bank. Yet, it would be important to further enhance recruiting processes and open up career paths, given remaining room for improvement.

Sylvie Goulard (Vice Governor, Banque de France) added that even with many female deputies, central banking at the top was still a man's world, citing a male share of 93% at the ECB (Governing Council, 1998–2021), 89% in the Fed (FOMC, 1960–2021) and 88% at the Bank of England (Monetary Policy Council, 1997–2020) according to Istrefi and Sestieri (2018). To help staff to balance work and family life, the Banque de France had concluded a gender equality agreement, which did lead to an increase of the proportion of women in senior positions. On the downside, she pointed out the risk of doing part time, which typically put an end to careers. In terms of action points, she highlighted the need to better balance gender across professions (with 73% women in the human resources department at the Banque de France, but only 18 in banknote manufacturing and 30% in the IT growth area).

Ana Ivković (Vice Governor, National Bank of Serbia) had a success story to tell, with Jorgovanka Tabaković, Governor since August 2012, now being in her second term. Only every tenth central bank is headed by a woman, and according to the OMFIF Gender Balance Index 2021, the countries with a female governor tend to

be small countries. Surprisingly, the Serbian central bank has no gender policies in place. Only "normal" rules and standards apply, as set by the government, like maternity leave and financial assistance at the birth of a child, also apply at the bank.

Do committees work differently when women are present?

Again contributing the academic view, Profeta addressed the inherent endogeneity problem: is there really a causal relationship, are determinants at play, or is there even reverse causality? In short, her research finding is that countries with a higher share of women in the relevant committees produce tougher monetary policy decisions. A possible explanation comes from financial literacy: as women are more risk averse, they are also more inflation averse than men. As a result, at the same level of inflation, central bank committees with a higher presence of women showed a more hawkish behavior. Beyond that, the share of women had effects on performance, the selection of other board members, and agenda setting.

Sigurdardóttir argued that the literature was in fact inconclusive, finding evidence for both more dovish and more hawkish behavior of women. At Iceland's central bank, at any rate, male and female monetary policy decision-making was well-aligned. More generally, she argued that gender balance in committees was a question of legitimacy: gender balance was necessary to ensure a democratic policy outcome. Overall, it was important to bring in diverse views of diverse people, not only with a view to increasing the credibility of the decision-making process. Gender diversity also enriches the discussion and broadens the range of topics dealt with, to include e.g. environmental issues.

Goulard steered the discussion to the more relevant question: What do women expect from us? What do women tell us? As the listening events of the ECB and of the Banque de France showed, women are concerned about declining purchasing power, the worsening of the economic outlook, unemployment and job precariousness, climate change and growing inequality and poverty. She joined Sigurdardóttir in saying that diversity was an ethic imperative, but above all a way to double the pool of talent. Concerning monetary policy decisions, diversity is de facto a tool to improve communication. And she joined Lagarde in trying to do away with the distinction between doves and hawks by supporting owls. Ivković rounded off the picture by quoting Serbia's Governor Tabakovic, incidentally appointed "Central Banker of the year 2020": no one can do the job alone: at the end of the day everything is teamwork.

Session 3: Gender and risk-taking: implications for financial firms and regulation

In her introductory remarks, *Karin Turner-Hrdlicka* (OeNB Director for the Supervision of Significant Institutions) cited that, according to IMF research, a higher proportion of women on the boards of banks and financial supervision agencies is associated with a higher level of stability. Over the past few years, the "MSCI World Women's Leadership Index" outperformed the standard MSCI World Index, indicating that a more balanced gender mix may lead to superior market performance. Various studies have concluded that women are more likely to invest in sustainable and socially responsible areas, in view of climate change and other issues. Nevertheless, women remain underrepresented in the financial world, especially when it comes to executive positions and leadership functions.

The widespread belief that women are more risk averse than men is rooted in stereotypes

Julie A. Nelson (Professor Emerita of Economics, University of Massachusetts) presented a meta-analysis of over 50 empirical studies regarding gender and financial risk. This analysis failed to confirm general gender differences in mean scores as predicted by stereotypes. Any differences that were observed were always trivial, and the connection between gender and risk preferences was found to be extremely weak. Nelson concluded that a more balanced gender mix in policy institutions would make for better decisions, since this would lead to a more comprehensive set of human traits and interests – including concerns with safety and trust-worthiness – to be appreciated and enacted by all leaders.

Renée B. Adams (Professor of Finance at Saïd Business School, University of Oxford) agreed that women were not more risk averse on average than men. Using information about the directors of listed companies, Adams found that in particular female managers at financial firms even show a remarkably lower level of risk aversion than men. Regarding the question whether a more balanced gender mix would enhance social responsibility, Adams concluded that the more meaningful question would be whether financial firms would benefit from debiasing and removing (gender-related and finance-specific) barriers for advancement. The answer to this question was clearly yes.

A more balanced gender mix leads to a higher level of innovation, better business results and improves the CSR profile of financial firms

Becci McKinley Rowe (Head of Fundamental Active Equities in EMEA at Blackrock) agreed with Nelson and Adams that risk behavior is not gender specific, citing anecdotal evidence from her 25+ year career in the financial service industry. According to her experience, gender diversity leads to better business results, better decision-making, better solutions and better risk-taking as it enables a broad representation of views: "I want to know the unknown – that's why we need diverse teams." McKinley Rowe concluded that the financial service industry had turned far more gender-inclusive in recent years. However, the COVID pandemic may have partially reversed this positive trend, since increased childcare responsibilities, homeschooling and other issues had an adverse impact on the career paths of women.

A progressive gender and diversity balance not only boosts innovation and business results but may also improve the corporate social responsibility (CSR) profile of organizations, argued *Khlood Aldukheil* (CEO of Erteqa Financial Company): "I do believe that women will bring stability to the CSR agenda." According to Aldukheil's experience of 25+ years, women are risk-takers, just like men, but tend to be more diligent due to a "caretaker instinct." Aldukheil was optimistic that education and knowledge would give women the confidence to be less risk averse and shared her views on related initiatives and recent changes for women in Saudi-Arabia, including government initiatives to increase female employment, remove employment restrictions and guardian requirements, and lift the female driving ban to support working women. Gender-specific obstacles might be overcome by changing the underlying social setting, and specific campaigns could help to shift the general mindset, Aldukheil concluded.

Gerda Holzinger-Burgstaller (CEO of Erste Bank Austria) added that financial firms and institutions benefit significantly from encouraging career paths for talented women, as diverse and heterogenous teams are more innovative, exploiting cognitive diversity. In addition to successful women acting as role models when it comes to gender diversity, this requires clear commitments: top-down target setting (such as quotas); diversity-based talent management and succession planning; and measures endorsing gender diversity within the fit & proper framework, making diversity a leadership accountability and enforcing data-based reporting and monitoring. To avoid career paths being abruptly stopped during parental leave, Erste Group initiatives, for instance, include efforts to keep in touch with absent staff and continue to treat them as part of the organization.

Turner-Hrdlicka concluded that given the differences among men and among women, respectively, the most meaningful way forward might be to focus on individuals even more so than on gender differences. Summarizing the panelists' contributions, she underlined the strong case for more gender diversity in financial firms and institutions, pointed to ensuing managerial responsibilities and recalled key action necessary in this respect: managing talent, providing opportunities and empowerment, setting and monitoring targets, and improving financial education.

Session 4: Gender, financial literacy, inflation and COVID-19

This panel, chaired by *Petia Niederländer* (OeNB Director of Payments, Risk Monitoring and Financial Literacy), discussed gender differences in financial literacy, effects on financial well-being and measures to build financial resilience in times of crisis.

Anamaria Lusardi (Professor at the George Washington University School of Business) shared the latest Personal Finance Index data obtained under a long-term survey project launched in 2017 to assess financial literacy. The index is built from responses to 28 questions about earning, consuming, saving, investing, managing debt, insuring, comprehending risk and information sources. The data confirm a persistent gender gap: on average, women correctly answered 49% of the 2020 P-Fin Index questions, and men 56%. Men outperformed women on each topic, above all in areas which are particularly relevant during a pandemic, like comprehending risk, insuring, and investing.

Lusardi highlighted the role of confidence or a lack thereof, in arriving at a better score, since women have been more likely than men to answer "do not know" across all areas. When the "do not know" option was removed from the survey, women fared better. Similar gender differences have been established with the indicator of financial well-being. Because gender differences and confidence building start at a young age and financial literacy is directly linked to future financial wellness, Lusardi concluded that investing in early education and focusing on vulnerable groups like women will be the road to recovery from this pandemic.

Gender & finance: an Austrian perspective

A 2021 study about stock market participation presented by *Angelika Sommer-Hemetsberger* (Member of the Board of Executive Directors at Oesterreichische Kontrollbank) found approximately every second woman but only every third man to indicate a lack of knowledge of stock markets, thus confirming the link between financial literacy/confidence and capital market participation. With regard to the

COVID-19 pandemic, the study did not identify any major changes in views and behavior. However, women had become more sceptical about the stock market, and almost every second female answered that she was now saving more and spending less.

In the latest International Survey for Adult Financial Literacy conducted in 26 countries Austria came in third. In an effort to improve national financial literacy competencies further, Austria's finance ministry launched a project to develop a national financial education strategy in May 2020. Its mapping report Financial Literacy in Austria, released in cooperation with the OECD, recommends a comprehensive approach including efficient stakeholder coordination and audience-targeting based on evidence or policy priorities. Research and program evaluation are likewise encouraged. Sommer-Hemetsberger concluded that a national strategy would increase financial well-being and resilience in Austria, helping to reduce gender imbalances in the economy and society.

Can financial education help bridge the gender gap? Reflections from Singapore

Joanne Yoong (Program Director, University of Southern California) stressed the importance of building educator networks and target group alliances, sharing the success story of a long-term financial education program developed by a local foundation in Singapore. This initiative had brought small groups of elderly women together in community centres for a 12-week program about financial and social skills. Ten years later, a large percentage of these women continued to have elevated financial knowledge scores, and only a very small group resorted to "do not know" answers. Up to 95% of the women had their own savings and 75% kept track of their expenses. More generally, the program participants were found to exhibit enhanced confidence and self-awareness, and they were also more likely to cope better or find new ways to adapt to the pandemic conditions.

Yoong illustrated how socially significant such interventions can be, reporting that the participants had remained in close contact, encouraged by alumni meetings. They felt empowered to discuss financial questions freely with their peers. In conclusion, the success of financial education programs relies not solely on the curriculum but also on tools, networks, self-efficacy and life-long learning opportunities provided.

Gender & finance: a central bank's perspective

Andréa M. Maechler (Member of the Governing Board at the Swiss National Bank) addressed the link between inflation perceptions and financial literacy, citing international evidence according to which women appear to have systematically higher inflation perceptions and expectations than men (Kemeny and Pochon, 2016) and the finding that, once controlled for economic literacy, no significant differences between male and female respondents remain. This confirms the importance of the SNB's financial literacy programme, Iconomix.

With reference to Brown and Graf (2013), Maechler shared survey evidence according to which the three staple questions on financial literacy – about the concepts of compound interest, inflation and risk diversification – were understood by only 50% of Swiss respondents (which still is a high number in international comparisons). Although 62% of men answered all three questions correctly,

compared to only 39% of women, the gender gap in financial literacy is not only driven by correct or incorrect answers. Women did not provide answers or gave "don't know" answers twice as often times as men, corroborating the assumption of self-doubt in women concerning financial and economic matters.

A general knowledge gap?

In the final presentation, *Sylvia Kritzinger* (Professor of political science, University of Vienna) raised the question whether there might be a general knowledge gap between genders, given that not only financial literacy but also political knowledge seems to be lower for women than for men. One possible explanation are certain social gender norms. In a 2018 survey, 40% of the population still agreed with statements indicating that a woman's main goal was to have children and stay at home, and 53% thought that children suffer if mothers work. Surprisingly, these statements were mostly approved by female respondents. As a result, women suffer from socioeconomic disadvantages (e.g. less resources for education).

Kritzinger went on to speak about measurement bias. Literacy exercises usually lean towards men's interests and exclude women's life experiences by asking for factual knowledge. Furthermore, Kritzinger revisited the fact that men tend to guess even if they do not know the correct answer, while women won't and suggested dropping the "do not know" response option. With regard to the pandemic conditions, she listed measures to actively boost confidence, reduce socioeconomic disadvantages, provide gender-friendly socialization during childhood and adjust knowledge measurement tools as the vision for the future.

Petia Niederländer wrapped up the conference with the encouraging conclusion that a national strategy carried the promise of creating a culture of financial literacy spanning gender, age and time and should therefore be promoted by ministries, central banks and other public institutions. Keeping the dialogue going between all stakeholders, including the private sector, could provide for new inspirations and help closing the gender gap.

References

Alesina, A., P. Giuliano and N. Nunn. 2013. On the origins of gender roles: women and the plough. In: The Quarterly Journal of Economics 128(2). 469–530.

Brown, M. and R. Graf. 2013. Financial literacy, household investment and household debt: Evidence from Switzerland. University of St. Gallen. Working Papers on Finance 13/1.

Criado Perez, C. 2019. Invisible Women – Exposing Data Bias in a World Designed for Men. Vintage Books.

Del Boca, D. and M. Locatelli. 2008. Motherhood and participation. Social Policies, Labor Markets and Motherhood. Del Boca and Wetzels (eds.). Cambridge University Press.

Diouf, I. and D. Pépin. 2017. Gender and central banking. Economic Modelling 61(2). 193–206.

Financial Times. 2021. Women central bankers want action on 'hidden barriers' to equality. May 4.

Gerling, K., H. P. Grüner, A. Kiel and E. Schulte. 2005. Information acquisition and decision making in committees: A survey. In: European Journal of Political Economy 21(3). 563–597.

Hasler, A., A. Lusardi and P. Yakoboski. 2021. Women's Financial Wellness and Literacy. Womens-Financial-Literacy-2020-P-Fin-Index-FINAL.pdf (gflec.org)

Istrefi K. and G. Sestieri. 2018. Central banking at the top: it's man's world. Banque de France Blog post no. 88. April 10. https://blocnotesdeleco.banque-france.fr/en/blog-entry/central-banking-top-its-mans-world.

Katty, K. and C. Shipman. 2014. The confidence code. The science and art of self-assurance – what women should know. Harper Business.

Kemeny, F. and V. Pochon. 2016. Frauen und Jüngere schätzen Inflation höher ein. In: Die Volkswirtschaft. March 23.

Masciandaro D., P. Profeta and D. Romelli. 2020. Do Women Matter in Monetary Policy Boards? BAFFI CAREFIN Centre Research Paper 2020-148. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3703641

OMFIF. 2021. Gender Balance Index 2021. www.omfif.org/wp-content/uploads/2021/03/GBI_2021_PDF

Profeta, P. 2020. Gender equality and public policy. Oxford University Press.