OESTERREICHISCHE NATIONALBANK
EUROSYSTEM

MONETARY POLICY & THE ECONOMY

Quarterly Review of Economic Policy

COVID-19 and the Austrian economy: selected issues

Security through stability.

Q4/20–Q1/21

Monetary Policy & the Economy provides analyses and studies on central banking and economic policy topics and is published at quarterly intervals.

Publisher and editor	*Oesterreichische Nationalbank* *Otto-Wagner-Platz 3, 1090 Vienna, Austria* *PO Box 61, 1011 Vienna, Austria* *www.oenb.at* *oenb.info@oenb.at* *Phone: (+43-1) 40420-6666* *Fax: (+43-1) 40420-046698*
Editorial board	*Ernest Gnan, Doris Ritzberger-Grünwald,* *Helene Schuberth, Martin Summer*
Managing editor	*Anita Roitner*
Editing	*Joanna Czurda, Rita Glaser-Schwarz, Ingrid Haussteiner, Barbara Meinx, Anita Roitner,* *Susanne Steinacher*
Translations	*Dagmar Dichtl, Ingrid Haussteiner, Barbara Meinx, Susanne Steinacher*
Layout and typesetting	*Sylvia Dalcher, Birgit Jank, Andreas Kulleschitz, Melanie Schuhmacher*
Design	*Information Management and Services Division*
Printing and production	*Oesterreichische Nationalbank, 1090 Vienna*
Data protection information	*www.oenb.at/en/dataprotection*

ISSN 2309–3323 (online)

Printed according to the Austrian Ecolabel guideline for printed matter.

Please collect used paper for recycling.

EU Ecolabel: AT/028/024

Contents

Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the Oesterreichische Nationalbank or of the Eurosystem.

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.

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 KLERS program for as long as we cannot resume visits due to the pandemic situation.*

Nontechnical summaries in English and German

Nontechnical summaries in English

Monitoring the economy in real time with the weekly OeNB GDP indicator: background, experience and outlook

Gerhard Fenz, Helmut Stix

Similar to most other industrialized countries, the COVID-19 pandemic triggered a deep and abrupt slump in economic activity in Austria. As traditional economic indicators are only available with a certain time lag, indicators that are a lot more timely were called for in this special situation. Against this background, we developed the new, experimental OeNB GDP indicator (OeNB GDP-I).

The OeNB GDP-I relies on a demand-side approach on estimating GDP. It (1) provides weekly estimates of economic activity in Austria, (2) provides estimates of the major GDP components, (3) focuses on year-on-year changes and (4) considers shifts from cash to noncash consumer spending, which makes it possible to obtain a relatively accurate estimate of consumption growth. The results of the OeNB GDP-I have been published on a regular basis since early May 2020, thus providing real time information on the state of the Austrian economy.

In this study, we present the OeNB GDP-I and its main results, explain how it was constructed, discuss its pros and cons and draw some (preliminary) lessons from more than half a year of weekly nowcasting.

Compared with Austrian GDP figures that have been published so far, the OeNB GDP-I has proven to be a valid and informative instrument suitable for capturing developments in the current economic crisis. It differs from well-known international economic indicators in that it is data driven (for reasons of data availability), while most other economic indicators rely on time series models. The unavailability of longer time series restricts the extent of possible validation. This means that the OeNB GDP-I is, and will remain, an instrument to be used in times of crises and not for observing economic developments in "normal" times. In contrast, a number of real-time (sub)indicators (in particular payments data) that have been employed in economic analyses at the national and international level since the outbreak of the COVID-19 pandemic will be of use also in economically calmer times. These indicators have turned out to be highly informative and can provide important insights, e.g. when studying the consumption response to a fiscal stimulus.

Austrian tourism sector badly hit by COVID-19 pandemic

Gerhard Fenz, Helmut Stix, Klaus Vondra

The tourism sector is an important pillar of the Austrian economy, accounting for almost 7½% of Austrian GDP. By European standards, this is an above-average contribution. We use weekly data on payment card spending and monthly data on overnight stays to analyze the strong impact of the COVID-19 crisis on Austrian tourism. During the lockdown in spring 2020, overnight stays by tourists dropped by almost 100%. While domestic tourists returned quickly after accommodation facilities reopened, foreign tourists (mainly from continental Europe) took a few weeks longer; most overseas tourists have not returned at all since the COVID-19 pandemic broke out in Austria in March 2020. Over the summer of 2020, tourism activity in Austria recovered strongly, backed by domestic and German tourists. Still, it remained clearly below 2019 levels. In October 2020, the renewed increase in the number of COVID-19 infections caused another severe downturn in Austrian tourism (total overnight stays: –49.3%, domestic tourists: –13.7%, foreign tourists: –66.8%), as several neighboring countries posted travel warnings for Austria. On November 2, 2020, a second lockdown was imposed on Austria. Accommodation establishments and restaurants were closed. Basing our estimations on payment card data, we expect a decline of 93% in overnight stays (domestic tourists: –90%, foreign tourists: –95%) for November 2020 compared to November 2019. According to the new rules communicated by the Austrian government on December 2, 2020, Austrian accommodation establishments will not open before January 2021. Moreover, travel warnings by major countries of origin (especially Germany) remain in place at least until the end of the year. Therefore, we expect overnight stays to drop by 95% in December. For the full year 2020, we expect a 36% decrease in total overnight stays, mainly because of the strong decline in overnight stays by foreign tourists (–41%). Overnight stays by domestic tourists, by contrast, will go down by 23%. Had the lockdowns fallen into the high tourist season, the overall decline in overnight stays might have been far stronger. If containment measures and travel warnings remain in place in the first months of 2021, severe losses in the Austrian accommodation and winter tourism industry are very likely. This would also have a strong impact on total Austrian tourism in 2021.

Prices and inflation in Austria during the COVID-19 crisis – an analysis based on online price data

Christian Beer, Fabio Rumler, Joel Tölgyes

The COVID-19 pandemic and the accompanying policy measures have affected both the demand and supply side of the Austrian economy, and consequently also consumer prices, in multiple ways. Apart from affecting prices, the COVID-19 pandemic also made it difficult to collect price data for inflation measurement. Statistical offices had to resort to imputations and the use of scanner data when price data could not be collected directly from shops. To gain insights into price developments during the first stage of the COVID-19 pandemic in Austria, the OeNB has collected price data from several online shops via webscraping, i.e. automatic daily downloads of large amounts of online price data, since the beginning of April 2020.

Based on these webscraped data, we analyzed price developments of those product categories that became especially relevant during the COVID-19 crisis, i.e. food and beverages, medical products, IT equipment, personal care products and delivered meals. Our observation period for most products is from April to August 2020. Our results suggest that, contrary to what the media occasionally reported, prices for food and nonalcoholic beverages showed an – albeit rather small – decline over the observation period while prices for alcoholic beverages and medical products did not show a clear upward or downward trend. For personal care products and IT equipment, we find a price increase in the first half of the observation period followed by a somewhat more pronounced price decline in the second half. In contrast, for meals delivered by a meal delivery service provider, we observe a steady – but rather small – price increase over the observation period (in this case, from mid-June to end-August 2020).

A comparison of the results derived from online data and official figures from the Harmonized Index of Consumer Prices (HICP) for Austria shows similar price developments for food and personal care products, but some differences for the remaining product categories. The latter may be attributable to conceptual differences in product and store coverage.

Have mitigating measures helped prevent insolvencies in Austria amid the COVID-19 pandemic?

Claus Puhr, Martin Schneider

In this study, we assess the impact of the COVID-19 pandemic on companies in Austria. Using a novel insolvency model, we estimate their risk of becoming insolvent. Our model reflects companies' balance sheets as well as profit and loss statements. The economic impact of the pandemic varies strongly among industries. This is why we implemented the model for 17 economic sectors. As a result of the pandemic and lockdown measures, economic activity has fallen sharply. As a consequence, many companies and households have been facing an existential threat. Government and private mitigating measures have helped cushion the blow. Support for companies includes grants and subsidies (e.g. fixed cost grants and short-time work), deferrals of short- and long-term payment obligations, credit guarantees and changes to the insolvency law. In this analysis, we considered measures until August 31, 2020.

Our model shows that COVID-19 leads to a marked increase in corporate insolvencies. Without mitigating measures, the number of insolvencies in 2020 would have increased sixfold compared with previous years. But the mitigating measures in place helped reduce this number by two-thirds. The insolvency rates we predict based on our model should be interpreted with caution. Most importantly, our model allows us to compare and rank the mitigating measures. We find, for instance, that credit guarantees appear most effective, followed by fixed cost support and short-time work. In the short term, delayed filing for insolvency is most efficient. Yet, this effect is set to reverse itself in 2021, when public institutions are likely to return to their usual practice.

How has COVID-19 affected the financial situation of households in Austria?

Nicolas Albacete, Pirmin Fessler, Fabian Kalleitner, Peter Lindner

This study discusses the potential effects of the COVID-19 crisis on household finances in Austria. We use data from the Austrian Corona Panel Project carried out by the University of Vienna as well as data from the Eurosystem Household Finance and Consumption Survey for Austria.

In the first part of the study, we illustrate that different individuals and households have been exposed to the COVID-19 crisis in very different ways and to varying degrees. Households with a small living space, such as larger households with children, households with single parents or households living in densely populated areas, are more exposed to income shocks stemming from COVID-19. Income from pensions and other public transfers serve as an important buffer for poorer households against potential impacts of the COVID-19 crisis, as these income sources have not (yet) been exposed to the effects of the crisis. Furthermore, we find that the median household might be able to compensate for financial losses for a relatively long time by drawing on its liquid assets such as savings. Thus, putting the focus on those households who are not able to make up for losses incurred during the COVID-19 crisis, such as single-parent households or households with unemployed household members, seems warranted.

In the second part of the study, we analyze potential impacts of the COVID-19 crisis. Our analysis suggests that households' income losses averaged about 12% during the first lockdown in April 2020; this percentage would double if one-third of employees on short-time work became unemployed. Moreover, tenants suffered particularly large income losses. Although households' attitudes toward consumption were negatively affected at the onset of the COVID-19 crisis, they have improved over time. Uncertainties remain high, however. Saving attitudes were also surrounded by high uncertainties, but we find some weak evidence of increasingly positive attitudes for high-income households over time.

Support measures should mainly target those households who were in a difficult social, economic and financial situation already before the COVID-19 crisis and who suffered the largest income losses during the pandemic to protect them from further financial and social harm.

The effects of the monetary policy response to the COVID-19 pandemic: preliminary evidence from a pilot study using Austrian bank-level data

Claudia Kwapil, Kilian Rieder

The Eurosystem's monetary policy response to the economic impact of the COVID-19 pandemic has been swift and powerful. Its policy package contained both extensions of existing unconventional monetary policy measures and new instruments geared to address the extraordinary economic challenges resulting from the COVID-19 pandemic. This pilot study analyzes the effects of one important building block of the monetary policy rescue package – the targeted longer-term refinancing operations (TLTROs) – on Austrian banks' credit supply. In spring 2020, the conditions of the latest generation of TLTROs (TLTRO III) were relaxed substantially in view of the COVID-19 pandemic: volumes were expanded, interest rates were lowered and collateral requirements were reduced. We analyze whether those banks that borrowed more funds in the June 2020 TLTRO III (i.e. after the above-mentioned relaxation) did in fact extend more loans to customers in July, August and September 2020. Using data on Austrian banks and applying an instrumental variable strategy, we approximate the causal relationship between TLTRO take-up and banks' credit supply. We find evidence for an unambiguously positive effect of TLTRO participation on new lending in Austria. The estimated elasticity of credit supply ranges between 0.26 and 1.00, depending on the period and credit categories covered.

Unprecedented fiscal (re)actions to ease the impact of the COVID-19 pandemic in Austria

Doris Prammer

Austria's public finances have played a major role in mitigating the effects of the COVID-19 pandemic on the economy. First, automatic stabilizers have cushioned parts of the economic downturn. Second, unprecedented active fiscal policy measures were taken both at the national and the EU level to further support the economy.

In Austria, fiscal policy measures adopted during the lockdown periods in spring and November/December 2020 were mainly aimed at ensuring that the health care system remains fully operational and at supporting businesses (fixed cost grant, net turnover compensation) and households (short-term work scheme, hardship funds). Compensating businesses and households for income losses suffered because of the containment measures has helped maintain the economy's production capacity. The latter would have been lost if viable firms and jobs had been permanently destroyed.

The measures enacted since the summer 2020 had a twofold purpose. First, restarting the economy by taking classic stimulus measures (cut in income taxes and VAT for certain sectors, one-off social payments) was key after the lockdown periods. These measures were meant to stimulate consumer demand, in particular from liquidity-constrained households. Second, initiatives were taken to promote private investment (carryback of 2020 losses, accelerated depreciation, investment premium) and public investment (federal cofinancing of local government investment, higher investment budgets). Ideally, these investments promote long-term objectives, such as the decarbonization and greening of the economy. In doing so, they support the transition to new technologies and ways of working, put the economy on a sustainable footing and thereby increase its long-term growth potential.

However, given the high uncertainty surrounding the economic outlook, measures might be less effective than during normal times. Households and businesses might just "wait and see" rather than consume and invest. Moreover, policy measures must be unwound with caution to avoid crisis legacy issues that might hamper the economic recovery.

The costs associated with the unprecedented fiscal measures and automatic stabilizers have left their mark on Austria's public finances. In 2020, Austria is likely to see the largest budget deficit since 1995. Nevertheless, the sustainability of Austria's public finances should not be at risk, as Austria went into the crisis with a sound fiscal position. However, as low interest rates might not stay around forever, the high debt ratio should be reduced in a socially and environmentally sustainable way.

Nontechnical summaries in German

Wirtschaftsbeobachtung in Echtzeit mit dem wöchentlichen OeNB-BIP-Indikator: Hintergrund, Erfahrungen, Ausblick

Gerhard Fenz, Helmut Stix

Wie in vielen anderen industrialisierten Staaten hat die COVID-19-Pandemie auch in Österreich zu einem abrupten und tiefen Einbruch der wirtschaftlichen Aktivität geführt. Da traditionelle wirtschaftliche Indikatoren erst mit einer gewissen zeitlichen Verzögerung verfügbar sind, bestand der Bedarf nach Indikatoren die wesentlich zeitnäher zur Verfügung stehen. Vor diesem Hintergrund wurde der neue experimentelle OeNB-BIP-Indikator entwickelt.

Der OeNB-BIP-Indikator basiert auf einer Messung der nachfrageseitigen Komponenten des BIP. Er (i) bietet eine Schätzung der wirtschaftlichen Aktivität auf wöchentlicher Basis, (ii) bietet Schätzungen des Wachstumsbeitrags der Hauptkomponenten des BIP, (iii) stellt die Entwicklung im Jahresvergleich dar und (iv) berücksichtigt Verschiebungen zwischen baren und unbaren Konsumausgaben, was eine relativ genaue Einschätzung der Konsumentwicklung zulässt. Die Ergebnisse des OeNB-BIP-Indikators wurden sein Anfang Mai 2020 regelmäßig veröffentlicht. Damit konnten die wirtschaftspolitischen Akteure und die Öffentlichkeit zeitnah informiert werden.

Im vorliegenden Beitrag präsentieren wir den Indikator sowie die Hauptergebnisse, erläutern seine Konstruktion, diskutieren seine Vor- und Nachteile und ziehen eine (vorläufige) Bilanz nach mehr als einem halben Jahr wöchentlichen Nowcastens.

Im Großen und Ganzen hat sich der BIP-Indikator bisher als sehr nützliches und valides Instrument in Zeiten der aktuellen wirtschaftlichen Krise erwiesen. Er unterscheidet sich von anderen bekannten internationalen Indikatoren, in dem er – aus Gründen der Datenverfügbarkeit – „datengetrieben" ist, während die meisten anderen Indikatoren auf Zeitreihenmodellen beruhen. Dies schränkt das Ausmaß der möglichen Validitätsprüfungen ein. Insofern ist und bleibt der OeNB-BIP-Indikator ein Instrument, das krisenbezogen eingesetzt wird und nicht zur Konjunkturbeobachtung in „normalen" Zeiten dient. Im Gegensatz dazu werden etliche Echtzeitindikatoren, die national und international seit Ausbruch der COVID-19-Pandemie zur Wirtschaftsanalyse verwendet werden, insbesondere Zahlungsverkehrsdaten, auch in wirtschaftlich ruhigeren Zeiten eingesetzt werden. Sie haben sich als ausgesprochen informativ erwiesen und eröffnen neue Möglichkeiten der Wirtschaftsanalyse.

Österreichischer Tourismussektor von COVID-19-Pandemie stark betroffen

Gerhard Fenz, Helmut Stix, Klaus Vondra

Der Tourismussektor stellt eine wichtige Stütze der österreichischen Wirtschaft dar. Rund 7½% des österreichischen BIP entfallen auf diesen Sektor. Im europäischen Vergleich ist dieser Wert überdurchschnittlich hoch. Die beträchtlichen Auswirkungen der COVID-19-Krise auf den österreichischen Tourismus werden in diesem Beitrag auf Basis wöchentlich erhobener Kartenzahlungsdaten und monatlich erhobener Nächtigungszahlen analysiert. Während des Lockdowns im Frühjahr 2020 gingen die Nächtigungen im österreichischen Fremdenverkehr um beinahe 100 % zurück. Während die Anzahl inländischer Touristen nach der Wiedereröffnung der Beherbergungsbetriebe rasch wieder anstieg, dauerte dies bei den ausländischen Touristen (in erster Linie aus Kontinentaleuropa) einige Wochen länger; die meisten Touristen aus Übersee sind seit dem Ausbruch der COVID-19-Pandemie in Österreich im März 2020 ausgeblieben. Über die Sommermonate 2020 verzeichnete der österreichische Tourismus eine starke Erholung, die hauptsächlich auf inländische und deutsche Gäste zurückzuführen war. Dennoch blieben die Nächtigungen deutlich unter dem Vorjahrsniveau. Im Oktober 2020 führte die neuerlich ansteigende Zahl an COVID-19-Infektionen zu einem weiteren starken Rückgang im heimischen Fremdenverkehr (Nächtigungen insgesamt: –49,3 %; inländische Touristen: –13,7 %; ausländische Touristen: –66,8 %). Am 2. November 2020 wurde in Österreich ein zweiter Lockdown verhängt. Beherbergungsbetriebe und die Gastronomie wurden geschlossen. Auf Basis von Schätzungen anhand der Kartenzahlungsdaten ist im November 2020 im Vorjahrsvergleich mit einem Rückgang von 93 % bei den Nächtigungen zu rechnen (heimische Touristen: –90 %; ausländische Touristen: –95 %).

Gemäß den von der österreichischen Bundesregierung am 2. Dezember 2020 verlautbarten neuen Regelungen werden Beherbergungsbetriebe in Österreich nicht vor Jänner 2021 wieder öffnen. Darüber hinaus werden Reisewarnungen der wichtigsten touristischen Herkunftsländer (insbesondere Deutschlands) zumindest bis Jahresende in Kraft bleiben. Insgesamt ist somit im Dezember ein Rückgang der Nächtigungen von 95 % zu erwarten. Für das Gesamtjahr 2020 wird von einem 36-prozentigen Rückgang der Nächtigungen ausgegangen, was in erster Linie auf das deutliche Minus bei den Nächtigungen ausländischer Touristen zurückzuführen ist (–41 %). Der Nächtigungsrückgang bei inländischen

Touristen hingegen wird 23 % ausmachen. Wären die Lockdowns in die Hochsaison gefallen, so wären die Nächtigungszahlen vermutlich noch stärker zurückgegangen. Wenn die Eindämmungsmaßnahmen und Reisewarnungen in den ersten Monaten des Jahres 2021 aufrecht bleiben, sind hohe Verluste in der österreichischen Beherbergungs- und Wintersportindustrie sehr wahrscheinlich. Dies würde auch den Gesamttourismus 2021 in Österreich stark beeinträchtigen.

Preis- und Inflationsentwicklung in Österreich während der COVID-19-Krise – eine Analyse anhand von Online-Preisdaten

Christian Beer, Fabio Rumler, Joel Tölgyes

Die COVID-19-Pandemie und die Maßnahmen zu ihrer Bekämpfung wirken sich sowohl nachfrage- als auch angebotsseitig auf vielfache Weise auf die österreichische Wirtschaft, und somit auch auf die Verbraucherpreise, aus. Abgesehen von ihrer Auswirkung auf die Preise erschwert die COVID-19-Pandemie auch die Erhebung von Preisdaten zur Inflationsmessung. So mussten die statistischen Ämter mitunter auf Schätzungen und Daten von Supermärkten zurückgreifen, da eine Erhebung von Preisdaten vor Ort in den Geschäften nicht immer möglich war. Um Aufschluss über die Preisentwicklung während der ersten Phase der COVID-19-Pandemie in Österreich zu erhalten, erhebt die Oesterreichische Nationalbank (OeNB) seit Anfang April 2020 Preisdaten unterschiedlicher Online-Geschäfte. Dabei kommt die Methode des Webscraping zum Einsatz, d. h. der automatische tägliche Download großer Mengen von Online-Daten.

Auf Basis dieser Daten wurde die Preisentwicklung jener Produktkategorien analysiert, die während der COVID-19-Krise besonders ins Blickfeld gerückt sind: Nahrungsmittel und Getränke, medizinische Produkte, IT-Ausrüstung, Körperpflegeprodukte und Essenszustellungen. Der Beobachtungszeitraum für die meisten Produkte umfasst die Monate von April bis August 2020. Die Analyseergebnisse legen nahe, dass die Preise für Nahrungsmittel und alkoholfreie Getränke – entgegen teils anders lautenden Medienberichten – im Beobachtungszeitraum zurückgegangen sind (wenn auch nur leicht), während die Preise für alkoholische Getränke und medizinische Produkte keinen klaren Auf- oder Abwärtstrend erkennen ließen. Für Körperpflegeprodukte und IT-Ausrüstung zeichnete sich in der ersten Hälfte des Beobachtungszeitraums ein Preisanstieg ab, auf den in der zweiten Hälfte des Beobachtungszeitraums ein etwas deutlicherer Preisrückgang folgte. Bei Essenszustellungen durch einen Lieferservice hingegen konnte ein stetiger, wenn auch geringer, Preisanstieg festgestellt werden (Beobachtungszeitraum: Mitte Juni bis Ende August 2020).

Ein Vergleich der aus den Online-Daten abgeleiteten Ergebnisse mit den offiziellen Ergebnissen des Harmonisierten Verbraucherpreisindex (HVPI) für Österreich zeigt ähnliche Preisentwicklungen bei Nahrungsmitteln und Körperpflegeprodukten, jedoch einige Unterschiede in den übrigen Produktkategorien. Diese Abweichungen könnten auf konzeptionelle Unterschiede in der statistischen Erfassung von Produkten und Geschäften zurückzuführen sein.

Der Beitrag von Hilfsmaßnahmen zur Vermeidung von COVID-19-bedingten Unternehmensinsolvenzen in Österreich

Claus Puhr, Martin Schneider

Wir beleuchten in dieser Studie, wie sich die COVID-19-Pandemie auf Unternehmen in Österreich auswirkt. Mithilfe eines neu entwickelten Insolvenzmodells schätzen wir, wie hoch das Insolvenzrisiko der Unternehmen aufgrund der wirtschaftlichen Folgen der Pandemie sein wird. Unser Modell basiert auf Unternehmensdaten und bildet die Bilanz sowie die Gewinn- und Verlustrechnung ab. Da sich die wirtschaftlichen Folgen der Pandemie stark nach Branchen unterscheiden, haben wir das Modell für 17 Branchen implementiert. Die Pandemie und die Lockdown-Maßnahmen zur Eindämmung des Coronavirus haben zu einem starken Einbruch der wirtschaftlichen Aktivität geführt. Dies stellt für viele Unternehmen und private Haushalte eine existenzielle Bedrohung dar. Zur Abfederung dieser Folgen wurden von staatlicher und privater Seite Hilfsmaßnahmen ergriffen. Die Maßnahmen für Unternehmen umfassen Zuschüsse (z. B. Fixkostenzuschuss und Kurzarbeit), kurz- und langfristige Stundungen, Kreditgarantien sowie Änderungen im Insolvenzrecht. In der Analyse wurden Hilfsmaßnahmen bis zum 31. August 2020 berücksichtigt.

Unserem Modell zufolge führt die Pandemie zu einem starken Anstieg der Unternehmensinsolvenzen. Ohne Hilfsmaßnahmen würden 2020 im Vergleich zu den Vorjahren sechs Mal so viele Unternehmen insolvent werden. Die Hilfsmaßnahmen können diese Zahl jedoch um zwei Drittel reduzieren. Die mit unserem Modell berechneten Insolvenzraten sind mit einem hohen Ausmaß an Unsicherheit verbunden. Die Stärke des Modells liegt denn auch insbesondere in der Abschätzung der Wirksamkeit der einzelnen Hilfsmaßnahmen. Kreditgarantien scheinen beispielsweise die Maßnahme mit der größten Wirkung zu sein, gefolgt vom Fixkostenzuschuss und von der Kurzarbeit. Auf kurze Sicht ist die Aussetzung der Insolvenzantragspflicht am effizientesten; allerdings wird sich der Effekt dieser Maßnahme 2021 umkehren, wenn die Maßnahme annahmegemäß ausläuft.

Auswirkungen der COVID-19-Pandemie auf die finanzielle Situation der privaten Haushalte in Österreich

Nicolas Albacete, Pirmin Fessler, Fabian Kalleitner, Peter Lindner

In dieser Studie werden die potenziellen Auswirkungen der COVID-19-Pandemie auf die finanzielle Situation der privaten Haushalte in Österreich untersucht. Sie stützt sich auf Daten aus dem Austrian Corona Panel Project der Universität Wien sowie aus dem Household Finance and Consumption Survey des Eurosystems in Österreich.

Im ersten Teil der Studie wird aufgezeigt, dass Einzelpersonen und Haushalte auf sehr unterschiedliche Weise und in unterschiedlichem Ausmaß von der COVID-19-Krise betroffen sind. So sind Haushalte, die relativ wenig Wohnfläche zur Verfügung haben – etwa größere Haushalte mit Kindern, Alleinerzieherhaushalte oder Haushalte in dicht besiedelten Gebieten –, den durch COVID-19 verursachten Einkommensschocks stärker ausgesetzt. Für einkommensschwächere Haushalte stellen Pensionseinkommen und sonstige staatliche Transferleistungen einen wichtigen Puffer gegen potenzielle Auswirkungen der COVID-19-Krise dar, da diese Einkommensquellen von den Folgen der Krise bislang (noch) nicht betroffen waren. Darüber hinaus zeigt sich, dass der Medianhaushalt finanzielle Verluste über einen relativ langen Zeitraum hinweg kompensieren könnte, indem er auf liquide Mittel, wie Ersparnisse, zurückgreift. Es scheint daher geboten, sich mit jenen Haushalten zu befassen, die während der COVID-19-Krise erlittene Verluste nicht wettmachen können, wie etwa Alleinerzieherhaushalte oder von Arbeitslosigkeit betroffene Haushalte.

Der zweite Teil der Studie analysiert die potenziellen Folgen der COVID-19-Pandemie. Die Ergebnisse deuten darauf hin, dass private Haushalte während des ersten Lockdowns im April 2020 Einkommenseinbußen von durchschnittlich 12 % verzeichneten; dieser Prozentsatz würde sich verdoppeln, wenn ein Drittel der von Kurzarbeit betroffenen Arbeitnehmerinnen und Arbeitnehmer ihren Arbeitsplatz verlieren würde. Besonders hohe Einkommensverluste verzeichneten zudem Mieterhaushalte. Auf die Konsumabsichten privater Haushalte hatte sich die COVID-19-Pandemie zunächst negativ ausgewirkt, seither ist die Ausgabenneigung allerdings wieder gestiegen. Beträchtliche Unsicherheiten bleiben dennoch bestehen. Auch die Einstellung zum Sparen ist mit hoher Unsicherheit behaftet; doch fanden sich immerhin schwache Hinweise auf eine im Zeitverlauf zunehmend positive Sparneigung einkommensstarker Haushalte. Unterstützungsmaßnahmen sollten insbesondere mit Blick auf jene Haushalte gesetzt werden, die sich bereits vor der COVID-19-Pandemie in sozialen, wirtschaftlichen und/oder finanziellen Schwierigkeiten befunden hatten und die während der Pandemie die höchsten Einkommenseinbußen zu verzeichnen hatten. Nur so kann man weiteren finanziellen und sozialen Benachteiligungen vorbeugen.

Auswirkungen der geldpolitischen Reaktion auf die COVID-19-Pandemie: vorläufige Ergebnisse einer Pilotstudie auf Basis österreichischer Einzelbankdaten

Claudia Kwapil, Kilian Rieder

Die geldpolitische Reaktion des Eurosystems auf die wirtschaftlichen Folgen der COVID-19-Pandemie erfolgte rasch und in großem Umfang. Das Politikpaket umfasste sowohl Erweiterungen bestehender unkonventioneller Maßnahmen als auch neue Instrumente, um den außerordentlichen wirtschaftlichen Herausforderungen durch die Pandemie zu begegnen. Diese Pilotstudie analysiert die Auswirkungen eines wichtigen Bausteins des geldpolitischen Rettungspakets – nämlich die gezielten längerfristigen Refinanzierungsgeschäfte (TLTRO) – auf das Kreditangebot österreichischer Banken. Im Frühjahr 2020 wurden in Reaktion auf COVID-19 die Bedingungen der jüngsten Generation an TLTROs (TLTRO III) erheblich gelockert, indem das Volumen ausgeweitet, der Zinssatz gesenkt und die Anforderungen an die Sicherheiten heruntergeschraubt wurden. Wir untersuchen, ob jene Banken, die im Juni 2020 (nach der oben genannten Lockerung) den TLTRO III stärker in Anspruch genommen haben, in den Folgemonaten Juli und August vermehrt Kredite an ihre Kundinnen und Kunden vergeben haben. Dabei stützen wir uns auf österreichische Bankdaten und benutzen eine Instrumentalvariablenstrategie, um den kausalen Zusammenhang zwischen der TLTRO-Mittelaufnahme und dem Kreditangebot der Banken zu untersuchen. Wir finden Hinweise auf einen eindeutig positiven Effekt der TLTRO-Beteiligung auf das Kreditangebot in Österreich. Die geschätzte Elastizität des Kreditangebots liegt je nach berücksichtigtem Zeitraum bzw. je nach berücksichtigten Kreditkategorien zwischen 0,36 und 1,97.

Beispiellose fiskalische Maßnahmen zur Bekämpfung der Auswirkungen der COVID-19-Pandemie in Österreich

Doris Prammer

Österreichs Fiskalpolitik kommt bei der Abmilderung der wirtschaftlichen Folgen der COVID-19-Pandemie eine wichtige Rolle zu. So federn zum einen automatische Stabilisatoren den Wirtschaftsabschwung teilweise ab und zum anderen tragen neue, proaktive fiskalpolitische Maßnahmen sowohl auf nationaler als auch auf europäischer Ebene zur weiteren Stützung der Wirtschaft bei. Die fiskalpolitischen Maßnahmen, die in Österreich während der Lockdowns im Frühjahr und im November/Dezember 2020 getroffen wurden, zielten insbesondere auf die Sicherstellung eines funktionsfähigen Gesundheitssystems und die Unterstützung von Unternehmen (Fixkostenzuschuss, Umsatzersatz) sowie privaten Haushalten (Kurzarbeit, Härtefallfonds) ab. Die Entschädigung von Unternehmen und Haushalten für Einkommensverluste aufgrund von Eindämmungsmaßnahmen trug dazu bei, Produktionskapazitäten zu retten. Letztere wären verloren gegangen, wenn rentable Unternehmen um ihre Existenz gebracht und Arbeitsplätze dauerhaft vernichtet worden wären. Die seit dem Sommer 2020 verabschiedeten Maßnahmen verfolgten zwei Ziele: Erstens hatte der Neustart der Wirtschaft durch klassische Impulse (Einkommenssteuersenkung, Senkung der Mehrwertsteuer für bestimmte Sektoren, einmalige Sozialleistungen) nach der Aufhebung der Lockdowns oberste Priorität. Die damit verbundenen Maßnahmen sollten die Konsumnachfrage – insbesondere von Haushalten mit Liquiditätsengpässen – ankurbeln. Zweitens wurden Initiativen ergriffen, um private Investitionen (Verlustvortrag 2020, degressive Abschreibung, Investitionsprämie) ebenso wie öffentliche Investitionen (Bundeszuschuss für kommunale Investitionen, Aufstockung der Investitionsbudgets) anzuregen. Idealerweise sollen diese Investitionen auch langfristige Ziele, etwa die Abkehr von fossilen Brennstoffen und die Ökologisierung der Wirtschaft, vorantreiben. Dies wiederum erleichtert den Übergang zu neuen Technologien und Arbeitsweisen, stellt die heimische Wirtschaft auf eine tragfähige Basis und steigert damit das langfristige Wachstumspotenzial. Angesichts der weiterhin höchst unsicheren konjunkturellen Perspektiven könnten diese Maßnahmen jedoch weniger wirksam als unter normalen Voraussetzungen sein. So könnten private Haushalte und Unternehmen einfach eine abwartende Haltung einnehmen, anstatt zu konsumieren und zu investieren. Auch sollten die Maßnahmen mit Bedacht zurückgenommen werden, um etwaige Nachwirkungen der COVID-19-Krise, die die wirtschaftliche Erholung hemmen könnten, zu vermeiden. Die mit den neuen fiskalischen Maßnahmen und den automatischen Stabilisatoren verbundenen Kosten bleiben nicht ohne Folgen für das österreichische Budget. So wird Österreich 2020 voraussichtlich das höchste Budgetdefizit seit 1995 verzeichnen. Dies sollte die Tragfähigkeit der öffentlichen Finanzen dennoch nicht gefährden, da Österreich zu Beginn der COVID-19-Pandemie gesunde öffentliche Finanzen aufwies. Da jedoch das derzeit niedrige Zinsniveau nicht von Dauer sein könnte, sollte der hohe öffentliche Schuldenstand auf sozial verträgliche und ökologisch nachhaltige Weise reduziert werden.

Analyses

Monitoring the economy in real time with the weekly OeNB GDP indicator: background, experience and outlook

Gerhard Fenz, Helmut Stix[1]
Referee: Philipp Wegmüller, State Secretariat for Economic Affairs (SECO), Switzerland

This study presents the OeNB's new weekly indicator of economic activity, which is based on a demand-side approach to measuring GDP and which relies on real-time data. The weekly OeNB GDP indicator (1) tracks economic development in Austria on a weekly basis; (2) provides estimates of the contributions of the main demand components of GDP; (3) focuses on seasonally adjusted year-on-year changes; and (4) considers shifts from cash to noncash consumer spending, thus taking into account behavioral changes in the use of payment instruments.

The OeNB has published weekly GDP estimates since early May 2020 and has thus provided policymakers and the public with important and timely information on the state of the Austrian economy. First benchmarking results indicate that the weekly OeNB GDP indicator generated rather accurate results for aggregate economic activity in the first two quarters after the outbreak of the COVID-19 pandemic in Austria.

We describe the construction and the main features of the weekly OeNB GDP indicator, present its results for the period from March to December 2020, discuss the strengths and shortcomings of our approach and draw some lessons from more than eight months of weekly nowcasting with real-time data.

Indicator updates will continue to be released during the COVID-19 pandemic at https://www.oenb.at/Publikationen/corona/bip-indikator-der-oenb.html.

JEL classification: C53; E01; E27
Keywords: GDP, nowcasting, COVID 19, real-time data, payments data

As in most other industrialized countries, the COVID-19 pandemic triggered a deep and abrupt slump in economic activity in Austria. Timely estimates of the economic contraction following the March 2020 lockdown, the subsequent gradual recovery of the Austrian economy and the renewed contraction in November and December 2020 present economic research with substantial challenges. Traditional economic indicators are typically not available on a timely basis given their monthly or quarterly publication schedule. Moreover, the performance of traditional forecasting models might be suboptimal in this special case, as some econometric relationships that are reliable in normal times may have broken down during this severe contraction, e.g. because of sudden behavioral changes and/or nonlinearities.

Against this background, the Oesterreichische Nationalbank (OeNB) developed a weekly economic indicator based on economic data that are measured at

[1] *Oesterreichische Nationalbank, Economic Analysis Division, gerhard.fenz@oenb.at, Economic Studies Division, helmut.stix@oenb.at.* *We are indebted to the companies (some of which prefer to remain anonymous) that continuously provide the (anonymized and aggregated) data necessary to construct the weekly OeNB GDP indicator. We are grateful to the referee and to Ernest Gnan, Walpurga Köhler-Töglhofer, Doris Ritzberger-Grünwald, Martin Summer and Thomas Steiner (all OeNB) for very helpful comments, suggestions and support in developing the GDP indicator. Also, we thank Doris Prammer, Anton Schautzer, Martin Schneider, Alfred Stiglbauer and Patrick Thienel (all OeNB) for valuable support regarding data and methods. Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the Oesterreichische Nationalbank or the Eurosystem.*

high frequency. This indicator estimates real GDP via the expenditure approach. The weekly OeNB GDP indicator (1) tracks economic developments in real time[2]; (2) provides estimates of the contributions of the main demand components of GDP; (3) looks at seasonally adjusted year-on-year changes; and (4) incorporates behavioral shifts as e.g. its consumption estimate encompasses cash and noncash expenditure and thus takes account of the surge in the use of payment cards during the COVID-19 pandemic. As such, the indicator accounts for some major points of criticism that have been raised against real-time economic indicators.[3] Overall, the weekly OeNB GDP indicator generated accurate results for aggregate economic activity in the first two quarters after the outbreak of the COVID-19 pandemic in Austria while traditional nowcasting models performed rather poorly. Since the weekly OeNB GDP indicator is available on a weekly basis, it provides policymakers and the public with important and timely information on the state of the Austrian economy, which is particularly important given the rapid changes in economic activity caused by renewed lockdowns, stay-at-home orders or travel restrictions.

The aim of this study is to describe the construction and main features of the weekly OeNB GDP indicator. Also, we present its results for the period from March to December 2020 and discuss some early tests on its validity. The weekly OeNB GDP indicator aligns with a series of international economic indicators based on real-time data. We will therefore also put it in an international perspective and (briefly) compare its main features with those of other approaches. Finally, we discuss the lessons that we draw from more than nine months of nowcasting using high-frequency data, and in particular the strengths, limitations and potential of this approach.[4]

Before we proceed, we would like to point out that the weekly OeNB GDP indicator is based on an experimental approach and represents a "living project," i.e. we continuously work on improving it and implementing additional data. This means that results may be revised, also retrospectively.

1 Austrian GDP growth during the COVID-19 pandemic

Chart 1 presents the key results of the weekly OeNB GDP indicator for the period from March to December 2020.[5] The red line shows the change in Austrian real GDP per week against the comparable week of 2019. The value of –5.1 recorded in calendar week (CW) 34 which started on August 17, for example, indicates that real GDP in this week in 2020 was 5.1% below real GDP in calendar week 34 of 2019.[6]

[2] *We will use the term "real-time data" as synonymous with "almost or quasi real-time data," meaning data that are available at a daily or weekly frequency without great delays in publication. Also, our use of the term real-time data differs from the term used in the context of forecast evaluation in the sense that our real-time data can be subject to revisions.*

[3] *See, for example, "Why real-time economic data need to be treated with caution" (The Economist, July 23, 2020). https://www.economist.com/finance-and-economics/2020/07/23/why-real-time-economic-data-need-to-be-treated-with-caution.*

[4] *The OeNB GDP indicator has been published on a regular basis since mid-May 2020 and its results have been made available on the OeNB's website. Each publication comprises a data file (both in English and German) and a German summary of the results.*

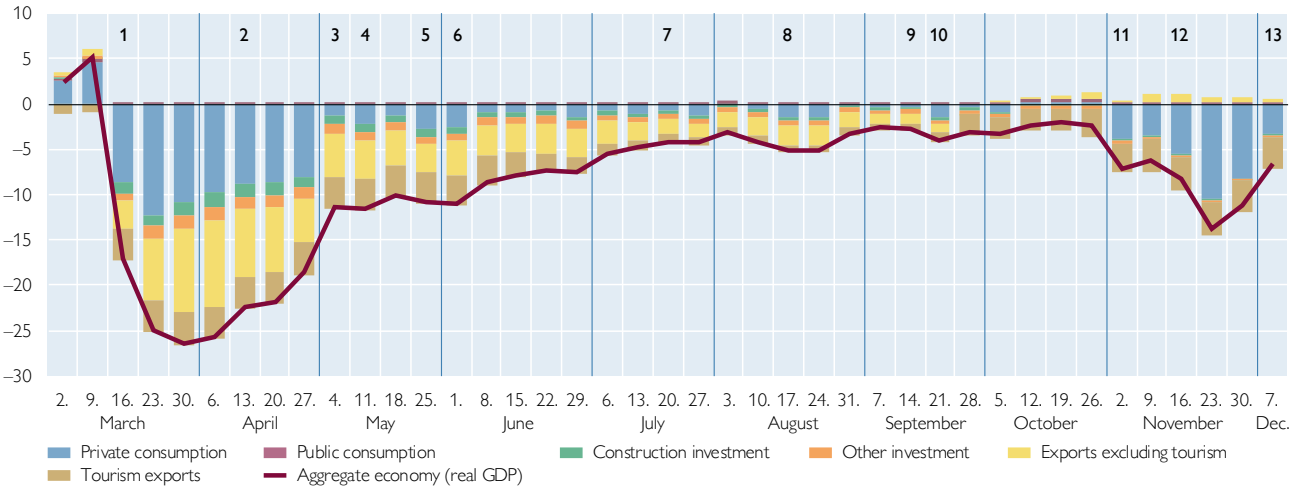
[5] *Cutoff date for data: December 13, 2020.*

[6] *2019 is particularly suitable as a year of comparison as it was a normal business year with growth rates close to the long-term average and a closed output gap.*

Chart 1

Weekly OeNB GDP indicator for Austria

Year-on-year change of real GDP in %; import-adjusted growth contributions in percentage points



Source: OeNB.

Note: 1: lockdown (March 16, 2020), 2: small shops reopen (April 14, 2020), 3: all shops reopen (May 2, 2020), 4: restaurants reopen (May 15, 2020), 5: hotels reopen (May 29, 2020), 6: borders reopen gradually (June 4, 2020), 7: duty to wear face masks reintroduced (July 24, 2020), 8: travel warnings issued (for Croatia, the Balearic Islands, gradually from August 8, 2020), 9: travel warnings issued for Austria (September 16, 2020), 10: protective measures tightened (September 21, 2020; November 25, 2020), 11: lockdown light (November 3, 2020), 12: lockdown (November 17, 2020), 13: retail shops and personal service shops reopen (December 7, 2020).

The first lockdown in Austria of March 2020 led to a sudden and steep slump in economic activity – at rates not seen in Austria since the World War II.[7] Our estimates suggest that two weeks after the lockdown was in full effect (CW 14), Austrian GDP was 26% below 2019 values.[8] This gloomy state continued until shops were reopened (smaller shops in CW 16 and larger shops at the end of CW 18). The reopening of restaurants and hotels also supported economic recovery. However, GDP growth remained negative over the summer of 2020 (July began in CW 27) and in early fall.

New restrictions were imposed in response to the renewed surge in COVID-19 cases in October 2020. First, Austria issued travel warnings for other countries. Then, other countries issued travel warnings for Austria. In early November 2020, a partial lockdown was imposed in Austria, essentially shutting down restaurants, hotels, cinemas, fitness studios, etc. These measures were tightened on November 17, 2020, with nonessential retail shops and schools being temporarily closed (second lockdown). On December 7, 2020, retail shops and personal service shops were allowed to reopen.

While short-term economic developments are discussed regularly in the reports published on the OeNB's website www.oenb.at/Publikationen/corona/bip-indikator-der-oenb.html, in this study, we focus on the broader results that emerge from the OeNB GDP indicator estimates:

[7] *Containment measures were imposed from March 9, 2020, onward. Monday, March 16, 2020, (calendar week 12) was the first working day when shops remained closed. A timeline is provided at https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Austria (retrieved on September 24, 2020), for example.*

[8] *Table A2 in the annex lists calendar weeks and the corresponding calendar dates.*

- In the early stages of the COVID-19 crisis, consumption, nontourism exports and tourism exports contributed most to the decline in Austria's economic activity. This changed over time, as nontourism exports have returned toward normal levels. For the second lockdown period of November 2020, we find that consumption and tourism exports drove the economic downturn.
- Our estimates show that consumption remained subdued even after the containment measures were lifted in May 2020. This development reflects elevated unemployment rates, a partial continuation of short-term work at lower incomes, increased economic uncertainty and precautionary savings as well as, possibly, a certain extent of spending restraint motivated by fears of contracting the coronavirus.
- Exports also remained subpar for an extended period of time; this shows how important international developments are for a small open economy. At the beginning of October (CW 40), growth rates in non-tourism exports started to turn positive, which was a positive signal in an overall gloomy economic environment.
- Tourism exports, which contribute around 7.5% to GDP in Austria, almost completely collapsed during the first and second lockdowns and gradually recovered over the summer months of 2020, mainly by virtue of domestic and German tourists (Fenz et al., 2020).
- While recovery was fast after the first lockdown in March 2020, over the summer and fall the slope of the recovery increasingly took the shape of a check mark with an increasingly flatter right arm, with real GDP levels ranging between 2% and 5% below 2019 levels.
- The second lockdown has caused a renewed decline in economic activity in Austria. However, the drop is less sharp than in spring, mainly because production and exports have remained largely unaffected.
- Altogether, COVID-19-related GDP losses in Austria (measured as the difference to 2019 GDP levels) are substantial. During the first lockdown, losses amounted to about EUR 2 billion per week. Over the weeks of fall (before the second lockdown), losses came to about EUR 0.5 billion. The fall lockdown led to a renewed increase in weekly GDP losses to about EUR 1 billion. Overall, GDP losses accumulated to EUR 27 billion from March 16 to December 13, 2020. If we also consider the level of GDP that was forecast before the outbreak of the COVID-19 pandemic, losses amount to EUR 31 billion or 7.8% of 2019 GDP.

2 Methodological background

In this section, we discuss why the COVID-19 crisis required the development of new economic activity indicators. Then, we discuss our approach of measuring the demand components of GDP with real-time data.

2.1 The case for new real-time indicators

What forecasters usually like to do, especially in the course of nowcasting exercises, is the following: feed the data into the model, run the model, take the results at face value (after some cross-checking) and – this last point is typically less popular – write a forecast report. As the models are typically highly sophisticated and well validated, this procedure usually leads to results with high nowcasting accuracy (in the sense that they only deviate slightly from final GDP data).

While this well-established and well-tested procedure works well in normal times, it tends to fail in times of severe crises. Most models (factor models, time series models, bridge equations, vector autoregressive models, etc.) are estimated on the basis of historical data and are validated in a pseudo out-of-sample way, with the most recent data being used for validation but not for estimation. This approach to modeling may be quite appropriate as long as there are no structural breaks and the assumption can be maintained that the data follow the same stochastic process during the entire sample period. The problem is that the data sample typically contains no, or at best only a few, episodes of severe economic crises. Furthermore, each crisis has its unique features. Therefore, autoregressive terms, which tend to increase the forecast accuracy in nowcasting models in normal times, can give rise to substantial forecast errors in crises times. Moreover, nonlinearities may not matter much in normal times but can be crucial in crisis times, e.g. if economic agents change their behavior in response to unprecedented events.

Another, and even more important, weakness of traditional approaches to nowcasting is their low time frequency. The typical target variable is GDP, data on which are available only on a quarterly basis, and many short-term economic indicators used in traditional nowcasting models are published with a considerable time lag. The flash estimate for GDP is available 30 days after the respective quarter; the publication lag of foreign trade variables or industrial production is up to two months. If economic activity plunges within a few days or weeks, quarterly models cannot meet policymakers' high demand for timely information.

Thus, the extraordinary circumstances of the COVID-19 pandemic generated an urgent need for short-term indicators that meet the following requirements:

- They are measured at high frequency (daily or weekly) and are available without much of a delay (almost in "real-time");
- They are not prone to behavioral changes, not biased by fiscal or monetary policy measures or other measures taken to contain the crisis;
- They exhibit a direct (linear) relationship to one of the main components of GDP;
- They are available for a period of time long enough to account for seasonal patterns and to apply standard econometric tools.

The availability of data and their characteristics determine the nowcasting method that can be applied. If researchers observe enough indicators for a sufficiently long time period, time series approaches like principal components analysis can be applied and are the prime choice (e.g. for the Weekly Economic Index by the Federal Reserve Bank of New York or Aprigliano et al. 2019). If – as in our case – most of the real-time indicators are only available for a short time period, a more data-driven approach seems appropriate.

Table A1 lists – without any claim to completeness – a set of possible economic indicators that are available for Austria. Our real-time data set of weekly or daily indicators comprises detailed information on labor market developments at a regional and a sectoral level and broken down by socioeconomic characteristics; daily mobility data – for Austria as a whole and for the individual provinces; data on freight volumes, at a detailed regional level, and flight data; weekly debit and credit card transaction data according to country of issue and/or use and spending category; information on cash shipments, ATM withdrawals and bank transfers;

various financial market data; information on electricity consumption, air pollution and internet activity.

Not all of these indicators fulfill all the requirements listed above. For example, data on financial markets are currently biased by fiscal or monetary policy decisions; air pollution data are strongly influenced by idiosyncratic events like wind and weather conditions, which are difficult to control for; the higher number of people working from home affects internet activity data, etc. We therefore do not use these data in estimating weekly economic activity.

Beyond that, and this is of particular importance, many of the available real-time indicators cover only a short period of time – often less than two years. This limits the possibilities of applying standard econometric tools. Therefore, we pursue a more "data-driven" approach, for which we use only a few particularly informative real-time indicators. As most of these indicators are directly linked to one of the main demand components of GDP, we estimate weekly economic activity via the expenditure approach.

Another obstacle when using daily or weekly data is seasonal adjustment. The standard statistical tools currently do not support the seasonal adjustment of daily or weekly data, although new procedures are being developed (Ollech, 2018). However, these new procedures require sufficiently long time series. Given that the available indicators are only observed for a short period of time, we have to seasonally adjust the data "by hand."[9] Specifically, care is required in choosing the appropriate reference week of the previous year when calculating year-on-year growth rates, i.e. for moving holidays, beginning-of-the-month effects, etc. In this sense, seasonal adjustment is truly "hand-made" and involves considerable judgment.

In the next sections, we present detailed information on how we estimate weekly growth in private consumption and exports as these are the two most important demand components. In contrast, we will only briefly touch upon the other demand components and the aggregation of all subcomponents to overall GDP.

2.2 Consumption

Private consumption is, next to exports, the single most important expenditure-side component of Austrian GDP (accounting for a share of 51%, see table 1). As in many other international approaches, our nowcasting estimate of private consumption rests on measuring consumer spending via payment card expenditure (e.g. Andersen et al., 2020; Aprigliano et al. 2019; Baker et al., 2020; Bounie et al., 2020; Brown et al., 2020; Chetty et al., 2020; Carvalho et al., 2020; González Mínguez et al., 2020; INSEE, 2020; Kraenzlin et al., 2020). Given the importance of cash in Austria, we also account for a broad estimate of cash expenditure (see box 1).[10]

The sum of (estimated) cash and (measured) payment card spending by Austrian residents in Austria comprises about 55% of consumer spending, as derived from

[9] *Some seasonal adjustment occurs by focusing on year-on-year changes. Beyond that, seasonalities are mainly introduced by moving holidays and beginning-of-the-month effects.*

[10] *The importance of including cash into estimating consumption is also highlighted in Ardizzi et al. (2020) for Italy and Brown et al. (2020) or Kraenzlin et al. (2020) for Switzerland.*

national accounts data. About 25% of private consumption in Austria refer to expenditure for housing and insurance. Travel expenses abroad account for almost 5% of total consumer spending. Our estimate of Austrian private consumption relies on the 55% of "discretionary" (cash and payment card) consumer spending we observe on a weekly basis. We assume that consumption expenditure for housing and insurance remains constant relative to the previous year. Travel expenses abroad (i.e. tourism imports) are estimated on the basis of payment card information (see section 2.4 for more details). For the remaining share of consumer expenditure (about 15%), for which we do not have any proxy variable, we assume a growth rate similar to the one observed for the above-mentioned 55% of "discretionary" spending. Overall, once we have an estimate of weekly cash and card transactions, the estimate of private consumption is obtained from a simple summation and extrapolation. The essential task is to estimate the weekly value of cash and card transactions.

Estimating "discretionary" weekly consumer spending requires information on the following components:

- the value of domestic face-to-face debit and credit card spending of Austrian residents;
- the value of domestic cash spending of Austrian residents;
- the value of remote (online) transactions of Austrian residents; These transactions can be conducted via credit or debit card, by online transfers via online banking accounts, by ordinary bank transfers, by cash, by gift cards, by mobile phone bills, etc.

As regards domestic face-to-face payment card transactions, we have data on close to 100% of the weekly value of spending via debit cards issued by Austrian banks. Also, we receive data from several credit card-issuing banks in Austria that, taken together, have a dominant market share. We use information on market shares to compute projections for overall credit card spending.

As the weekly OeNB GDP indicator rests on a year-on-year comparison, we could derive annual changes in consumption only from annual changes in payment card spending if the payment cards-cash ratio remained constant. However, in Austria – like in many other countries – the COVID-19 pandemic has caused behavioral changes in the use of payment instruments (see box 1), which are motivated, inter alia, by the fear of contagion, by merchants promoting the use of payment cards or by changes in consumption baskets. Neglecting changes in the use of cash would result in a biased consumption estimate.

The main problem in measuring weekly cash consumption is that it is unobserved and can only be estimated indirectly, e.g. via the value of cash shipments or cash withdrawals at ATMs. If merchants or banks receive cash, it will be shipped to cash-handling companies or to the OeNB. As the organization of the cash cycle in Austria is rather centralized, it takes a relatively short period of time for a banknote to be shipped back to the OeNB (Schautzer and Stix, 2019). For this institutional peculiarity, our estimate relies heavily on data on the weekly return flow of cash to the OeNB.[11]

This means that we make the somewhat heroic assumption of a velocity of one, meaning that each banknote is only used once before it is returned to the OeNB,

[11] *We exclude data on cash shipments by international wholesale cash dealers from our estimations.*

when estimating the absolute value of cash transactions in Austria per week (e.g. to derive the percentage of overall private consumption paid in cash). To assess year-on-year changes in consumption, which is required for estimating the weekly OeNB GDP indicator, we must make the somewhat weaker assumption of a constant velocity. Actual velocity will be somewhat higher than one, e.g. because automated cash recycling machines can check banknote fitness and put banknotes into recirculation without them being delivered back to the OeNB or because merchants directly use their cash receipts for consumption. On the one hand, we will thus underestimate cash consumption. On the other hand, we will overestimate it because cash shipments to the OeNB comprise banknotes that were not used for consumption. This is the case, for instance, when a person receives a cash payment and deposits the respective amount with a bank and the bank ships back this amount of cash to the OeNB or when people reduce their hoarded stocks of cash. Despite these biases, we presume that cash deliveries to the OeNB are highly correlated with actual cash consumption in Austria.[12]

It is not possible to provide a comprehensive test for these assumptions. Some degree of validation can be obtained by comparing data on ATM withdrawals, which can be considered a close proxy for cash consumption, with our measure of cash shipments.[13] Overall, the correlation of the value of weekly cash shipments and of ATM withdrawals has been very high in Austria since March 2020, with a correlation coefficient of above 0.9. Furthermore, we compute the implied share of cash from the total of cash, debit card and credit card expenditure, as shown in box 1. The implied share of cash obtained for the time before the COVID-19 pandemic is similar to the respective share of cash obtained in the payment diary study conducted in Austria in 2019 (European Central Bank, 2020; see box 1). Overall, these two checks suggest that our cash shipment measure provides for a reasonably appropriate measure of weekly cash spending in Austria.[14]

An alternative to using information on banknote (return) shipments to the OeNB would be to use information on banknote shipments from the OeNB or to use data on ATM withdrawals. We consider banknote shipments from the OeNB less appropriate as these also comprise cash held for hoarding. This was of particular importance in the early weeks of the COVID-19 crisis when cash withdrawals soared (such a surge was also observed in other countries, see Deutsche Bundesbank, 2020; Goodhart and Ashworth, 2020). Data on the value of ATM withdrawals would be more promising but these are not available on a weekly basis. Moreover, hoarding could have similarly influenced ATM withdrawals in the early days

[12] *Another subtle issue arises as cash shipments also comprise cash spending by tourists and cash exported by domestic residents when traveling abroad. We have attempted to estimate these components (as best we can, given available data and using ad hoc assumptions) and find that their quantitative importance is not large relative to the overall amount of cash that is shipped from or to the OeNB.*

[13] *Unfortunately, we cannot use information on ATM withdrawals directly because we observe only a relatively small share of all ATM withdrawals in Austria.*

[14] *Moreover, our interpretation is continuously vetted and discussed with experts in the OeNB's Cashier's Division and adjusted if necessary. For example, our year-on-year comparison of banknote shipments is biased in certain weeks as the issuance of the new EUR 100 banknote series in 2019 resulted in an above-average return flow of old EUR 100 banknotes. In such cases, we adjusted return flow data on a judgmental basis, utilizing data on changes in ATM withdrawals.*

of the COVID-19 crisis.[15] Cash shipments to the OeNB, in turn, which we consider, predominantly reflect cash spending (with some contribution from nonconsumptive purposes, e.g. dissolved hoarding stocks).

The final ingredient needed for our consumption estimate is the value of remote (online) transactions. We use data from debit and credit card issuers as well as from providers of secure transfers via online banking accounts. Unpublished survey information shows that these means of settling online transactions comprise the major payment methods for online transactions. However, we have no information on the market shares of the various payment instruments used for online purchases to compute projections for the entire online payment market. An additional problem arises as not all online payments can be assigned to domestic and foreign purchases. Given this situation, we take a pragmatic approach and just record an unadjusted sum of remote transactions. This should nevertheless provide a reasonable estimate of year-on-year changes in online spending as long as there are no large changes in the market shares of the various payment instruments and as long as there is no large shift between domestic and foreign retailers. Moreover, these data limitations are not overly important – from a quantitative perspective – for our consumption estimate, as remote transactions still account for only a modest share in overall private consumption.

Box 1

Cash use first declined but then recovered in Austria during the COVID-19 pandemic

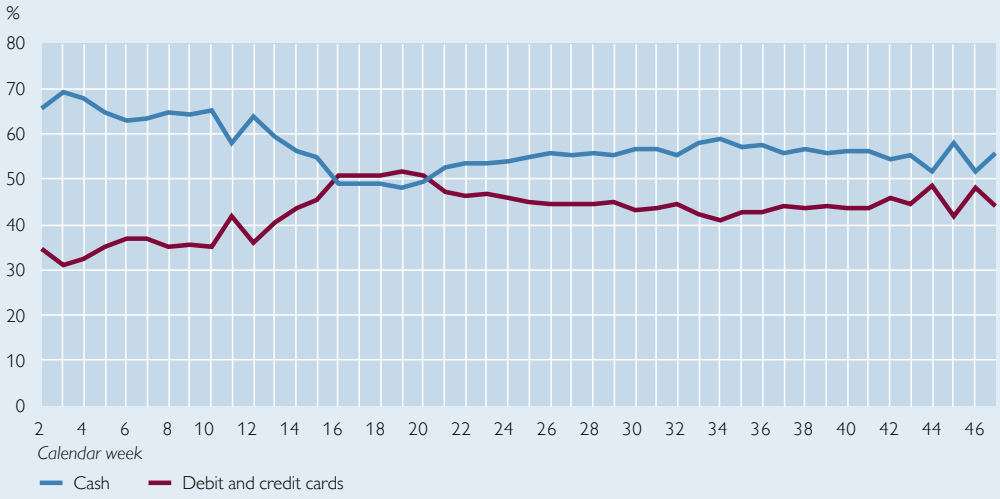
Austria has a high cash intensity. According to the most recent payment diary study conducted in 2019 (European Central Bank, 2020), cash payments in Austria accounted for about 58% of the value of consumer purchases excluding recurrent payments, while card payments accounted for 28% and other payment instruments for 13%. Among payment cards, debit cards are most frequently used in Austria. European Central Bank (2020) does not report separate shares for debit and credit cards, but if we draw on the results of an earlier study on the situation in Austria, debit cards can be assumed to have a share of around 21% and credit cards a share of around 7% in consumer spending (Rusu and Stix, 2016). If we rebase the shares reported in European Central Bank (2020) and only consider transactions conducted using cash, debit cards and credit cards, cash transactions in Austria have a value share of 67%.

Chart B1 shows our estimate of the implicit shares of cash in point-of-sale (face-to-face) payment transactions before and during the COVID-19 pandemic in Austria. Although these estimates rely on strong assumptions and should therefore be treated as approximations only (see the discussion in the text), the implicit pre-COVID-19 shares are broadly comparable with the results obtained from the above-mentioned payment diary survey studies.

[15] *Hoarding behavior could, to a small extent, also exist for ATM withdrawals, e.g. around pay-day, when people replenish their cash reserves and store cash for later purchases (Brown et al., 2020b).*

Chart B1

Estimated share of payment instruments in payments at the point of sale



Source: Payment card issuers, OeNB.

Note: The chart shows an estimate of the value share of cash and of debit and credit cards in point-of-sale transactions in Austria. Shares sum up to 100. Payment cards comprise only cards issued in Austria.

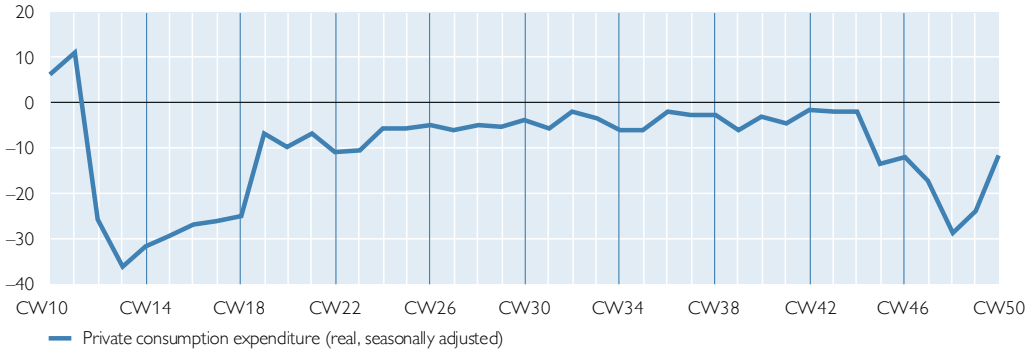
The share of cash in payment transactions declined strongly after the spring 2020 lockdown measures were imposed in Austria, from around 65% to slightly below 50% – which means that EUR 5 out of EUR 10 spent in domestic face-to-face transactions were paid in cash. The increase in card spending was driven by debit cards, and by contactless debit card payments in particular. For the latter, the limit for payments not requiring a PIN has been raised from EUR 25 to EUR 50. Credit cards temporarily lost ground in Austria during the March 2020 lockdown, given that a significant share of credit card spending is related to travel-related payments (Rusu and Stix, 2016), and recovered after the lockdown. Until the end of summer, cash use recovered to a share of about 55%, on average. In the most recent weeks, with the new lockdown in place in Austria since early November 2020, the share of cash payments in total payment transactions has remained roughly constant (if we abstract from short-run fluctuations).

Studies on the use of different payment instruments have shown that consumer behavior tends to change only slowly over time. Bearing this in mind, the swift change in cash use observed during the COVID-19 pandemic is indeed remarkable. However, the fact that cash use recovered also shows that some consumers have slowly returned to their pre-crisis payment behavior and/or that consumption behavior has returned to its pre-crisis state. The results of an OeNB survey conducted in the summer of 2020 indicate that the greatest drop in the use of cash, on average, can be observed for consumers who previously used cash a lot – mainly older persons, persons with lower incomes or persons who tended to not use digital banking or payment products. This survey also shows that 30% of the Austrian population (aged 14 years or older) were concerned about the possible transmission of the coronavirus via banknotes. 64% said they were not concerned and 6% answered that they did not know. Survey results are summarized in German at https://www.oenb.at/Presse/thema-im-fokus/bargeldnutzung-in-oesterreich.html (September 25, 2020).

Chart 2

Weekly indicator for private consumption expenditure

Change on comparable week in 2019 in %



Source: OeNB.

Note: CW = calendar week.

Overall, our estimate of weekly private consumption expenditure shows the strongest decline at the beginning of the first lockdown in spring 2020 (–35% in CW 13 compared to the same week of 2019) and indicates that consumption remained subdued even after the restrictive measures were lifted. The second lockdown, which started in CW 47, triggered another slump in expenditure which so far has remained less significant than during the first lockdown. Given its large share in GDP, weekly consumption significantly shapes the overall GDP growth pattern.

2.3 Goods exports

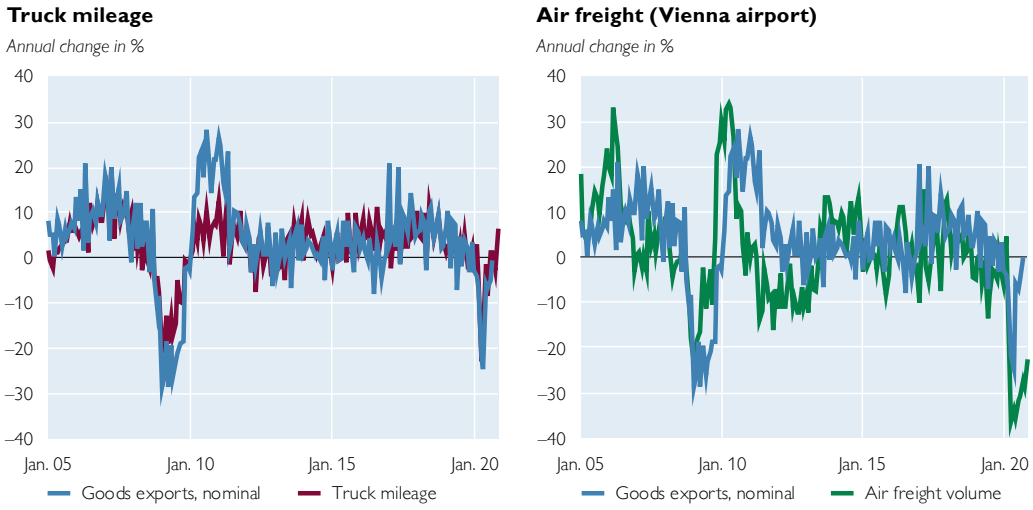
Business activity is closely related to freight performance. The high correlation between freight growth and economic growth has been emphasized in numerous international studies (e.g. OECD, 2004; Fenz and Schneider, 2009), with the linkage being particularly evident in small open economies.

For Austria, weekly information on truck mileage and rail transport is available on a real-time basis.[16] Weekly data on air traffic (passengers and freight volume) are provided for analytical purposes but for reasons of confidentiality only monthly data are approved for publication. Among all means of transportation, truck mileage shows the closest relationship to export activity (see chart 3).

[16] *Road transport is by far the single most important means of freight transport. In 2018, road transport accounted for 75% of total freight performance in Austria when measured in tons and 56% when measured in million ton-kilometers. Rail transport is second-most important, accounting for a share of 14% and 24%, respectively. Air transportation (<1%) and transportation via waterways (1%) are much less important in Austria. Pipelines account for the remainder of the overall transportation volume (10% and 19%, respectively).*

Chart 3

Goods exports and means of transportation



Source: ASFINAG, Vienna International Airport, Statistics Austria OeNB.

Fenz and Schneider (2009) document the good leading indicator properties of truck mileage data for goods exports in Austria. On the basis of their results, they developed the OeNB's Export Indicator – a monthly indicator of export performance published regularly (in German only) on the OeNB's website.[17]

To calculate the weekly OeNB GDP indicator, we update the estimations presented in Fenz and Schneider (2009) to determine the growth contributions of real exports of goods and services excluding tourism. The complementary relationship between goods and services exports is an empirically well-supported fact (Ariu et al. (2020) and Walter (2017) for Austria). Tourism exports are analyzed separately here (see section 2.4) while for exports of other services we make the simplifying assumption that they are closely linked to goods exports.

For our estimation, we aggregate truck mileage data on a quarterly basis and use this variable as the only explanatory variable in a simple regression for real exports of goods and services excluding tourism according to the national accounts. Both variables are seasonally adjusted. We refrain from using autoregressive terms, which would increase the overall fit of the equation but would worsen the nowcasting and forecasting performance during crises, as experience from past crises has shown. The estimated coefficient of truck mileage is 1.18 and it is highly significant. To nowcast weekly export activity, we assume that these estimation results at the quarterly level also hold at the weekly level.[18] Alternatively, we could have estimated an unobserved component model in state space form but this is left to future work.

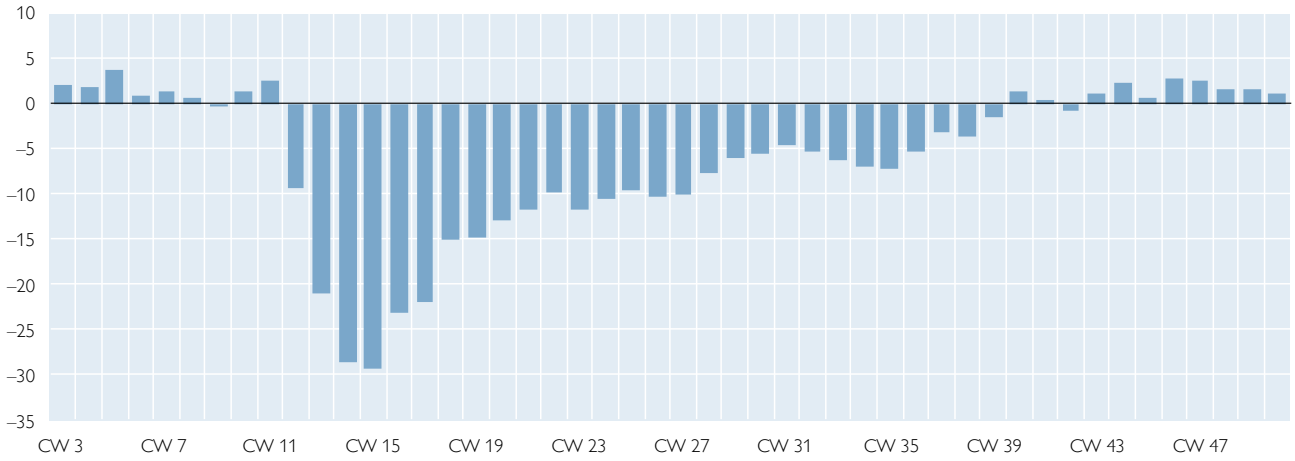
[17] *See www.oenb.at/Geldpolitik/Konjunktur/prognosen-fuer-oesterreich/oenb-exportindikator.html.*

[18] *To refine our estimations further, we use regional truck mileage data. From the beginning of 2019, the Austrian highway authority ASFINAG has provided detailed information on the border sections of the Austrian highway system. These data should be even more closely linked to export activity. Our weekly estimates are adjusted for the differences between the growth rate of truck mileage on the whole highway network and the growth rate of truck mileage in the border sections.*

Chart 4

Truck mileage on Austrian highways (border sections)

Year-on-year change in %, seasonally adjusted



Source: ASFINAG, OeNB.

Note: CW = calendar week.

2.4 Tourism exports

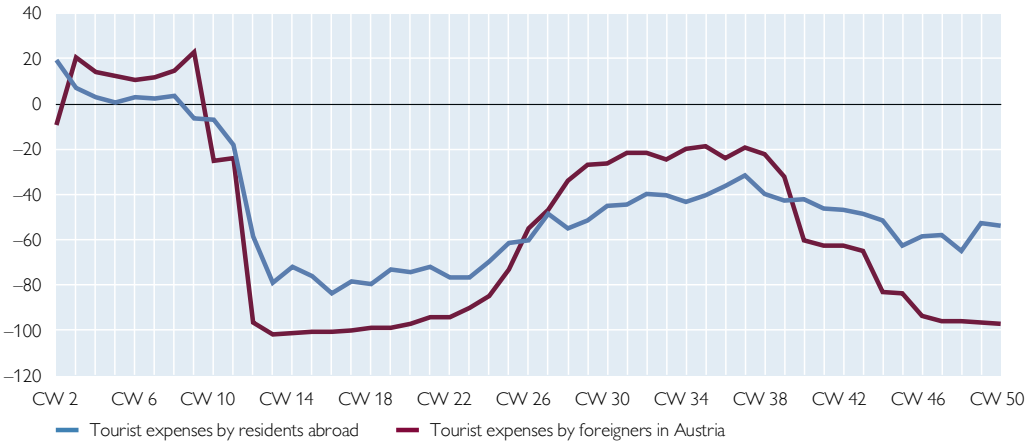
We analyze the tourism component of Austrian exports (and imports) separately for several reasons. First, tourism has been hit particularly hard by the COVID-19 crisis. Moreover, tourism exports account for more than 7% of total value added in Austria, which is well above the EU average, and their import share (19%) is significantly lower than that of total exports (45%). Finally, tourism services are obviously less closely linked to transport activity than goods exports and nowcasting them should therefore be based on other indicators.

We use data provided by payment card service providers to separately estimate tourism expenditure by foreigners in Austria (tourism exports) and by domestic residents abroad (i.e. tourism imports, which are also part of private consumption expenditure). Information on the respective expenses has been available on a weekly basis since the beginning of 2019. Payment card data are broken down by country of origin and several categories of goods and services. We use data on cardholders' expenses on typical tourist activities such as overnight stays, restaurants or traveling as a proxy for their overall tourism expenditure. Data are adjusted for moving holidays and inflation developments. Year-on-year changes are used to calculate the respective contributions to total GDP growth.

Chart 5

Tourism expenditure

Change on comparable week in 2019 in %



Source: Payment service providers, OeNB.

Note: CW = calendar week.

For a more detailed discussion of developments in Austrian tourism during the COVID-19 pandemic, see Fenz et al. (2020).

2.5 Other GDP components

The remaining demand components of GDP include investment activity (construction and nonconstruction investment), government consumption and changes in inventories (including the statistical discrepancy).

The development of construction investment is estimated using weekly data on the number of registered unemployed persons in the construction sector. When using weekly labor market data, the effects of short-term work schemes during the COVID-19 pandemic has to be taken into account. We do this on a judgmental basis since timely information is available only on the number of applications for short-term work schemes per economic sector but not on the actual utilization of these schemes – typically, actual utilization is substantially lower than the number of applications. Information about the actual utilization only becomes available with a considerable time lag. Other investment (nonconstruction investment) includes equipment investment and investment in R&D.[19] Since no suitable real-time indicator is available, we make the assumption that the weekly pattern of other investment follows the weighted average of the other demand components.[20] Public consumption is assumed to grow constantly at an annual growth rate of

[19] *Other investment (nonconstruction investment) comprises equipment investment, at a share of 60%, and investment in R&D, at a share of 40%. Equipment investment is very sensitive to the business cycle and is characterized by a high import share of almost 70%, while investment in R&D is less sensitive to the business cycle and is characterized by a relatively low import share of 20%.*

[20] *This approach led to reasonable results for the weeks until the end of the second quarter of 2020. From the beginning of the third quarter of 2020, the estimated recovery in "other investment" has been assessed to be too positive, given the steep rise in corporate debt. The latter should cause investment activity to be dampened more strongly than overall economic activity. We therefore adjusted the weekly pattern of "other investment" activity judgmentally, in line with the OeNB's June 2020 forecast.*

1.5%.[21] Finally, the growth contributions to GDP by inventory changes (including the statistical discrepancy) are assumed to be zero for all weeks considered.

Table 1

GDP and import shares of final demand components

	Share in GDP	Share in imports	Import-adjusted share in GDP
	%		
Private consumption	51	27	37
Government consumption	19	11	17
Investment	24	37	15
of which: construction	*11*	*22*	*8*
Exports	57	45	31
of which: tourism exports	*5*	*19*	*4*
Imports	53	x	x
of which: tourism imports	*3*	*x*	*x*

Source: Statistics Austria, authors' calculations.

2.6 Putting all subcomponents together

To infer weekly GDP growth from the estimated weekly demand components, two more steps are needed. First, we adjust each demand component for its import content according to the latest input-output table for Austria. Import contents vary considerably from 11% for public consumption to 45% for exports. Specific subcomponents like investment in vehicles even reach import content shares of more than 80% (Fenz and Schneider, 2019). Second, each demand component is weighted with its share in GDP to derive the import-adjusted GDP shares shown in table 1. The sum of the import-adjusted demand components corresponds to total GDP.

The import-adjusted GDP shares of the demand components we model in detail – private consumption, exports and construction investment – account for more than 75% of GDP. With an import-adjusted share of 37%, private consumption is the single most important GDP component. Possible changes in the import shares of the main demand components induced by the COVID-19 pandemic are taken into account at least partly by explicitly modeling tourism exports characterized by a below-average import share and tourism imports with an import share of 100%.[22]

2.7 How does the weekly OeNB GDP indicator compare internationally?

Over the past months, a plethora of real-time indicators has been developed and analyzed. These indicators refer to consumption, industrial production, exports, economic sentiment and overall economic activity. These indicators have greatly contributed to an understanding of how the economy and specific economic sectors have evolved in response to the COVID-19 shock (see e.g. Indergand, Kemeny and Wegmüller, 2020).

As the weekly OeNB GDP indicator focuses on overall economic activity, we briefly put it into perspective with other real-time indicators that focus on GDP. Specifically, we focus on selected, publicly available indices and neglect proprietary sources.

The Weekly Economic Index (WEI) of the Federal Reserve Bank of New York measures real economic activity on a weekly basis (Lewis, Mertens and Stock, 2020a, 2020b). The WEI is based on a principal component analysis of ten high-

[21] *This assumption follows the assessment of the OeNB's fiscal experts in their biannual macroeconomic projection exercise.*

[22] *Tourism imports are modeled not only as a subcomponent of imports but also as a subcomponent of private consumption. Changes in the consumption of tourism services abroad therefore have no direct effect on overall GDP as their import share amounts to 100%.*

frequency series, which is scaled to annual GDP growth. As mentioned above, such approaches have the advantage that they can provide nowcasts for a longer time period – back until 2008 in the case of the WEI. This makes it possible to conduct robustness tests that enhance the credibility of such indices. The downside of this principal component approach is that it does not provide information on the subcomponents of GDP. The WEI displays a sharp recession in the USA that reaches its lowest value in a –11.5% drop in real GDP (as of end-April 2020).

The nowcasts of the French National Institute of Statistics and Economic Studies (e.g. INSEE, 2020) are based on detailed and comprehensive assessments of the subcomponents of French GDP. This approach is based on the production side of GDP as well as on a broad range of real-time indicators and provides a disaggregated sectoral analysis. The respective nowcasting report is updated (at irregular intervals) about every second month, and GDP estimates refer to a monthly period. The deepest slump was recorded in April 2020 at about –30%, and the shape of the recovery is very similar to that observed in Austria: first, a strong recovery, and then a prolonged period featuring subpar GDP levels. We note that the estimate by INSEE (2020) of the size of the decline in household consumption as well as in GDP during the first lockdown in spring 2020 is rather similar to our estimate.

There are other informative and interesting nowcasting indicators of GDP that are based on time series methods and the extraction of a trend component, e.g. GDPNow of the Federal Reserve Bank of Atlanta (Higgins, 2014) and the Weekly activity index for the German economy (WAI) published by the Deutsche Bundesbank (Eraslan and Götz, 2020). GDPNow is a "running estimate" of real GDP growth in a specific quarter. It uses newly available data to update the forecasts of the current quarter's GDP growth. GDPNow provides information on the subcomponents of GDP. The WAI is based on a principal components analysis of high-frequency indicators, including pedestrian activity, Google search terms, etc., and presents changes over 13-week averages. The WAI does not reveal information on the state of the economy in the most recent weeks and is thus not directly comparable to the other indices. Finally, we note that the Austrian Institute of Economic Research WIFO developed a weekly GDP indicator for Austria based on a time series approach. This indicator has been computed since March 2020 but was published only in October 2020 (Baumgartner et al., 2020). Therefore, we do not discuss this informative indicator in more detail. The GDP growth path of this indicator is rather similar to that of the OeNB's. In November 2020, the Swiss State Secretariat for Economic Affairs (SECO) released a new weekly indicator that is broadly comparable to the other indicators and that is also based on a time series approach (SECO, 2020).

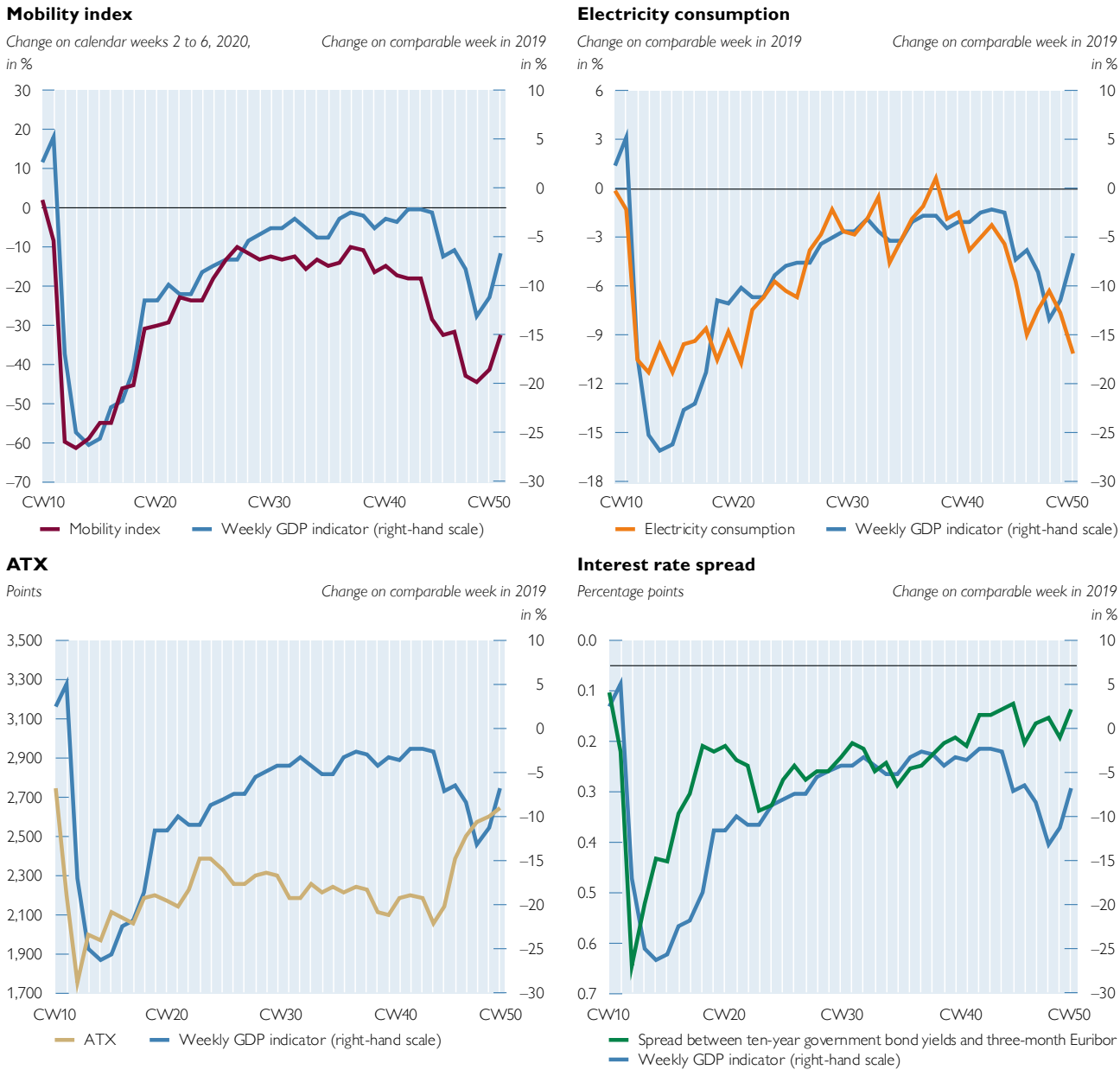
3 Plausibility and benchmarking checks

3.1 Plausibility checks with alternative real-time indicators

Some real-time indicators that are not directly included in the estimation of the weekly OeNB GDP indicator, such as data on electricity consumption, mobility behavior, short-term work and financial market variables, are used for plausibility checks. The Google mobility index (calculated as the average of the Google subindices "supermarket and pharmacy", "public transport", "workplaces",

Chart 6

Plausibility checks



Source: Bloomberg, Google, OeNB.

"retail and recreation") and the OeNB's GDP indicator move almost completely in parallel. Even if the extraordinarily high correlation of 0.95 results from the specific features of the COVID-19 crisis and the government's containment measures, it nevertheless indicates that these new indicators will play an increasingly important role in economic monitoring in the future. The link to electricity consumption and financial indicators, on the other hand, is recognizable, but much less pronounced.

3.2 First benchmarking results are promising

After individual data announcements, such as overnight stays and production indices, confirmed results for some subcomponents of the weekly OeNB GDP indicator , it successfully passed its first real "elk test" when national accounts (NA) data for the second quarter of 2020 were released. The results of the latest release of NA data (published on September 28, 2020) show that Austrian GDP fell by 14.5% (real, seasonally and working-day adjusted) in the second quarter of 2020 compared to the same period in 2019, which is remarkably close to the estimate provided by the weekly OeNB GDP indicator of 14.4%. Regarding Austrian GDP in the third quarter of 2020, the first release of NA data (published on November 30, 2020) suggests that it was 4.2% lower than in the third quarter of 2019. Our estimate based on the weekly OeNB GDP indicator was a GDP growth rate of –4.4%.[23]

Table 2 shows that the estimates of the individual demand components (for the second quarter of 2020) were also quite accurate, albeit less so than the estimate for overall GDP. The deep slump in private consumption expenditure, notably, was predicted well (second quarter of 2020: –14.9% according to the weekly OeNB GDP indicator versus –15.8% according to the NA; third quarter: –4.3 versus –4.7%), which is reassuring given that we had to make many assumptions when constructing our consumption index. Our estimates for exports and investment, by contrast, deviate farther from the preliminary NA figures. In general, we

Table 2

National accounts data for the second and third quarter of 2020

Second quarter of 2020

	OeNB GDP indicator (July 10, 2020)	New release of NA data (September 28, 2020)	First release of NA data (August 28, 2020)	NA flash estimate (July 30, 2020)
	Change on comparable quarter of 2019			
GDP	–14.4	–14.5	–12.9	–13.3
Private Consumption	–14.9	–15.8	–14.5	–15.0
Public Consumption	+1.5	+1.1	+1.6	+1.6
Investment	–14.2	–10.9	–10.5	–10.3
of which: construction	–12.0	–8.1	–9.6	x
Exports	–24.6	–17.5	–19.7	–18.1

Third quarter of 2020

	OeNB GDP indicator (October 10, 2020)		First release of NA data (November 30, 2020)	NA flash estimate (October 30, 2020)
	Change on comparable quarter of 2019			
GDP	–4.4		–4.2	–5.3
Private Consumption	–4.3		–4.7	–5.5
Public Consumption	+1.5		+0.4	x
Investment	–6.3		–2.3	–5.8
of which: construction	–3.9		–1.8	x
Exports	–8.3		–9.5	–9.1

Source: Statistics Austria, WIFO, OeNB.

Note: NA = national accounts, x = data not available.

[23] *We compute quarterly growth rates by taking the average of the weekly growth rates of a given quarter, adjusting for endpoints if calendar weeks overlap with months.*

must note, however, that the assessment of the individual demand components is hampered by the significant negative contribution of the statistical discrepancy to GDP growth in the second quarter of 2020 (–2.3 percentage points) in the latest release of NA data.[24] Past experience indicates that this signals future revisions mainly of the investment and foreign trade components.

4 Summary and conclusions

Each crisis has its very specific and unique features, drivers and transmission channels. The COVID-19 crisis and the ensuing containment measures triggered simultaneous supply and demand shocks, had very heterogenous sectoral impacts and caused the economic downturn to proceed at an unprecedented speed. This extraordinary situation generated the need for real-time information on various economic sectors that is typically not provided by traditional nowcasting models or short-term forecasting models.

In response to this situation, we have developed an experimental weekly estimate of economic activity which focuses on seasonally adjusted year-on-year changes. The weekly OeNB GDP indicator, which has been published regularly since May 2020, has provided policymakers and the public with timely and reliable information on the state of the Austrian economy.

Our choice of an estimation approach was governed by the availability and characteristics of real-time indicators for the Austrian economy. As many indicators are directly linked to one specific demand component, we estimate economic activity via the expenditure side of GDP. Moreover, the experimental nature of many indicators and the fact that they cover only a short period of time made the application of traditional econometric methods impossible. We therefore opted for a data-driven approach rather than a more conventional model-based approach. Our approach requires a lot of qualitative assessments and adjustments, e.g. the treatment of moving holidays, working day adjustments or the identification of outliers in cash shipment data. These adjustments often require further analyses, in-depth expert discussions, etc. – all in all, an extra effort that would not be necessary when applying a purely model-based approach. Moreover, our data-driven approach relies on the availability of suitable high-frequency data and on some institutional peculiarities (e.g. with regard to cash logistics) which might limit its applicability to other countries (Matheson, 2013).

By publishing a weekly estimate of economic activity, we have entered new grounds. This always entails some risks. In particular, it was not possible to validate in advance the accuracy of the OeNB GDP indicator. Reassuringly, the indicator turned out to be very accurate in nowcasting aggregate quarterly economic activity for the second and third quarters of 2020 (while the performance of traditional models with regard to these two quarters was rather weak). But more observations are needed for a final assessment, and it remains to be seen whether the new indicator also performs in times when economic activity is closer to normal. The results for some subcomponents of the weekly OeNB GDP indicator, such as exports of goods or construction investment, can be assessed on a monthly basis

[24] *Growth contributions of the statistical discrepancy are assumed to be zero in the weekly OeNB GDP indicator. Moreover, the latest NA data also show that changes in inventories made a significant negative contribution to GDP growth (–1.3%). Changes in inventories are not explicitly modeled in the weekly OeNB GDP indicator and are assumed to be growth neutral.*

using foreign trade data or production indices.[25] Some additional validation arises from comparisons with high-frequency indicators from other institutions and for other countries. For example, our estimates of private consumption and of GDP during the first lockdown in spring 2020 are rather similar to those reported for France (INSEE, 2020), where comparable stay-at-home orders and other protective measures had been imposed. Our consumption estimates for the weeks of the first lockdown period are rather close to estimates by Brown et al. (2020) for Switzerland or by Bank of Israel (2020) for Israel. The evolution of our weekly GDP estimates over the post-lockdown period is rather similar to those of the Austrian Institute of Economic Research (Baumgartner et al., 2020), which are based on a time-series approach. While these are (promising) bits and pieces, clearly a more systematic and profound validation analysis will need to be carried out.

The seemingly high accuracy of the weekly OeNB GDP indicator vis-à-vis traditional nowcasting models raises the question whether it should be a regular tool in nowcasting GDP. The answer is "probably not." In normal times, traditional models have proven to be rather precise for nowcasting and short-term forecasting while high-frequency real-time data might only provide additional explanatory content in times of crises (Delle Chiaie and Perez Quiros, 2020). Thus, the presumably low marginal benefit in normal times needs to be weighed against the cost and effort of collecting and processing the necessary data on a weekly basis as well as carrying out the required qualitative assessments of the results. Clearly, more research will be necessary to assess the corresponding costs and benefits, taking into account the results of further validation analyses. While this is beyond the scope of this paper, our conjecture is that the main benefits from integrating real-time data into the existing model toolkit arise mainly from their contribution in times of larger economic downswings or outright crises.

In general, the economics profession has shown creativity and swiftness in utilizing real-time data to provide urgently needed empirical evidence. Our experience with alternative data on transport activity during the last crisis, the Great Recession of 2008/2009, led to the development of the OeNB's monthly Export Indicator. During the COVID-19 crisis, it has been mainly real-time data on payment transactions which have created new possibilities in analyzing consumption and tourism activities. We think that these new data will be informative also in normal times, e.g. for policy analyses such as the assessment of the economic impact of fiscal transfers (see Chetty et al., 2020; Baker et al., 2020) or the change in (online) consumption patterns (Brown et al., 2020). In times of steady digital innovation, ever more information will be available, also at the disaggregated level and for small geographical areas. Clearly, this will open up new possibilities to economic modeling and forecasting. Apart from economic expertise, the increasing availability of new data will require new forms of collaboration, e.g. with data scientists. Economic institutions that run models and conduct forecasts will need to adjust to this development.

[25] *At a conceptual level, it will never be possible to validate the weekly estimates as GDP is measured only at a quarterly frequency. However, further validation tests are possible for some economic indicators that are published monthly.*

References

Andersen, A. L., E. T. Hansen, N. Johannesen and A. Sheridan. 2020. Pandemic, Shutdown and Consumer Spending: Lessons from Scandinavian Policy Responses to COVID-19. https://arxiv.org/pdf/2005.04630.pdf.

Aprigliano, V., G. Ardizzi and L. Monteforte. 2019. Using Payment System Data to Forecast Economic Activity. In: International Journal of Central Banking, October, 55–80.

Ardizzi, G., A. Nobili and G. Rocco. 2020. A Game Changer in Payment Habits: Evidence from Daily Data during a Pandemic. Mimeo.

Ariu, A., Mayneris, F. and M. Parenti. 2020. One way to the top: How services boost the demand for goods. In: Journal of International Economics, Vol. 123(C).

Baker, S. R., R.A. Farrokhnia, S. Meyer, M. Pagel and C. Yannelis, 2020. How Does Household Spending Respond to an Epidemic? Consumption During the 2020 COVID-19 Pandemic. In: NBER Working Papers 26949. https://ideas.repec.org/p/nbr/nberwo/26949.html.

Bank of Israel. 2020. Selected Rapid Indicators of the State of Economic Activity during the Coronavirus Crisis. https://www.boi.org.il/en/Pages/Indicators.aspx.

Baumgartner, J., Kaniovski, S., Bierbaumer-Polly, J., Glocker, C., Huemer, U., Loretz, S., Mahringer, H. and H. Pitlik. 2020. Die Wirtschaftsentwicklung in Österreich im Zeichen der COVID-19-Pandemie Mittelfristige Prognose 2020 bis 2024. In: WIFO Monatsberichte. 93(4), 239–265.

Bounie, D., Y. Camara and J. W. Galbraith. 2020. Consumers' Mobility, Expenditure and Online-Offline Substitution Response to COVID-19: Evidence from French Transaction Data. In: CIRANO Working Papers 2020s-28, CIRANO. https://ideas.repec.org/p/cir/cirwor/2020s-28.html.

Brown, M., Fengler, M., Lalive, R. and R. Rohrkemper. 2020. Monitoring consumption in Switzerland. https://monitoringconsumption.com/about/.

Carvalho, V., Hansen, S., Ortiz, A., García, J. R., Rodrigo, T., Rodríguez Mora, J.V. and P. Ruiz (2020), Tracking the covid-19 crisis with high-resolution transaction data. In: CEPR Discussion Paper No. 14642.

Chetty, R., J. N. Friedman, N. Hendren, M. Stepner and the Opportunity Insights Team. 2020. Real-Time Economics: A New Platform to Track the Impacts of COVID-19 on People, Businesses, and Communities Using Private Sector Data. https://opportunityinsights.org/wp-content/uploads/2020/05/tracker_paper.pdf.

Deutsche Bundesbank. 2020. Cash withdrawals and payments in urban and rural areas. In: Monthly Report. June 2020. 33-44.

Delle Chiaie, S. and G. Perez Quiros. 2020. Nowcasting economic activity and trade in times of COVID-19: are high frequency data useful? Mimeo ECB 2020.

Eraslan, S. and T. Götz. 2020. Weekly activity index for the German economy. Deutsche Bundesbank, available for download at https://www.bundesbank.de/wai.

European Central Bank. 2020. Study on the payment attitudes of consumers in the euro area. https://www.ecb.europa.eu/pub/pdf/other/ecb.spacereport202012~bb2038bbb6.en.pdf?05ce-2c97d994fbcf1c93213ca04347dd.

Fenz, G. and M. Schneider 2019. Weak global trade darkens growth outlook for Austria – Economic outlook for Austria from 2019 to 2022 (December 2019). In: Monetary Policy & the Economy. Q4/2019.

Fenz, G. and M. Schneider 2009. A Leading Indicator of Austrian Exports Based on Truck Mileage. In: Monetary Policy & the Economy. Q1/2009.

Fenz, G., Stix, H. and K. Vondra. 2020. Austrian tourism sector badly hit by COVID-19 pandemic. In: Monetary Policy & the Economy. Q3/2020.

González Mínguez, J., Pérez García de Mirasierra, M. and A. Urtasun. 2020. Consumption in Spain during the state of alert: An analysis based on payment card spending, In: Banco de Espana Economic Bulletin. 3/2020. https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/InformesBoletinesRevistas/ArticulosAnaliticos/20/T3/descargar/Files/be2003-art22e.pdf.

Goodhart, C. and J. Ashworth. 2020. Coronavirus panic fuels a surge in cash demand, Vox-EU, https://voxeu.org/article/coronavirus-panic-fuels-surge-cash-demand.

Higgins. P. 2014. GDPNow: A Model for GDP "Nowcasting". In: Federal Reserve Bank of Atlanta Working Paper Series 2014-7.

Indergand, R., Kemeny, F. and Philipp Wegmüller. 2020. Konjunkturprognosen in Zeiten von Corona – ein Werkstattbericht. Die Volkswirtschaft. Plattform für Wirtschaftspolitik. https://dievolkswirtschaft.ch/de/2020/04/konjunkturprognosen-in-zeiten-von-corona-ein-werkstattbericht/.

INSEE. 2020. Economic outlook 2020. https://insee.fr/en/statistiques/4473307.

Kraenzlin, S., C. Meyer and T. Nellen. 2020. COVID-19 and regional shifts in Swiss retail payments. In: Swiss National Bank Working Paper No. 15/2020.

Lewis, D. J., K. Mertens and J. H. Stock. 2020a. Weekly Economic Index, https://www.newyorkfed.org/research/policy/weekly-economic-index.

Lewis, D. J., K. Mertens and J. H. Stock. 2020b. Monitoring Real Activity in Real Time: The Weekly Economic Index, In: Federal Reserve Bank of New York Liberty Street Economics, March 30.

Matheson, T. D. 2014. New indicators for tracking growth in real time. In: OECD Journal: Journal of Business Cycle Measurement and Analysis 2013/2. https://www.oecd-ilibrary.org/docserver/jbcma-2013-5jz741mh2czs.pdf?expires=1601378615&id=id&accname=id5760&checksum=F-12D3E1D656190D0C523D96130B364B4.

National Bank of Greece. 2020. Tracking Greek GDP in high frequency. In: GREECE Macro Flash, https://www.nbg.gr/en/the-group/press-office/e-spot/reports/greece-macro-flash-tracking-greek-gdp-in-high-frequency, June 2020.

Olech, D. 2018. Seasonal adjustment of daily time series. In: Deutsche Bundesbank Discussion Paper No 41/2018.

Prammer, D. 2020. Fiskalmaßnahmen in Österreich zur Bekämpfung der COVID-19-Krise und ihre Wirkungen. Forthcoming Monetary Policy & the Economy, Q3/2020.

Rusu, C. and H. Stix. 2017. Cash and card payments – recent results of the Austrian payment diary survey, available for download at https://ideas.repec.org/a/onb/oenbmp/y2017iq1-17b4.html. Originally published in German as: Von Bar- und Kartenzahlern – Aktuelle Ergebnisse zur Zahlungsmittelnutzung in Österreich. In: OeNB. Monetary Policy & the Economy Q1/17. 54–85.

Schautzer A. and H. Stix. 2019. Approaching 20 years of euro cash in Austria: What has changed, and what's next? In: Monetary Policy & the Economy, Q1-Q2/2019. 99–112.

SECO (Swiss State Secretariat for Economic Affairs). 2020. Exkurs: Neuer Index zur wöchentlichen Wirtschaftsaktivität (WWA). https://www.newsd.admin.ch/newsd/message/attachments/63920.pdf.

Walter, P. 2017. Anatomy of Austria's trade in services. In: Monetary Policy and the Economy Q1/17 p.33–51.

Annex

Table A1

Real time indicators on a daily or weekly basis

	Frequency	Scope	Publication lag	Lenght of time series	Target variable	Use	Data source
Labor market							
Unemployed	d/w	Sectoral/ regional	< 1 week	< 1 year	General/sectoral economic developments	Plausibility check	AMS
Unemployed, sectoral	d/w	Sectoral/ regional	< 1 week	< 1 year	Construction investment	Estimation	AMS
Vacancies	d/w	Sectoral/ regional	< 1 week	< 1 year	General/sectoral economic developments	Plausibility check	AMS
Training sheme participants	d/w	Sectoral/ regional	< 1 week	< 1 year	General economic developments	Plausibility check	AMS
Short-term work	w	Sectoral/ regional	< 1 week	< 1 year	General/sectoral economic developments	Estimation	AMS
Mobility							
Mobile phone location data	d/w	Regional	< 1 week	< 1 year	General economoc developments	Plausibility check	Google, Apple
Transportation							
Truck milage	d/w	Regional	< 1 week	> 5 years	Exports, investment, general economic developments	Estimation	ASFINAG
Railway	w	Regional	< 1 week	> 5 years	General economic developments	Plausibility check	Austrian Federal Railways
Flight data	w		< 1 week	> 5 years	General economic developments, tourism	Plausibility check	Vienna International Airport
Payment transactions							
Cash	d/w		< 1 week	< 2 years	Private consumption, tourism	Estimation	OeNB, payment service providers
Debit cards	d/w	Sectoral	< 1 week	< 2 years	Private consumption, tourism	Estimation	Payment service providers
Credit cards	d/w	Sectoral	< 1 week	< 2 years	Private consumption, tourism	Estimation	Payment service providers
Online transfers	w		< 1 week	< 2 years	Private consumption	Estimation	Payment service providers
Bank transfers	w		< 1 week	< 2 ears	General economic developments	Not used	Payment service providers
Financial market data							
Stock price indices, yield curve, CDS, risk premia, etc.	d			> 5 years	General economic developments	Plausibility check	Various data providers
Miscellaneous indicators							
Electricity consumption	15 min	Sectoral	< 1 week	> 5 years	Industrial sector	Plausibility check	APG, E-Control
Gas consumption	d		< 1 week	> 5 years	Industrial sector	Not used	
Air pollution data	d	Regional	< 1 week	> 5 years	General economic developments	Plausibility check	Environment Agency Austria
Google trends, tweets, tag clouds	d		< 1 week	> 5 years	General economic developments	Not used	Various data providers
Tax data and/or social security contributions	w/m		< 1 week	> 5 years	General economic developments	Not used	Tax authorities
Webscraping	d		< 1 week	< 1 year	General economic developments	Not used	
Internet activity	d	Regional	< 1 week	< 2 years	General economic developments	Not used	

Source: OeNB.

Note: d = daily; w = weekly; CDS = credit default swaps; AMS = Public Employment Service Austria; APG = Austrian Power Grid.

Table A2

Calendar weeks and corresponding calendar dates

Calendar weeks in 2020			
CW1	December 30	–	January 5
CW2	January 6	–	January 12
CW3	January 13	–	January 19
CW4	January 20	–	January 26
CW5	January 27	–	February 2
CW6	February 3	–	February 9
CW7	February 10	–	February 16
CW8	February 17	–	February 23
CW9	February 24	–	March 1
CW10	March 2	–	March 8
CW11	March 9	–	March 15
CW12	March 16	–	March 22
CW13	March 23	–	March 29
CW14	March 30	–	April 5
CW15	April 6	–	April 12
CW16	April 13	–	April 19
CW17	April 20	–	April 26
CW18	April 27	–	May 3
CW19	May 4	–	May 10
CW20	May 11	–	May 17
CW21	May 18	–	May 24
CW22	May 25	–	May 31
CW23	June 1	–	June 7
CW24	June 8	–	June 14
CW25	June 15	–	June 21
CW26	June 22	–	June 28
CW27	June 29	–	July 5
CW28	July 6	–	July 12
CW29	July 13	–	July 19
CW30	July 20	–	July 26
CW31	July 27	–	August 2
CW32	August 3	–	August 9
CW33	August 10	–	August 16
CW34	August 17	–	August 23
CW35	August 24	–	August 30
CW36	August 31	–	September 6
CW37	September 7	–	September 13
CW38	September 14	–	September 20
CW39	September 21	–	September 27
CW40	September 28	–	October 4
CW41	October 5	–	October 11
CW42	October 12	–	October 18
CW43	October 19	–	October 25
CW44	October 26	–	November 1
CW45	November 2	–	November 8
CW46	November 9	–	November 15
CW47	November 16	–	November 22
CW48	November 23	–	November 29
CW49	November 30	–	December 6
CW50	December 7	–	December 13
CW51	December 14	–	December 20
CW52	December 21	–	December 27
CW53	December 28	–	January 3

Austrian tourism sector badly hit by COVID-19 pandemic[1]

Gerhard Fenz, Helmut Stix, Klaus Vondra[2]
Referee: Oliver Fritz, WIFO

Contributing 7.3% to Austrian value added, tourism is an important pillar of the Austrian economy. It has been hit particularly hard by the COVID-19 crisis. We analyze the impact of the crisis using high-frequency real-time data on payment card spending and monthly data on overnight stays. During the lockdown in spring 2020, overnight stays in Austria dropped by almost 100%. Over the summer, tourism activity recovered strongly, backed by domestic and German tourists. Nevertheless, it remained clearly below 2019 levels. In October 2020, the renewed increase in the number of COVID-19 infections led to another severe downturn in Austrian tourism, as several neighboring countries posted travel warnings. On November 2, 2020, a second lockdown started in Austria – accommodation establishments and restaurants were closed. Hence, we expect overnight stays to drop again by around 95% in November. As the Austrian government announced on December 2, 2020, Austrian accommodation establishments will not open before January 2021; on top of that, travel warnings by major countries of origin (especially Germany) will remain in place. Based on these assumptions, we estimate total overnight stays to decrease by 36% in 2020. This will be mainly attributable to a strong decline in overnight stays by foreign tourists (–41%), while overnight stays by domestic tourists will go down by only 23%. The overall decline in overnight stays could have been far stronger if the lockdown in spring 2020 and the recent shutdown had not fallen into the off-season but into the high season in winter or summer.

JEL classification: E23, L83
Keywords: tourism, COVID-19 pandemic, Austria

Tourism is an important pillar of the Austrian economy. According to data provided by the tourism satellite account (TSA), its direct and indirect value-added effects account for almost 7½% of GDP. By European standards, the Austrian tourism sector thus makes an above-average contribution to overall economic output. Almost 6% of total employment in Austria are directly attributable to main tourism activities like "accommodation and restaurants," "transport" and "culture, sports and entertainment."

Tourism was particularly strongly affected by the COVID-19 crisis. The first lockdown Austria imposed as of March 16, 2020, led to a sudden drop in revenues by almost 100% in many tourist areas – an economic downturn of unprecedented size and speed. Over the summer months of 2020, tourism in Austria recovered strongly. Therefore, the decline in overnight stays in Austria until fall 2020 was comparatively less pronounced than in Southern European countries like Greece, Spain or Portugal. However, containment measures to fight the COVID-19 pandemic, travel restrictions and travel warnings as well as fears and the perceived risk of COVID-19 infections continue to burden the tourism industry. Since

[1] *Cutoff date for data: December 2, 2020.*

[2] *Oesterreichische Nationalbank, Economic Analysis Division, gerhard.fenz@oenb.at, klaus.vondra@oenb.at and Economic Studies Division, helmut.stix@oenb.at. We thank the referee for very helpful comments as well as several payment card service providers for their willingness to support us with information on aggregate payment card transactions.*

mid-September 2020, these problems have intensified, and since November 2, 2020, the tourism industry has been suffering the consequences of a second lockdown.

Against this background, it is particularly important to closely monitor developments in tourism and to provide timely information about the COVID-19 pandemic's effects. In the past, statistics on overnight stays were the main data source for tourism analysis. Data on overnight stays are available for several accommodation categories, at a detailed regional level and for all countries of origin of foreign tourists in Austria. This information is highly relevant but has two weaknesses. First, data are published with a time lag of one month. Second, data are only available at a monthly frequency. We therefore supplement our analysis with information gained from payment card service providers. The latter data are available almost in real time and on a weekly basis, thus enabling, on the one hand, a timely assessment of the latest developments and, on the other hand, a very precise chronological representation of containment measures and their impact on Austrian tourism.

This study is structured as follows: Section 1 presents stylized facts on the economic weight of tourism in Austria and its provinces, comparing Austria with other European countries. In section 2, we analyze the economic consequences of the COVID-19 crisis for Austrian tourism between March and November 2020, using two data sources: the number of overnight stays and data on payment card expenditure collected from payment card service providers. In section 3, we provide projections of the path of overnight stays in Austria until end-2020. We give an overview of the 2020 summer tourist season and predict developments in Austrian tourism for the full year 2020. We summarize our results in section 4, outlining potential risks for Austria's winter tourist season 2020–2021.

1 Tourism is a key sector in the Austrian economy

1.1 The tourism industry generates 7½% of total value added in Austria

In Austria, the tertiary sector plays a dominant role in total economic activity, accounting for more than 70% of total value added (services: 70.2%; agriculture: 1.2%, manufacturing: 28.6%). Under the System of National Accounts (SNA), the tourism sector cannot be precisely separated from other sectors, but it can be approximated by the sum of NACE services sectors I (accommodation and food services) and R (arts, entertainment and recreation). In both sectors, however, it is impossible to distinguish activities of local residents from those of tourists, no matter whether they come from Austria or from abroad. Especially NACE sectors I56 (food and beverage service activities) and R (arts, entertainment and recreation) contain high shares of consumption by domestic nontourists. Nevertheless, the sum of the value added generated by these two sectors provides a first rough estimate of the significance of the tourism sector in Austria: Together, they accounted for 6.6% of total value added in Austria in 2019 (sector I: 5.4%; sector R:1.3%, see table 1). Given the statistical difficulties, the share of 6.6% overestimates the economic weight of the tourism sector. Then again, we might add other NACE sectors – like H50 (water transport), H51 (air transport) and N79 (travel agencies) – to the calculation, which would, in turn, increase the share.

Given the important role tourism plays in the Austrian economy and its inadequate representation in the SNA, Statistics Austria has been calculating a tourism satellite account (TSA) for Austria since 1999 – based on recommendations by Eurostat, the OECD and the World Tourism Organization (UNWTO). The TSA uses both supply- and demand-side information, combining it with input-output tables, which makes it possible to more accurately quantify the direct and indirect value-added effects of the tourism sector. In a narrow sense (i.e. considering only direct effects and excluding business trips), tourism in Austria contributed 5.6% to total GDP in 2019. In a broader sense (i.e. including indirect effects and business trips), its share was 7.3%. This proportion has remained almost unchanged since 2000.[3]

Table 1

Tourism plays vital role in the Austrian economy

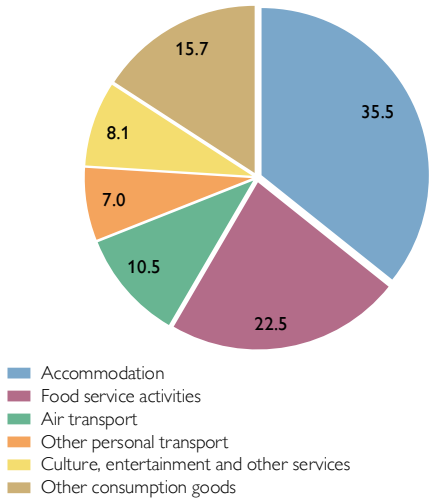
	2019	
National account data – value added	*EUR million*	*Share in value added in %*
Accommodation and food service activities (NACE I)	19,141	5.4
Arts, entertainment and recreation (NACE R)	4,468	1.3
Sectors I and R	23,608	6.6
Tourism satellite accounts (TSA) – GDP	*EUR million*	*Share in GDP in %*
Direct value added excluding business trips	22,135	5.6
Direct value added including business trips	23,545	5.9
Direct and indirect value added	29,171	7.3

Source: Statistics Austria, Eurostat.

Chart 1

Tourism consumption categories in 2018

% of total tourism consumption



Source: Statistics Austria.

Based on the TSA, Statistics Austria calculates tourism consumption expenditure by category on an annual basis. In 2018, accommodation accounted for just over one-third of total tourist spending, followed by expenses for food service activities, which accounted for just under one-fourth. The share of transport was not negligible, either – around 10% of total tourist expenditure was used for air travel and 7% for ground travel (by boat, rail or road). In contrast, tourist expenditure for culture, entertainment and other services made up less than 10% of the total[4] (see Fritz and Ehn-Fragner, 2020, for an in-depth analysis).

Moreover, tourism consumption expenditure can be broken down further into expenditure by foreign tourists and expenditure by domestic tourists. According to this breakdown, foreign tourists account for 54% and domestic tourists for 46% of total tourist expenses in Austria. Matching these figures with the tourism

[3] *If we consider the leisure industry as a whole, it has a share of almost 15% in GDP (Federal Ministry for Sustainability and Tourism, 2019). This figure includes all leisure and recreation activities of residents in or near their home environment.*

[4] *Expenses for other consumer goods include expenses for tourism-related and non-tourism specific goods and services (e.g. retail trade; services such as massages, hairdressing, etc.).*

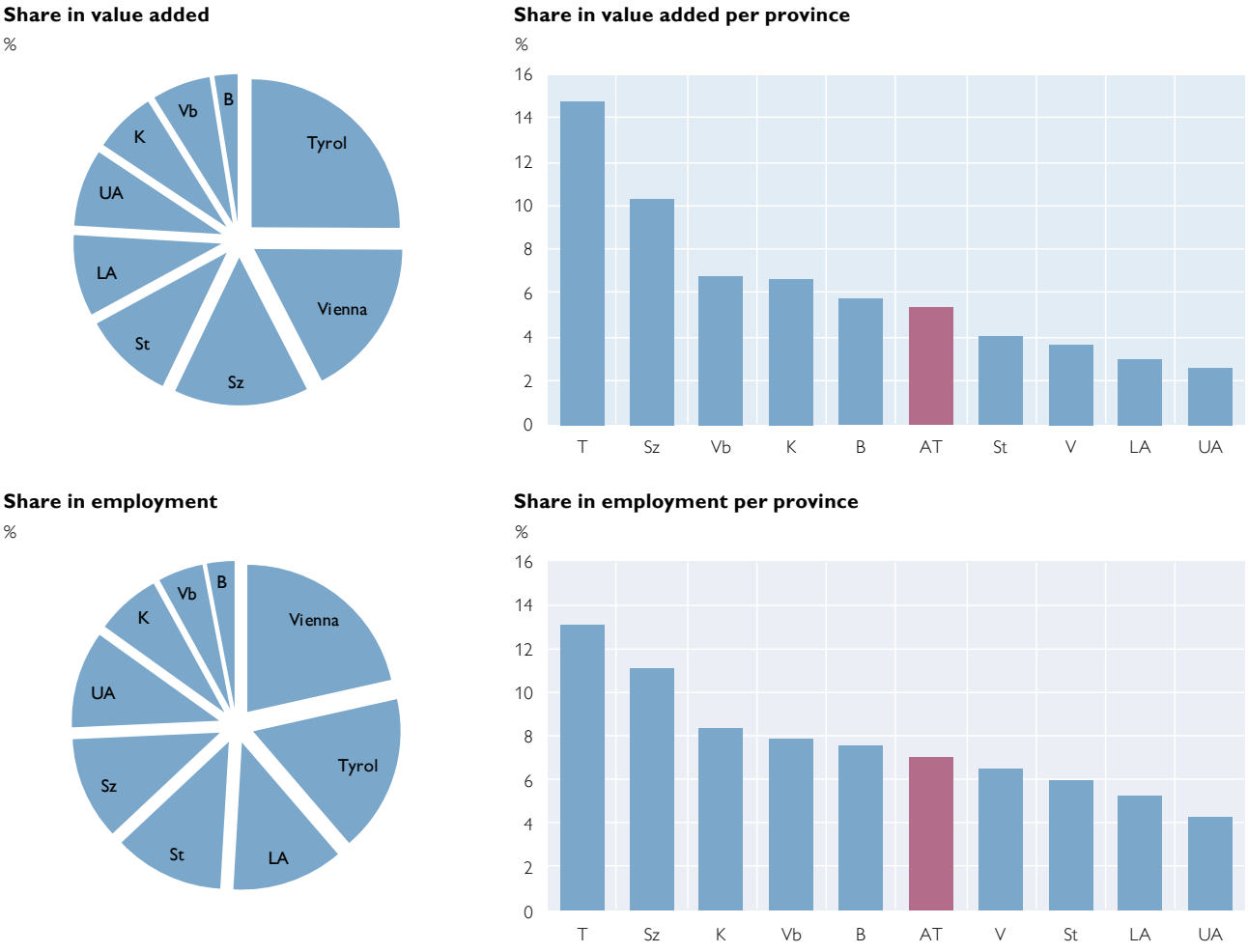
sector's share of 7.3% in Austrian GDP implies that foreign tourist expenses account for about 4% of Austrian GDP, while domestic tourist expenses account for just above 3%. By comparison, foreign tourists have a 74% share in total overnight stays in Austria, while domestic tourists account for 26% (see table A1 in the annex). This, in turn, implies that day trips play a major role in domestic tourism.

1.2 Significance of tourism in Austria differs widely across regions

The tourism sector's share in economic activity varies across Austria's provinces. The first best method to evaluate these differences would be based on regional TSAs. By mid-2021, Statistics Austria will, for the first time, produce consistent regional TSAs for all Austrian provinces (except Vorarlberg). For the time being, we compare the role of tourism in Austria's provinces on the basis of the share in value added and employment of NACE sector I (accommodation and food service

Chart 2

Economic importance of accommodation and food service activities (NACE I) for Austria's provinces, 2018



Source: Statistics Austria.

Note: T: Tyrol; V: Vienna; Sz: Salzburg; St: Styria; LA: Lower Austria; UA: Upper Austria; K: Carinthia; Vb: Vorarlberg; B: Burgenland; AT: Austria.

activities) – despite the above-mentioned drawbacks of this data source. The left-hand panels of chart 2 show the shares the individual provinces have in total Austrian tourism (top row: share in value added; bottom row: share in employment). The right-hand panel of chart 2 shows the relative importance tourism has in each province (top row: relative importance for total value added per province; bottom row: relative importance for employment).

The largest contributions to Austria's tourism come from Tyrol and Vienna. Measured by their share in value-added generated by NACE sector I in Austria, Tyrol ranks first, followed by Vienna. This ranking is reversed when we look at employment shares. The employment share of tourism is higher than the value-added share in Vienna, which reflects the fact that food service activities, which are more employment intensive, are of higher economic importance in Vienna than in Tyrol.

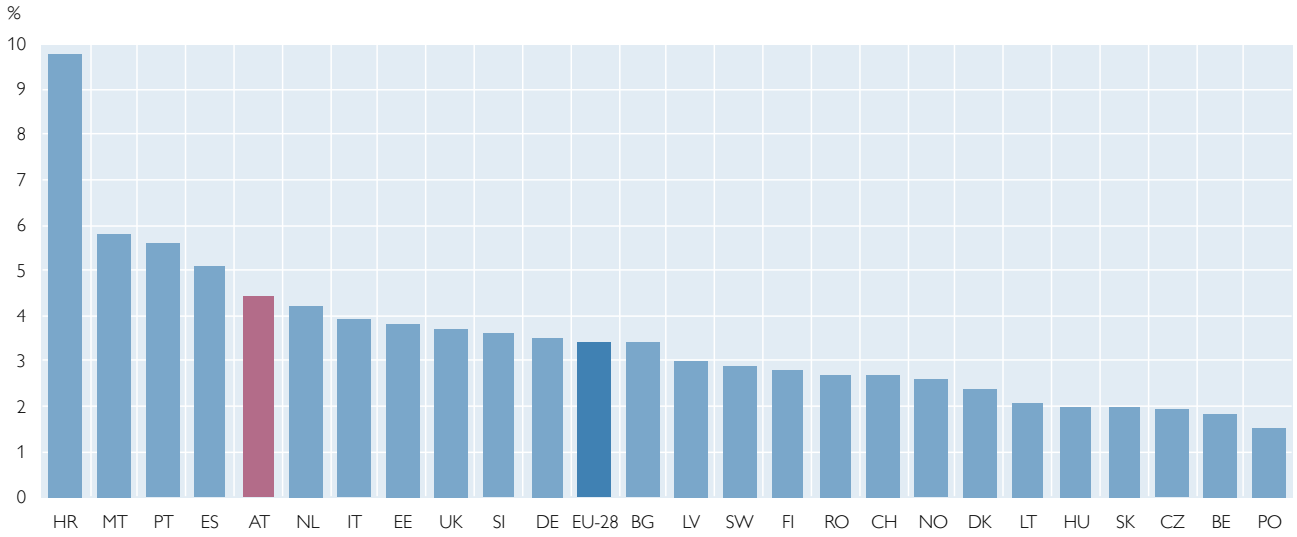
What is more useful in measuring the economic importance of tourism in Austrian regions is its share in value added or in employment (see chart 2, right-hand panel). According to both criteria, Tyrol has the largest tourism sector, with tourism accounting for a share of 15% in value added and of 13% in employment. Salzburg, Vorarlberg, Carinthia and Burgenland follow. Vienna, Styria, Lower Austria and Upper Austria are all below the Austrian average. In addition to the mere size of the tourism sector, other factors are also significant for assessing its vulnerability in the current crisis. For instance, the COVID-19 crisis affected cities and regions with a high proportion of tourists from distant countries with particular strength, as we show in section 2. Vienna's tourism, in particular, is additionally affected by the COVID-19 crisis as several major international conferences had to be canceled.

1.3 Economic importance of Austrian tourism industry above EU average

The economic importance of the tourism sector varies substantially across European countries. A comprehensive comparison is difficult as comparable data for all European countries are not available. Chart 3 shows the results of the available TSAs, more specifically internal tourism consumption (sum of domestic and inbound (foreign) tourist expenditure) as a proportion of domestic supply (as measured in gross production value). Overall, the results have to be interpreted with caution as, on the one hand, survey years differ significantly across countries, ranging from 2010 (Malta) to 2018 (Netherlands), and, on the other hand, different methods or definitions were used in the calculations (see Eurostat, 2019). Bearing this in mind, we find that the economic importance of the tourism industry in Austria is above the EU average (see chart 3).

Chart 3

Tourism satellite account: internal tourism consumption (at purchasers' prices) as a proportion of domestic supply



Source: Eurostat.

Note: Internal tourism consumption combines domestic and inbound (foreign) tourist expenditure. Both internal tourism consumption and domestic supply are recorded as gross production values and hence deviate from figures in table 1, which are in value-added terms.

In addition, chart A1 in the annex illustrates the economic importance of NACE sector I (accommodation and food service activities) for value added, employment and hours worked in a comparison of European countries. The corresponding data are available for all EU countries, confirming the above assessment and in particular the fact that, by international standards, the tourism sector makes an above-average contribution to economic activity in Austria.

2 COVID-19 lockdown severely affected Austrian tourism

The measures taken to contain the COVID-19 pandemic have hit the tourism industry, like many other sectors of the economy, on both the supply and the demand side. Border controls and strict entry rules, quarantine regulations and the closing of accommodation establishments and restaurants are among the major supply-side shocks. The reduced demand for holiday travel given the risk of infection as well as the severe economic downturn are the most important demand-side shocks.

Our analysis of the economic impact of the COVID-19 crisis on Austrian tourism rests upon two data sources: first, the number of overnight stays as reported by Statistics Austria and second, data collected from payment card service providers on expenditure on accommodation and other tourism-related goods and services. Data on the number of overnight stays are available on a monthly basis up to and including September 2020; advance information for some (sub)categories is already available for October 2020. These data comprise information on overnight stays broken down by Austrian provinces and by accommodation categories. In both cases, a cross-classification according to tourists' countries of origin is available as well. In contrast, data collected from payment card service providers are

available on a weekly basis up to and including end-November 2020 and include information on expenditure by Austrian residents and nonresidents for several consumption categories. In our analysis, we focus on payment card expenditure on accommodation (including hotels, holiday homes, private rooms, campsites, recreation facilities and other accommodation) to ensure comparability with information about overnight stays. The payment card data considered here cover almost the entire turnover of card transactions in Austria. Moreover, one provider with a substantial market share provides detailed information on the country of origin of cards used in Austria. The prompt availability of these data enables us to analyze changes in the tourism sector almost in real time.[5]

As shown in table 2 and chart A2 in the annex, overnight stays and payment card expenditure on accommodation have followed a very similar course during the COVID-19 crisis. In April 2020, during the first lockdown in Austria, both indicators dropped by almost 100%. For the weeks and months after the lockdown, payment card data show a stronger recovery than overnight stays, especially with regard to domestic tourists. The shift in consumer preferences toward cashless means of payment (Fenz and Stix, 2020) seems to be the main reason for these differences.[6] In the following sections, we will use both data sources to describe in detail the developments in Austrian tourism during the COVID-19 crisis and to give an outlook for the remaining months of 2020.

Table 2

Overnight stays and payment card expenditure for hotels in Austria

	Overnight stays			Payment card expenditure for accommodation establishments		
	Total	Foreign tourists	Domestic tourists	Total	Foreign tourists	Domestic tourists
	Annual change in %					
January 2020	5.8	6.2	4.3	8.8	9.9	7.6
February 2020	10.5	13.3	–0.0	20.6	27.2	8.7
March 2020	–58.6	–59.4	–55.5	–59.0	–57.9	–54.5
April 2020	–97.0	–98.3	–93.8	–100.0	–100.0	–97.4
May 2020	–89.7	–95.9	–80.1	–93.4	–98.0	–83.0
June 2020	–58.4	–73.7	–23.4	–52.3	–70.5	5.7
July 2020	–17.0	–28.4	15.9	–8.2	–20.2	50.0
August 2020	–10.9	–23.3	23.2	–4.4	–16.2	47.0
September 2020	–13.4	–25.7	14.8	–3.3	–14.8	48.9
October 2020	–49.3	–66.8	–13.7	–47.5	–67.4	2.9
November 2020	x	x	x	–85.8	–93.2	–72.3

Source: Statistics Austria, payment card service providers, OeNB.

Note: x = data not available yet.

[5] *Expenditure by foreign tourists in Austria includes all expenditure made using payment cards issued abroad. Card holders may also be resident in Austria, however. Moreover, we analyze only payment card transactions and cash withdrawals that are physically made in Austria (i.e. face-to-face transactions). Our analysis does not cover bank transfers, e-commerce payments and the import of currencies.*

[6] *Two more reasons may help explain the different growth rates of overnight stays and payment card expenditure. First, overnight stays are a real-term variable while payment card expenditure is measured in nominal terms. The inflation rate for accommodation services remained surprisingly high during the COVID-19 crisis. Second, an "average expenditure effect" might come into play in the sense that tourist in 2020 spent more than tourist in 2019, on average. The size and even the sign of this effect, however, is ambiguous.*

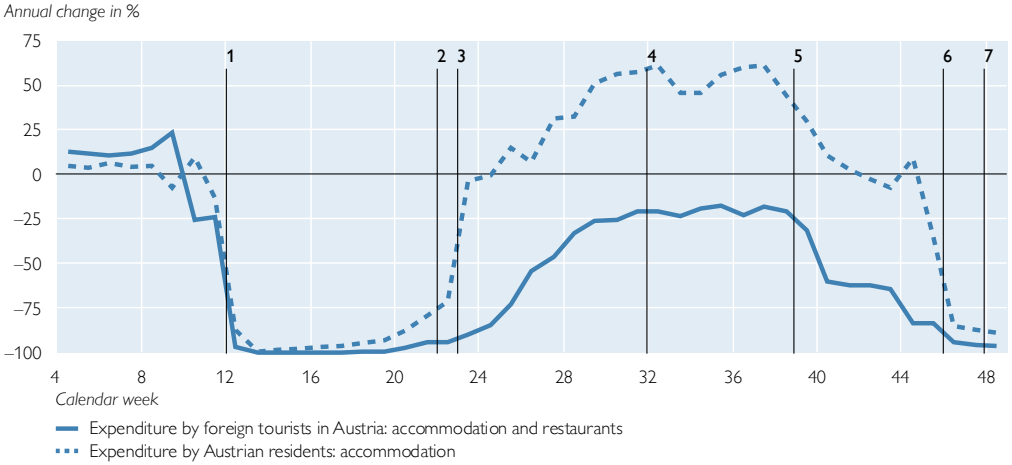
2.1 First COVID-19-induced lockdown hits Austrian tourism in the off-season

As payment card data on travel expenses are available on a weekly basis, they allow for a very precise chronological representation of the containment measures and their impact on the tourism sector in Austria. Following the lockdown imposed on March 16, 2020 (calendar week 12), card payments by foreign tourists fell by 100%, those by Austrian residents by almost 100%. With the reopening of accommodation establishments on May 29, 2020, payment card spending by residents recovered quickly and soon exceeded 2019 levels. This trend was supported by people's strong preference for spending their vacation in Austria and not abroad and by a shift toward cashless means of payment. From June 4, 2020, onward, borders were gradually reopened, but expenses by foreign tourists in Austria recovered only slowly and did not start to rise significantly before the second half of June 2020. The sharp declines observed during the lockdown fell into the off-season: Together, the months of April and May account for only 10% of the annual number of overnight stays (see table A2 in the annex).

In the summer months of 2020, spending by foreign tourists in Austria leveled off at around 25% below the 2019 value – very much in line with the path of overnight stays. Tourist spending by residents in Austria continued to rise until mid-August and stabilized thereafter. On average, domestic tourist expenditure exceeded previous-year levels by almost 50% during the summer months of 2020 – a significantly stronger increase than that recorded for overnight stays (+20%). The travel warnings that were issued gradually for Croatia, the Balearic Islands and other countries in the first half of August 2020 had no immediate effects on tourism in Austria. From September 2020 onward, an increasing number of countries started to impose travel warnings for Austria, notably the major countries of origin, i.e. Germany, the Netherlands and Switzerland (see table 2). The significant and sudden decline, against 2019, of expenditure by foreign tourists by 60%

Chart 4

Tourists' payment card expenditure in Austria



Source: Payment card service providers, authors' calculations.

Note: 1: lockdown in Austria (March 16, 2020), 2: reopening of hotels (May 29, 2020), 3: gradual reopnening of international borders (June 4, 2020), 4: travel warning (Croatia, Balearic Islands gradually from August 8, 2020), 5: travel warnings for Austria (starting September 16, 2020), 6: lockdown light in Austria (November 2, 2020), 7: lockdown in Austria (November 17, 2020).

in early October 2020 is a direct result of these travel warnings. Moreover, also domestic tourist spending declined to 2019 levels as a result of the renewed increase in the number of COVID-19 infections. The Austrian government imposed a second lockdown from November 2, 2020, onward. Until November 16, 2020, a "lockdown light" was in place, and after that, restrictions similar to those seen in March 2020 have applied and will remain in force until December 7, 2020. Accommodation establishments and restaurants were already closed in early November and will remain closed at least until early January 2021.

Consequently, the related expenditure by both domestic and foreign tourists dropped by around 90%, again, in the second week of November 2020. Like the months of the first lockdown in spring 2020, October, November and the weeks of December until Christmas are off-season months in Austrian tourism, with a common share of around 10% in the annual number of overnight stays (see table A2 in the annex). However, the peak winter season starts with the Christmas holidays. The seven weeks with the highest turnover in domestic tourism in terms of payment card expenditure fell into the first three months of 2019; the week with the highest tourism turnover in the entire year 2019 was the first week of January. This leads us to expect high risks to winter tourism developments in the next few weeks and months and, hence, to Austria's entire winter tourist season in 2021.

2.2 German tourist expenditure limited losses in Austrian tourism during the summer

In the summer months of July and August 2020, expenses and overnight stays by foreign tourists in Austria recovered from the massive losses recorded during the lockdown in spring. From an economic point of view, this was clearly good news; from a medical perspective however, several experts had been warning, as early as in summer, of the increasing probability of a second wave of COVID-19 infections in the fall. To limit inappropriate behavior, local restrictions were imposed in some tourist hotspots; nevertheless, as the rising numbers of COVID-19 infections have shown, these measures did not prove sufficient to effectively prevent a second wave and a second lockdown in the fall.

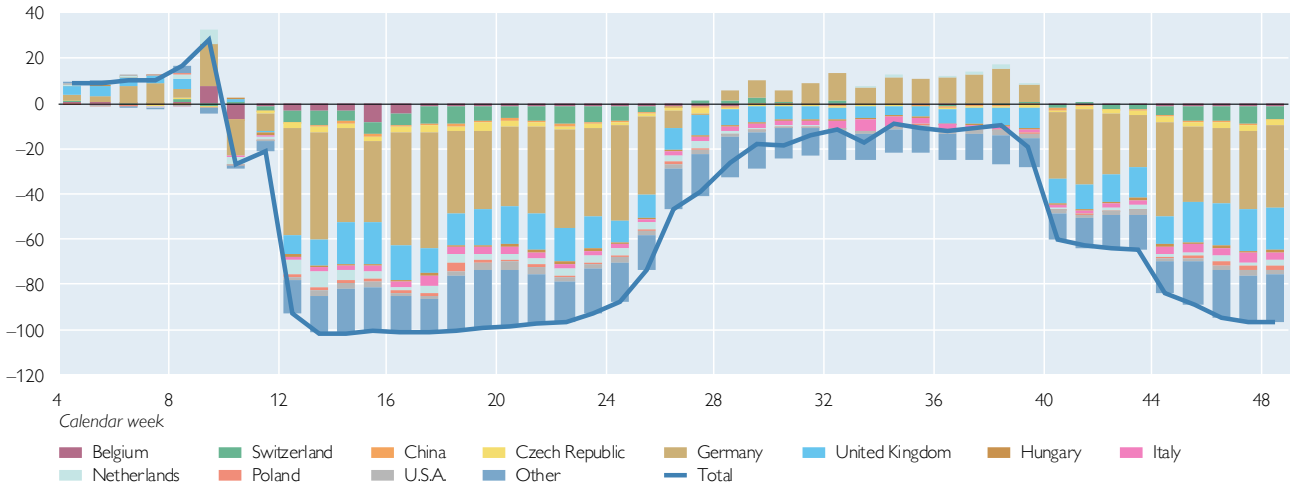
Focusing on the economic aspects of the pandemic we continue to analyze the effects on the tourism industry. As payment data are not only available at a weekly frequency but also according to a detailed list of countries of origin, we use these data to analyze which countries triggered the recovery over the summer of 2020. Moreover, the real-time nature of our payment card data also allows for a first assessment of the drivers of the second slump in Austrian tourism, which started in October 2020, as well as of the effects of the November lockdown.

The recovery observed after the lockdown in spring was mainly related to tourists from Germany. Payment card expenditure by German tourists in Austria during the summer months of July and August 2020 even exceeded that recorded in 2019 by almost 20%, while overnight stays by German tourists in Austrian accommodation facilities reached 2019 levels. Again, the shift to cashless means of payment and a change in the spending behavior of tourists (see footnote 6) are likely to be the main reasons for this difference. The Austrian tourism sector benefited from the country's geographical proximity to Germany, which is by far the most important country of origin of incoming foreign tourists. Nevertheless,

Chart 5

Foreign tourists' payment card expenditure in Austrian accommodation establishments in 2020, by country of orgin

Growth contributions of countries in percentage points; annual change in %



Source: Payment card service providers, authors' caluclations.

the positive trend observed in expenses by incoming German tourists could not compensate for the losses recorded in expenses by incoming tourists from most other countries. In October, again, the decline in expenses by German tourists was found to be mainly responsible for the overall steep decline in tourist spending.

Other than that, an increase in payment card expenditure was only recorded for Dutch and Swiss tourists in Austria in some weeks between July and September, and it was smaller than the figure recorded for German tourists. Expenses by tourists from other European countries, by contrast, declined by between 13% to 55%, and expenses by tourists from overseas destinations like the USA or Asia, who can only travel to Austria by air, went down by more than 90%. These changes are rather similar to what we observe in monthly overnight stays (see chart A3 in the annex).

Since the summer, the Austrian tourism sector has seen a second slump, which happened in two steps, the first one materializing at the end of September and the beginning of October and the second one in early November 2020. For a more detailed analysis of the latest developments, see section 3.

2.3 Tourism activity in the Austrian provinces and breakdown by accommodation categories

To analyze tourism sector activity at the regional level and in a breakdown by accommodation categories, we use data on overnight stays published by Statistics Austria, as such detailed information is not available on payment card expenditure. According to these data, after rising by 10½% in February 2020, the number of overnight stays in Austria fell by almost 60% in March, by 97% in April and by 90% in May. In June 2020, the situation started to improve, supported in particular by overnight stays by domestic and German tourists, and it continued to improve in July and August 2020. Chart 6 and chart 7 show the growth rates of overnight

stays in Austria from January to October 2020 and the contributions to these growth rates stemming from both the Austrian provinces and the different accommodation categories.

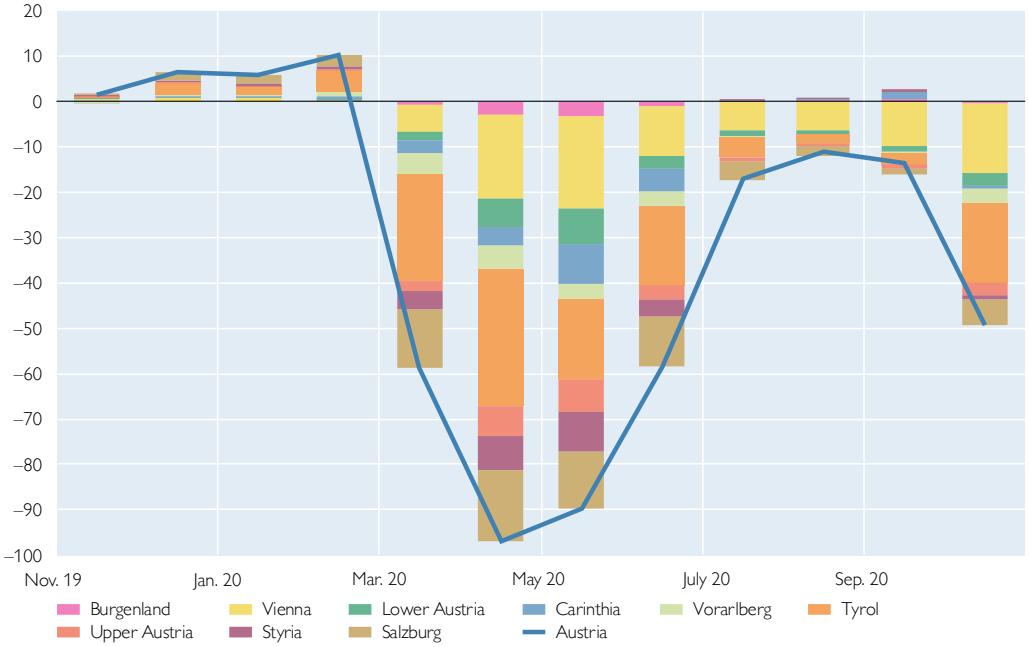
As accommodation establishments were, in fact, closed from mid-March to end-May 2020, overnight stays declined by almost 100% in this period. The contributions to this decline both by the Austrian provinces and by accommodation categories just reflect their relative importance for the tourism sector. Around 50% of the Austria-wide decline was attributable to the decline in overnight stays observed in Tyrol and Vienna in March and April 2020; in May, Vienna's negative growth contribution exceeded that of Tyrol. Negative contributions from Salzburg were the third-largest at more than 10 percentage points on average. The sector started to recover in the course of June but recovery was uneven across Austria's provinces. As cities continued to suffer in particular, the province of Vienna made the biggest contribution to the drop in overnight stays in Austria in July and August 2020. In September, overnight stays and their contributions were almost unchanged from August; Burgenland, Carinthia and Styria even posted small gains compared to September 2019. Recording growth contributions of –18 percentage points and –16 percentage points, respectively, Tyrol and Vienna accounted for as much as two-thirds of the overall decline in overnight stays recorded in October 2020 as a result of the travel warnings.

With regard to hotel categories, the comparatively high importance of three-, four- and five-star hotels is evident. On average, these categories account for almost two-thirds of the overall decline in overnight stays in the months from March to August 2020. Our breakdown also shows that all hotel categories recorded above-average declines, while holiday homes and campsites even posted a slight increase in overnight stays in August and September 2020 compared to 2019 levels. Almost half of the setback observed in October 2020 (–49% compared to October 2019) is attributable to five-and/or four-star accommodation establishments (23 percentage points).

Chart 6

Number of overnight stays in Austria

Annual change in %; growth contributions in percentage points



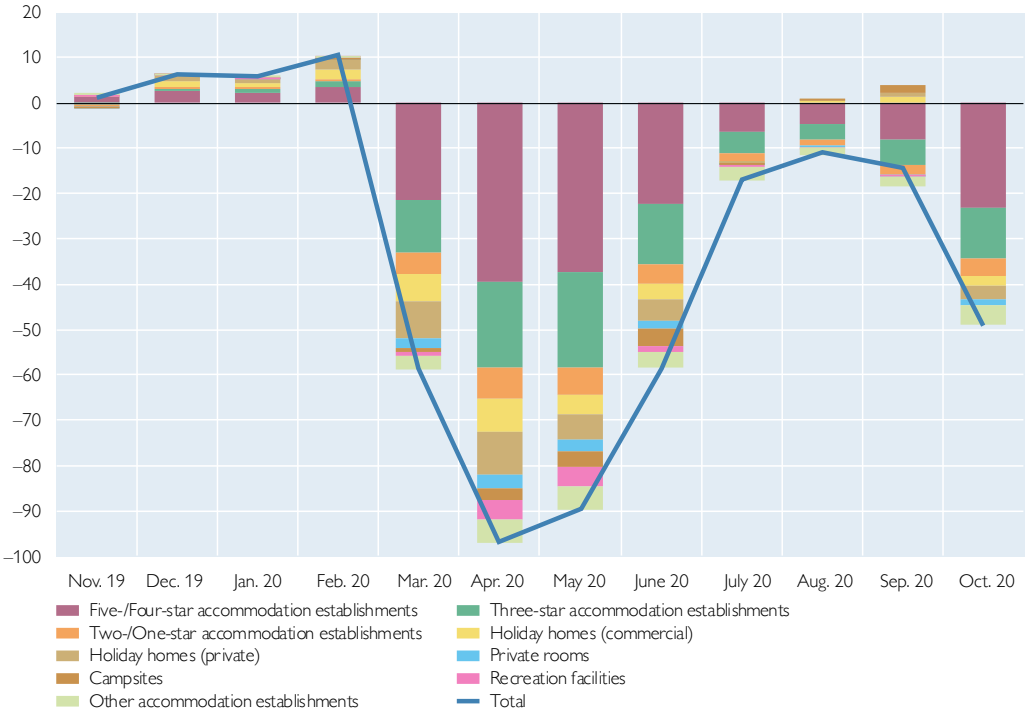
Source: Statistics Austria.

Following a global trend, city tourism – in Vienna in particular – has been strongly affected by the COVID-19 crisis for several reasons: First, many tourists used to come to Vienna by airplane, and so far, most tourists have avoided traveling by air. Second, tourism in Vienna is characterized by a high share of overseas tourists. Active travel restrictions from several overseas regions thus exert additional pressure on Viennese tourism. Third, the COVID-19 pandemic put a halt to international conference tourism, and this branch had gained great importance in Vienna over the past years. Finally, because of the COVID-19 pandemic, demand for city trips has gone down when compared to that for other travel destinations. Naturally, the focus of city trips is rather on indoor activities such as visiting museums and cultural events or shopping, which all have become less attractive in times when (strict) containment measures are in place, being perceived as entailing a higher risk of infection. These factors are also reflected in the change in overnight stays in Vienna, as compared to the rest of Austria, since the start of the COVID-19 crisis. While in Austria as a whole, the number of overnight stays by domestic tourists increased in July and August 2020, numbers remained below 2019 levels in Vienna. Vienna saw an above-average number of overseas tourists in 2019 when compared to the rest of Austria; overseas tourists are still almost completely absent this year. In contrast, the proportion of German tourists who visited Vienna in 2019 was below the Austrian average. Consequently, Vienna could not benefit from the rise in the number of German tourists during the 2020 summer tourist season as other regions in Austria did. Overall, this led overnight stays in Vienna to decline by just over 70% in the summer months – by substan-

Chart 7

Number of overnight stays in Austria by accommodation category

Annual growth in %; growth contribution in percentage points



Source: Statistics Austria.

tially more than in Austria a whole (–14%). Another factor is the composition of accommodation establishments in Vienna, which features an above-average share of hotels, and hotels have an even bigger share in the overall loss than other accommodation facilities, which are more common in the other provinces. Between March and September 2020, 79% of the decline observed in overnight stays in Vienna, on average, were attributable to three-, four- and five-star hotels; in October 2020, this accommodation category accounted for as much as 93 percentage points of the overall 85% loss in overnight stays in Vienna.

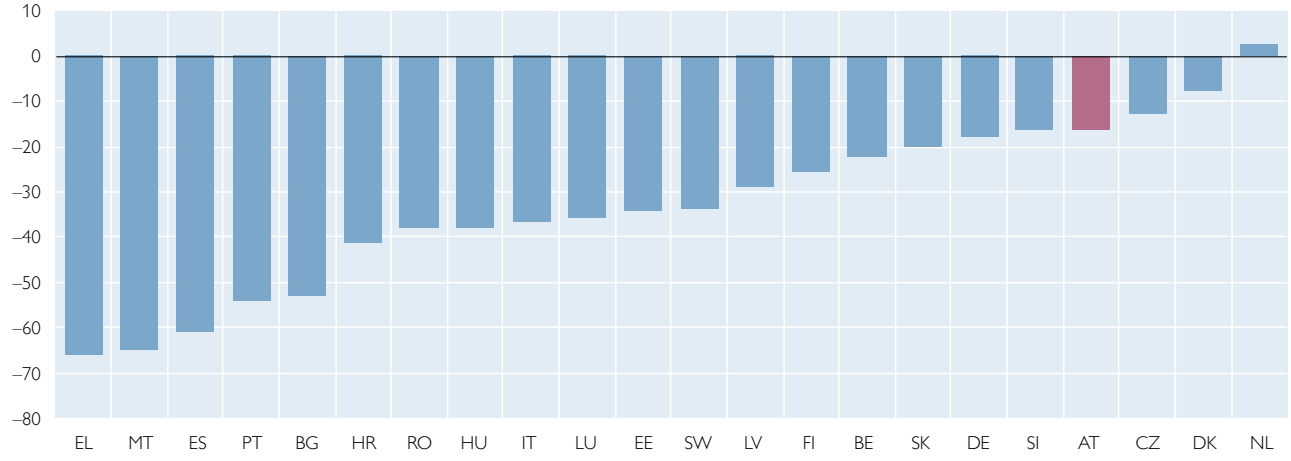
2.4 Central European countries such as Germany, Slovenia and Austria recorded smaller decline in overnight stays than Southern European countries in summer 2020

Tourism has been strongly affected by the COVID-19 pandemic in almost all European countries. Many Southern European countries, in particular, strongly rely on tourism and suffered huge drops in overnight stays, as shown in chart 8 for July and August 2020. Travel restrictions and the respective tourism sector's dependence on international flights had a stronger negative effect in countries on Europe's southern periphery. Moreover, some Southern European countries, like Spain and Italy, were among those with the highest numbers of COVID-19 infections.

Chart 8

Overnight stays in EU countries

Annual change in July and August 2020 in %



Source: Eurostat.

Given Austria's central position in Europe, which enables many European tourists to travel to Austria by car, and the low number of COVID-19 infections registered during the summer, Austria's tourism recovered comparatively well over the summer months, although it still recorded a decline in overnight stays. The Netherlands are the only EU country that, overall, recorded a small increase in overnights stays in July and August 2020, compared to July and August 2019.

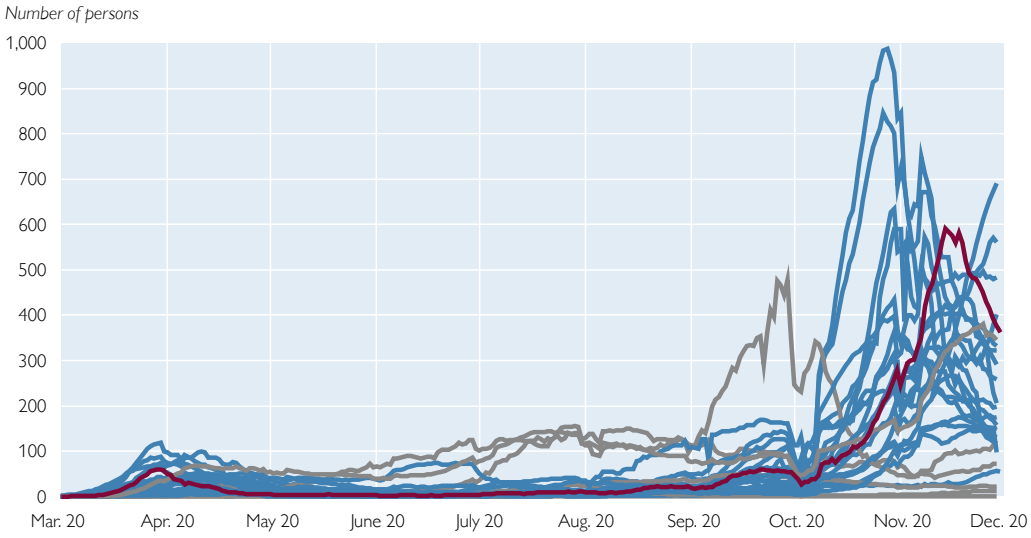
3 Travel warnings caused a second steep decline in overnight stays

The number of COVID-19 infections in Europe fell to low levels after the first wave of the pandemic was contained in spring 2020 and remained low during the summer. However, the number of positive COVID-19 cases started to rise already back in June 2020, but initially at such a low pace that it was not recognized accordingly. In October 2020, the rise in positive cases accelerated significantly in most European countries (see chart 9). A second wave of COVID-19 infections was also recorded in Austria. The number of new COVID-19 infections had also been increasing since the early summer but again, at a very low initial pace. While in the first week of October 2020, the seven-day incidence in Austria stood at 43 newly infected persons per 100,000 inhabitants, it reached the 100 person threshold on October 18, 2020, and stood at 278 by end-October. In the first two weeks of November, it sharply increased again, peaking at 592 on November 14, 2020.[7] This rise went hand in hand with a growing number of hospitalizations, stronger need for intensive care and, lately, also with higher numbers of people dying while infected with COVID-19. In Belgium, the Czech Republic, Switzerland or France, even steeper rises and higher numbers were recorded. Germany, by contrast, has so far managed to prevent a similarly steep increase, with the seven-day incidence coming to 155 at end-November.

[7] *Source: European Centre for Disease Prevention and Control (ECDC).*

Chart 9

New COVID-19 infections per 100,000 inhabitants – seven-day incidence



Source: European Centre for Disease Prevention and Control.

Note: Red: Austria; blue: Belgium, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Portugal, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK; grey: Brazil, China, India, Israel, Japan, USA.

In reaction to the renewed rise in the number of COVID-19 infections, all European countries have implemented new containment measures. These measures often started out at the regional level, and part of the respective containment strategies was the issuance of travel warnings (see table 2 for travel warnings for Austria). When travel warnings are in place, travelers would typically have to present either a negative COVID-19 test (which should not be older than 48 hours) and/or would have to observe self-quarantine for several days upon their return. Thus, the situation for tourism turned difficult again, even though only a very small number of COVID-19 clusters in Austria were traceable to the areas of travel, accommodation and the restaurant and catering business in early October 2020.[8] As described in section 2, the recent travel warnings in place for Austria, especially those issued by Germany, already led to a second slump in Austrian tourism in the first half of October 2020.

[8] *See https://www.ages.at/themen/krankheitserreger/coronavirus/epidemiologische-abklaerung-covid-19/ .*

Table 3

Travel warnings for Austria

Date	Country issuing travel warning	Travel warning issued for
July 15, 2020	Norway	Austria
September 1, 2020	Hungary	Austria
September 14, 2020	Switzerland	Vienna
September 16, 2020	Germany	Vienna
September 18, 2020	Belgium	Vienna
September 18, 2020	Denmark	Austria
September 22, 2020	Netherlands	Vienna, Innsbruck
September 24, 2020	Germany	Vorarlberg, Tyrol
September 25, 2020	Belgium	Vienna, Vorarlberg, Tyrol
September 25, 2020	Switzerland	Vienna, Lower Austria, Upper Austria, Burgenland, Salzburg
September 29, 2020	Slovenia	Vienna, Vorarlberg, Tyrol
October 7, 2020	Belgium	Vienna, Tyrol
October 7, 2020	Romania	Austria
October 12, 2020	Slovenia	Vienna
October 14, 2020	Belgium	Austria, except Carinthia and Styria
October 16, 2020	Netherlands	Vienna, Lower Austria, Tyrol, Vorarlberg
October 22, 2020	Netherlands	Austria, except Burgenland, Carinthia and Styria
October 24, 2020	Germany	Austria, except Carinthia
October 30, 2020	Switzerland	No more warnings
November 1, 2020	Germany	Austria
November 3, 2020	Belgium	Austria
November 10, 2020	Slovakia	Austria

Source: Authors' compilation.

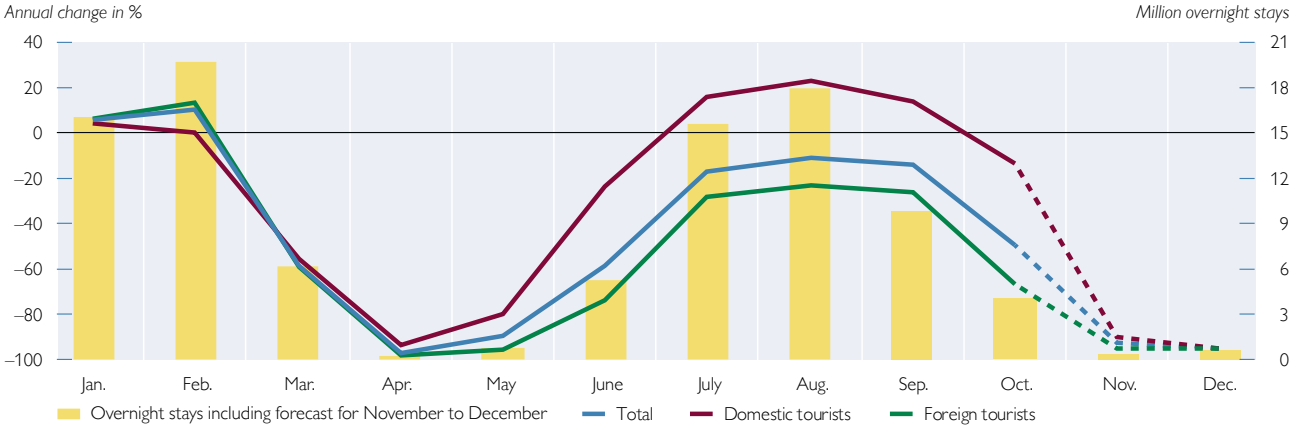
To break the steep rise in new COVID-19 infections in Austria, the Austrian government imposed a second lockdown. In a first step, starting on November 2, 2020, hotels and restaurants were closed and all events were canceled. As Austria's seven-day incidence figures went up further, the government intensified the lockdown rules from November 17, 2020, onward by additionally closing the retail sector and schools. For the tourism industry, this further tightening did not impose any additional changes.

These intensified measures kept the number of new COVID-19 infections from rising further; at the end of November 2020, the seven-day incidence in Austria stood at 362 persons (as on November 30, 2020). The payment card expenditure data for November 2020 already mirror the effects of the second lockdown. While in the first week of November, results were biased reflecting the fall holidays in Austria and Germany, from the second week of November onward, expenditure by domestic tourists declined by almost 90% compared to the level seen last year, and expenditure by foreign tourists dropped by a little more than 95%. Unlike during the first lockdown, business trips were not prohibited during the second lockdown. This may also explain the difference in expenditure by domestic and foreign tourists. We expect that the decline will continue at the rate recorded since mid-November until the end of the second lockdown. As the Austrian government announced on December 2, 2020, accommodation establishments in Austria will not open before January 2021; on top of that, travel warnings (including compulsory self-quarantine of at least five days for tourists returning to Germany) will remain in place at least until end-2020.

Against this background, we assess the further path of tourism in Austria up to the end of 2020. Our forecast of the course of overnight stays in Austria for November and December 2020 is based on official statistics on overnight stays up to October, on information provided by payment card service providers up to

Chart 10

Forecast of overnight stays in Austria in 2020



Source: Statistics Austria, payment card service providers, OeNB.

Note: Until October: Data on overnight stays as published by Statistics Austria, November to December: OeNB forecast based on data collected from payment card providers.

November 2020[9] and on our assumptions regarding the loosening of lockdown measures and remaining travel warnings.[10]

Chart 10 shows the results of our assessment for the individual months of 2020. Additionally, table 3 shows the growth rate of overnight stays for the period from January to October and for the 2020 summer tourist season (May to October) and our estimates for November and December and for the full year 2020. Overall, we expect a decrease in overnight stays by 36.5%, compared to 2019, for the full year 2020. Overnight stays by foreign tourists will be much more strongly affected (–41.2%) than overnight stays by Austrian residents (–23.2%).

These negative results could have been even more pronounced if the two lockdowns had not fallen into the off-season. This is also true for the second lockdown – given the current outlook. November and December (until Christmas) play a

Table 4

Forecast of overnight stays in Austria in 2020

	Total	Domestic tourists	Foreign tourists	German tourists
	Annual change in %			
January to October	–29.2	–12.7	–35.0	–25.9
Summer tourist season	–32.3	–3.2	–44.5	–28.1
Forecast for				
November	*–92.8*	*–90.0*	*–95.0*	*–95.0*
December	*–95.0*	*–95.0*	*–95.0*	*–95.0*
Full-year 2020	–36.5	–23.2	–41.2	–31.8

Source: Statistics Austria, payment card service providers, OeNB.

Note: Until October: Statistics Austria; from November: forecast based on data collected from payment card providers.

[9] *Given the shift in consumer preferences toward cashless means of payment, the year-on-year growth rate of payment card expenditure in October 2020 exceeded the growth of overnight stays by 17 percentage points (see table 2). Correcting for this factor, and inducing some additional judgment as the present data overestimate developments in the first week of November (fall holidays), we expect overnight stays to decline by 90% for domestic tourists and by 95% for foreign tourists.*

[10] *Based on the rules announced by the Austrian government on December 2, 2020, Austrian accommodation establishments will not open before January 2021. Therefore, we expect overnight stays by domestic and foreign tourists to decline by 95% in December 2020 compared to December 2019. We assume that the number of overnight stays will not decline by 100% as business trips continue to be allowed. We also expect a certain number of overnight stays by professional athletes and their support teams.*

comparatively smaller role in Austrian tourism. November accounts for only 3,5% of overnight stays in a typical year (see table A2 in the annex). Given recent developments, our results are more pessimistic than the estimates by Fritz (2020), who, in a preliminary assessment of the 2020 summer tourist season, expected a 15% decline in domestic and a 30% decline in foreign demand.

4 Conclusions

Tourism contributes around 7½% to the Austria's total value added; for the entire leisure industry, this value doubles. By European standards, tourism makes an above-average contribution to Austria's economic output.

Tourism is among the economic sectors hit hardest by the COVID-19 containment measures. The number of overnight stays by domestic and foreign tourists in Austria fell by almost 100% in spring 2020, when accommodation establishments were completely closed. Over the summer, tourism activity in Austria recovered, backed by domestic and German tourists. Nevertheless, overnight stays remained clearly below 2019 levels. In October 2020, the renewed increase in the number of COVID-19 infections led to new containment measures in many European countries, including travel warnings for high-risk regions. Austria was considered a high-risk country by several important countries of origin of foreign tourists, most notably Germany, the Netherlands and Switzerland. This triggered another severe downturn in Austrian tourism. With the second lockdown in place as of November 2020, overnight stays by both domestic and foreign tourists again fell by more than 90%. According to the Austrian government's announcements of December 2, 2020, Austrian accommodation establishments will not open before January 2021. Therefore, the decline expected for November – on the basis of weekly data on payment card expenditure – can be expected to continue until year-end. Hence, for the year 2020 as a whole, we expect a drop in total overnight stays by 36.5%.

The decline in overnight stays would have been substantially stronger if the two Austrian lockdowns had not fallen into the off-season. The first lockdown was from mid-March until the end of May 2020. With the exception of the week around Easter, this period is, from a tourism perspective, mainly off peak. The second lockdown started in November 2020 and will be in place at least until early January 2021. November and early December are preseason months in Austrian tourism. The main winter tourist season starts in the week around Christmas and ends around Easter. The seven weeks with the highest turnover in domestic tourism in terms of payment card expenditure fell into this period in 2019; the week recording the highest tourism turnover in the entire year 2019 was the first week of January.

From early-January 2021 onward, supply-side constraints should slowly begin to disappear, if we assume that accommodation establishments will be allowed to reopen. Demand-side constraints, however, will persist as long as travel warnings remain in effect. From today's perspective, the further development of the COVID-19 pandemic cannot be accurately assessed. What we can say, however, is that the drop in overnight stays by foreign tourists will be substantial in Austria. Unlike during the summer tourist season, domestic tourists will not be able to compensate for the expected decline in winter tourism. In the past winter tourist season, they accounted for only 20% of overnight stays in Austria. As for Austria,

the winter tourist season is more important – in terms of the number of overnight stays and tourist's average expenditure – than the summer season in regular years. Hence, the current situation poses a key downside risk to tourism sector developments in Austria.

References

Eurostat. 2019. Tourism Satellite Accounts in Europe. 2019 edition. November.

Federal Ministry for Sustainability and Tourism. 2019. Tourismus und Freizeitwirtschaft 2018. Vienna.

Fenz, G. and H. Stix. 2020. Monitoring the economy in real time with the new OeNB weekly GDP indicator: background, experiences and outlook. Forthcoming in Monetary Policy & the Economy Q4/20–Q1/21. Oesterreichische Nationalbank.

Fritz, O. and S. Ehn-Fragner. 2020. Bericht über die Bedeutung, Entwicklung und Struktur der österreichischen Tourismuswirtschaft im Jahr 2019. WIFO. April.

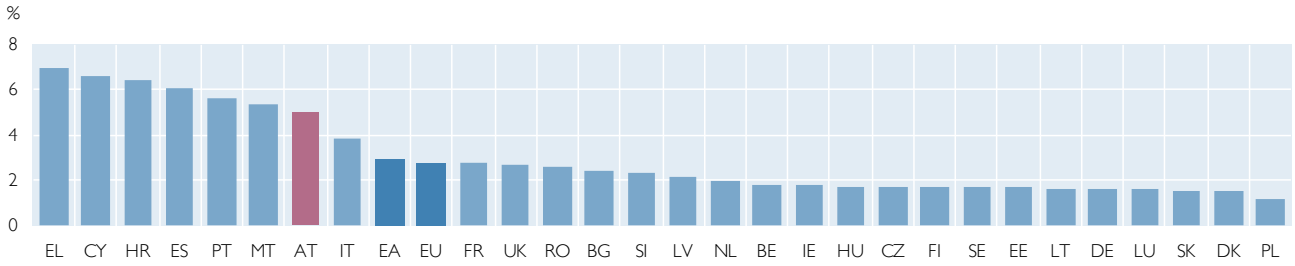
Fritz, O. 2020. Tourismusanalyse Mai bis Juli 2020. Nachfrage in den ersten drei Monaten der Sommersaison auf fast die Hälfte geschrumpft. WIFO press release. September 4. https://www.wifo.ac.at/news/tourismusanalyse_mai_bis_juli_2020.

Annex

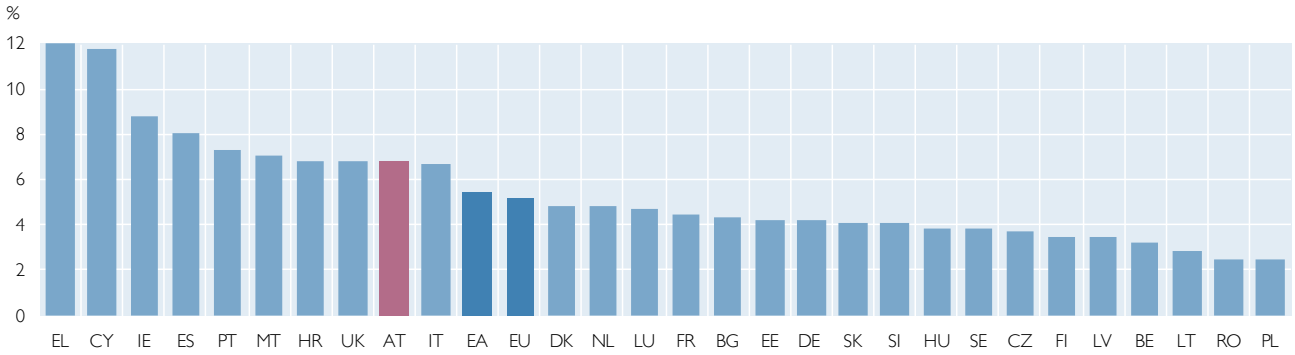
Chart A1

Economic importance of accommodation and food service activities (NACE I), 2019

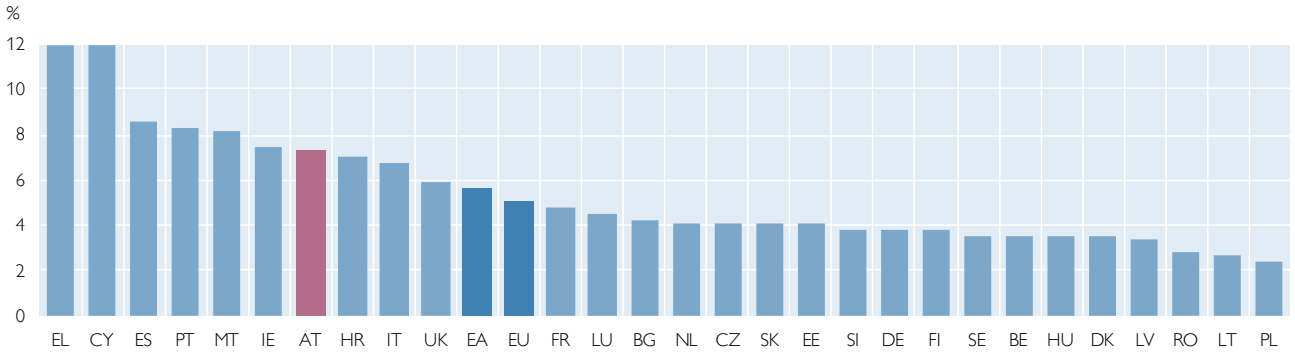
Share of value added generated by NACE I sector in total value added[1]



Share of employment in NACE I sector in total employment[2]



Share of hours worked in NACE I sector in total hours worked[3]

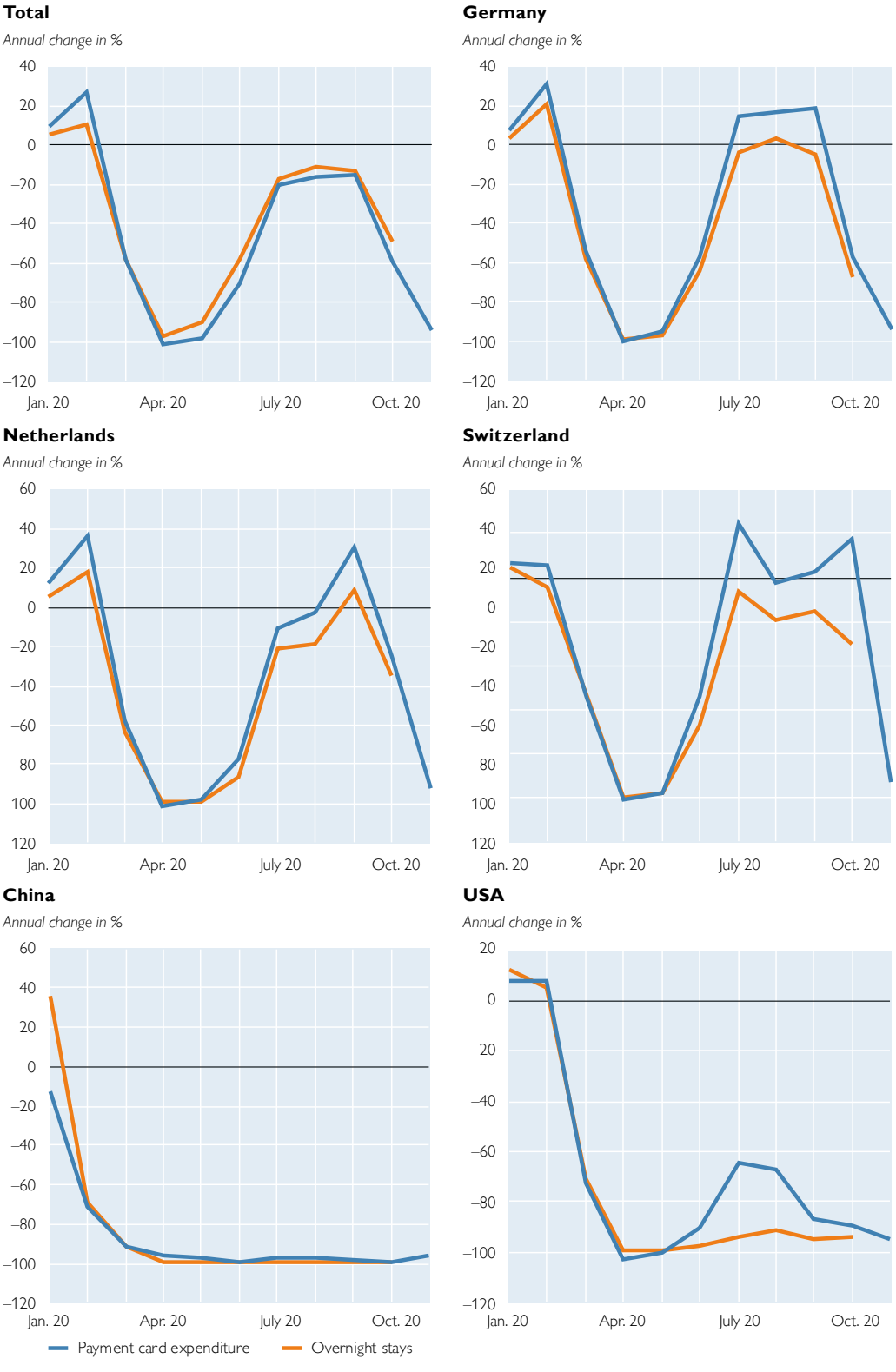


Souce: Eurostat.

[1] *BE, EA-19, EU-28, LT, SE, UK: 2018; HR: 2017.*
[2] *BE, BG, EA-19, EU-28, SE: 2018.*
[3] *BE, BG, EA-19, EU-28, SE: 2018.*

Chart A2

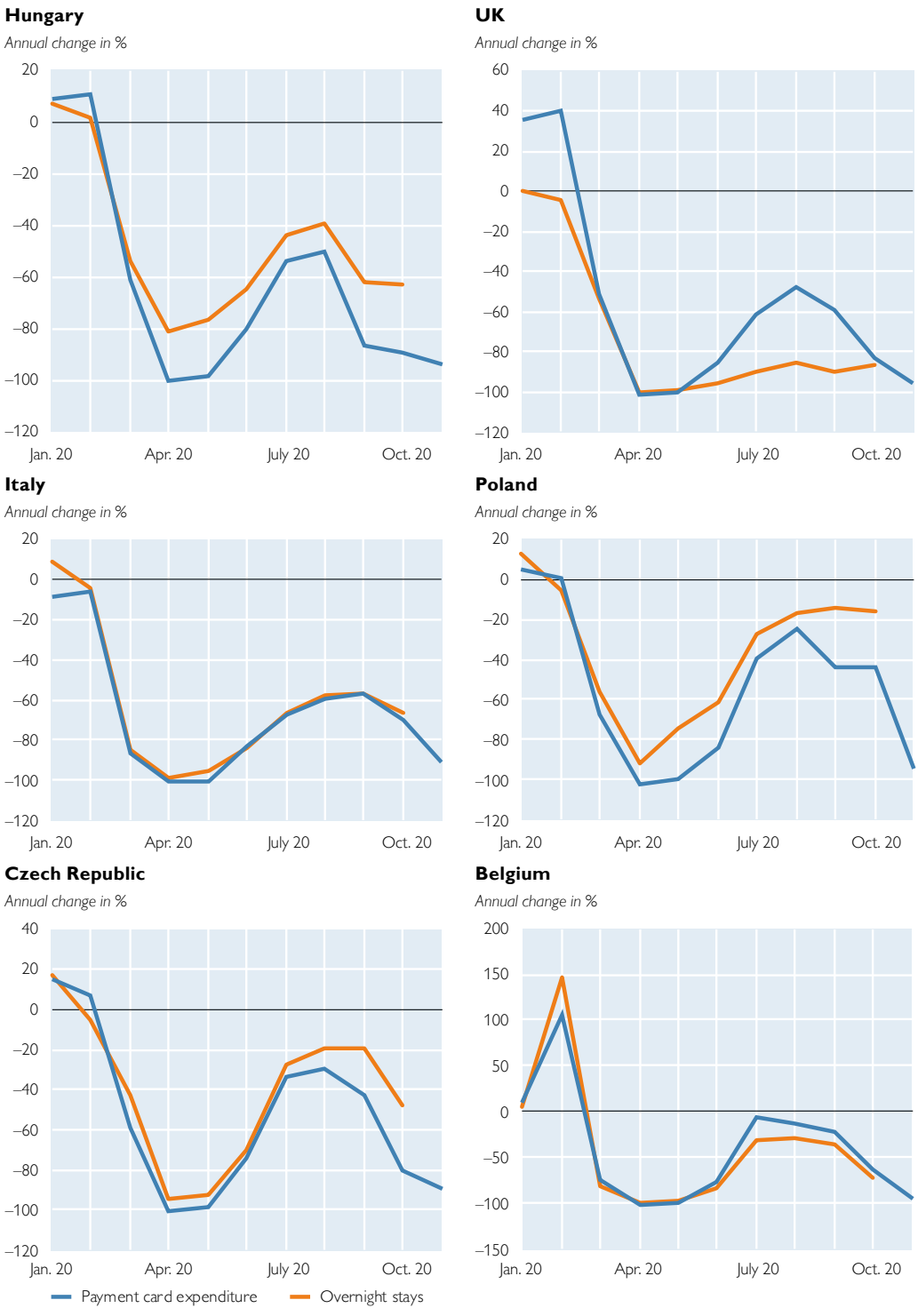
Comparison of tourists' payment card expenditure on accommodation and overnight stays in Austria for selected countries of origin



Source: Statistics Austria, payment card service providers, OeNB.

Chart A2 continued

Comparison of tourists' payment card expenditure on accommodation and overnight stays in Austria for selected countries of origin

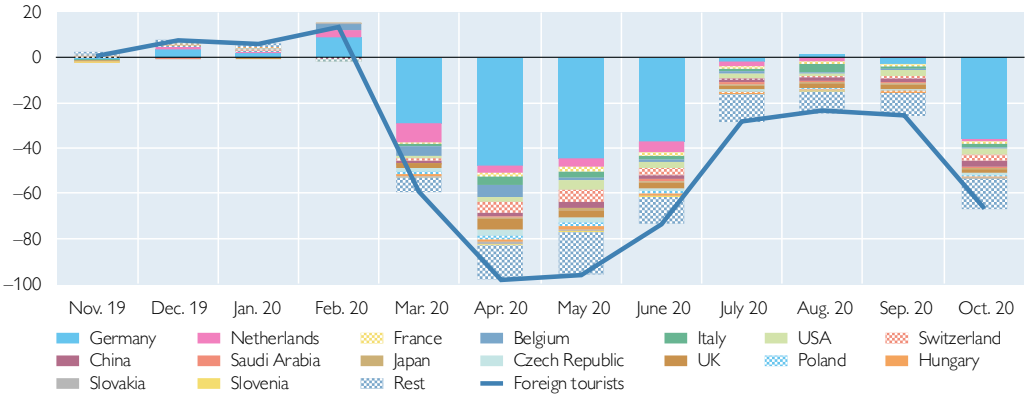


Source: Statistics Austria, payment card service providers, OeNB.

Chart A3

Overnight stays in Austria

Annual change in %; growth contributions in percentage points



Source: Statistics Austria.

Table A1

Monthly pattern of overnight stays in Austria in 2019

	Total	Domestic tourists	Foreign tourists	Total	Domestic tourists	Foreign tourists	Domestic tourists	Foreign tourists
	1,000			*Share in figures for full-year 2019 in %*			*Share in total in %*	
2019	152,709	39,944	112,765	100.0	100.0	100.0	26.2	73.8
January 2019	15,156	2,803	12,354	9.9	7.0	11.0	18.5	81.5
February 2019	17,863	3,769	14,094	11.7	9.4	12.5	21.1	78.9
March 2019	14,979	2,875	12,105	9.8	7.2	10.7	19.2	80.8
April 2019	8,277	2,393	5,883	5.4	6.0	5.2	28.9	71.1
May 2019	7,465	2,936	4,529	4.9	7.4	4.0	39.3	60.7
June 2019	12,611	3,839	8,771	8.3	9.6	7.8	30.4	69.6
July 2019	18,754	4,834	13,920	12.3	12.1	12.3	25.8	74.2
August 2019	20,195	5,402	14,793	13.2	13.5	13.1	26.7	73.3
September 2019	11,428	3,469	7,959	7.5	8.7	7.1	30.4	69.6
October 2019	8,522	2,815	5,707	5.6	7.0	5.1	33.0	67.0
November 2019	5,301	2,301	3,000	3.5	5.8	2.7	43.4	56.6
December 2019	12,158	2,508	9,650	8.0	6.3	8.6	20.6	79.4

Source: Statistics Austria, OeNB.

Prices and inflation in Austria during the COVID-19 crisis – an analysis based on online price data

Christian Beer, Fabio Rumler, Joel Tölgyes[1]
Refereed by: Elisabeth Wieland, Deutsche Bundesbank

To shed light on price developments during the early stage of the COVID-19 pandemic in Austria, we analyze online price data collected from April to August 2020 by means of webscraping. Our analysis focuses on product categories that received special attention during the COVID-19 crisis, such as food and medical products. In contrast to what has been reported in the media, we find only small price changes for most product categories over the observation period. For food, nonalcoholic beverages, personal care products and IT equipment, we find small price decreases. Prices for alcoholic beverages remained broadly stable. Medical products and delivered meals saw very small price increases. When comparing price changes derived from our online price dataset with monthly price changes as reported in official inflation statistics, we find similarities for some product categories but also considerable differences for others. These differences are most likely attributable to methodological differences in data collection. For the analysis of price developments, we find that webscraped data are a useful data source complementary to data from official inflation statistics.

JEL classification: E31, C82
Keywords: inflation, price developments, COVID-19, webscraping, online shops

The COVID-19 pandemic and the accompanying policy measures have affected the Austrian economy in multiple ways. On the one hand, the supply side of the economy has been severely hit by shutdowns and other public health measures. Supply chains had to be adapted and new ways of cooperation had to be found. As a result, more people than ever are working from home. At the same time, the grim economic outlook led to mass layoffs, rising unemployment and a high number of persons in short-time work.

On the other hand, the demand side of the economy has been hit as well. A combination of lower income due to unemployment on the one hand and changing consumption patterns and consumer expectations on the other has dampened demand. While demand for some goods and services has decreased, demand for other goods has gone up (see e.g. Baker et al., 2020). In Austria, for example, the media reported anecdotal evidence of toilet paper and pasta hoarding during the first lockdown in March 2020.[2] Moreover, rising demand for medical equipment, such as protective clothing, face masks and testing equipment, has led to shortages all around the world.

It follows almost directly that these supply and demand shocks have affected prices as well. Typically, falling demand leads to lower prices while disruptions of

[1] *Oesterreichische Nationalbank, Economic Analysis Division, christian.beer@oenb.at, fabio.rumler@oenb.at and joel.toelgyes@oenb.at.* *Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the OeNB or the Eurosystem. The authors would like to thank the participants in an internal OeNB workshop for helpful suggestions and comments, Elisabeth Wieland for a thorough discussion of this paper and Matthias Frühwirth (Düsseldorf Institute for Competition Economics (DICE), Heinrich Heine University Düsseldorf) for his collaboration in the webscraping project.*

[2] *https://kurier.at/chronik/oesterreich/konserven-nudeln-klopapier-erste-hamsterkaeufe-in-oesterreich/400763904.*

supply chains have the opposite effect. However, when demand and supply shocks occur simultaneously, as in the current COVID-19 pandemic, their overall effect on prices is ambiguous. Moreover, prices and consequently also inflation may adjust slowly to a changing environment because of nominal rigidities.

Furthermore, the COVID-19 pandemic also led to difficulties in collecting price data for inflation measurement. Many stores were closed for several weeks and many products were out of stock due to supply chain-related problems. As a result, statistical offices had to rely on alternative data collection methods. Apart from performing imputations and using scanner data, statistical offices started to implement or expand online price data collection. To ensure a harmonized approach across the EU, Eurostat published guidance notes on the techniques to be used for imputations and replacements.[3] The UK's Office for National Statistics, for instance, included online price data in their collection of short-term economic indicators. Germany's Statistisches Bundesamt and Statistics Austria incorporated online price data in their inflation measurement during the first COVID-19 lockdown. Other institutions, such as central banks, have also started to gain interest in online price data. Within the framework of the Price Setting Microdata Analysis (PRISMA) research network[4], the OeNB started to collect online price data in April 2020 to shed light on price developments during the COVID-19 pandemic. The method used to collect these data is webscraping[5]. Over the last two decades, e-commerce has become an ever more important distribution channel of the retail industry. In Austria, the share of turnover generated in e-commerce as a percentage of the total turnover in the retail sector amounted to about 14% in 2019.[6] During the COVID-19 pandemic this share has very likely increased substantially which makes webscraping an even more important method of collecting price data.

In this paper, we use these webscraped price data to analyze the development of prices for selected product categories in the period from April to August 2020. Section 1 provides information on the data used in our analysis; section 2 presents the results of our analysis and, in a box, the results of an analysis of price developments in reaction to consumption tax cuts. Finally, section 3 draws some conclusions.

1 Data

In the following, we analyze price developments in recent months for certain product categories based on the United Nations Statistics Division's Classification of Individual Consumption by Purpose (COICOP) concept. More specifically, due to their relevance during the COVID-19 crisis and the high representativity of the data we collected in these product categories, our analysis focuses on the following COICOP categories: food; nonalcoholic beverages; alcoholic beverages; audio-

[3] *https://ec.europa.eu/eurostat/en/data/metadata/covid-19-support-for-statisticians.*

[4] *PRISMA is a joint research network the ECB and the euro area national central banks set up to investigate price setting patterns in the euro area countries with the help of micro data.*

[5] *Webscraping refers to the automatic download of large amounts of data from the internet. These data are collected at regular intervals for analytical purposes; in our case, price data were collected from online shops. Apart from supporting the analysis of short-term price trends, webscraping also opens up the possibility of investigating other relevant questions in inflation research, such as whether e-commerce has a dampening effect on inflation or whether the collected data are suitable for forecasting and nowcasting the inflation rate.*

[6] *According to Euorstat data on the use of e-commerce by enterprises and individuals. For a cross-country comparison of the shares of e-commerce, see Ritzberger-Grünwald and Rumler (2019).*

visual, photographic and information processing equipment (in the following referred to as "IT equipment"); medical products, appliances and equipment (in the following referred to as "medical products"); and personal care products. In addition, our analysis also covers price developments in online meal delivery services, which are not part of the consumer price index (CPI) or of the Harmonised Index of Consumer Prices (HICP) basket[7] of goods and services for Austria. The online price data we collected stem primarily from two supermarkets, one drugstore, two electronics stores, one pharmacy and one meal delivery service provider.[8] The online shops in our sample set uniform prices for the whole of Austria, with the exception of the meal delivery service provider, which offers local prices as it cooperates with about 3,350 different catering businesses all over Austria. About 50% of these catering businesses are located in Vienna, about 10% each in Lower Austria and Styria, and the remaining 30% in other Austrian provinces. Even though we also webscrape price data from clothing stores, we do not include these data in our analysis given problems connected to product churn[9].

Since we only started collecting online price data in April 2020, the observation period for most product categories is from April 1 to August 31, 2020. Given this fairly short observation period and the lack of data from previous years, we were not able to calculate year-on-year inflation or interpret seasonal price patterns. Instead, after constructing daily price indices for each product category, we analyzed changes in price levels based on these indices.

To render a broad picture of developments in the many individual prices on which data were collected, we aggregated our price indices to the level of COICOP 3-digit groups.[10] Given the rather sudden start of our project during the early stages of the COVID-19 crisis, we gradually expanded our sample of online shops covered by including additional stores (see table A1 in the annex). In some cases, the inclusion of new stores in our sample led to a major change in the number and type of products covered in certain COICOP 3-digit categories. Consequently, we treated these new entries into the sample as data breaks and recalibrated the index to 1 on the day the major changes occurred. This was the case on June 17, 2020, for medical products and personal care products (inclusion of a pharmacy in the sample) and on June 18, 2020, for IT equipment (inclusion of a second electronics store).

Before turning to the results of our analysis, it seems appropriate to point out that there are considerable differences between collecting price data for official

[7] *The CPI is the national indicator measuring inflation in Austria for Austrian residents; the HICP follows an EU-wide, harmonized methodology facilitating cross-country comparison and measures inflation in Austria regardless of residency, i.e. also including the demand of foreign tourists in Austria. The underlying price data are the same for both indices but the weighting of goods and services differs.*

[8] *Before scraping their prices, the online shops were informed about our plans to collect their prices giving them the possibility to object to being scraped. For reasons of confidentiality, the names of these shops are not disclosed here.*

[9] *Product churn refers to the frequency at which products are replaced by similar products. The clothing sector typically features a high product churn as, each season, certain products are replaced by new products that are very similar to the incumbent products (e.g. products of the winter collection are replaced by products of the spring collection). This process is typically preceded by sales. The high rate of product churn in the clothing sector leads to an ever-decreasing price trend, which poses problems in analysis. We are currently working to develop methods to overcome these problems.*

[10] *Specifically, daily price changes are calculated at the individual product level and aggregated (without weighting) for the respective COICOP 5-digit groups to finally calculate a continuous index per 5-digit group. This index is normalized to 1 on the first day of observation. Further aggregation to the COICOP 3-digit level is then performed using HICP weights. To make price trends easier to read, our charts show five-day moving averages of the price indices.*

inflation statistics and webscraping online price data. We will discuss this point in more detail in section 2.4.

Finally, since we only just began webscraping online price data, many products and, especially, many services have not been included in our webscraping product basket yet. Many of the still missing product categories are, however, very important when it comes to headline inflation (e.g. services, energy). Hence, at least at this stage of our project, analyzed price developments are not necessarily representative for the whole basket of goods and services that households consume. For this reason, we refrain from calculating an overall rate of inflation from the results of our analysis.

2 Results

In the following subsections, we will first discuss developments in prices for food, beverages and meal delivery services and then developments in prices for medical products, personal care products and IT equipment. Moreover, we compare price developments according to our data with price developments according to the HICP as published by Statistics Austria, discussing potential reasons for differences in the results.

2.1 Food price development during the COVID-19 crisis

Based on anecdotal evidence, the Austrian media occasionally reported that some food and services prices went up during the weeks the first containment measures were in place in spring 2020.[11] Based on our data, we are able to investigate price developments since the beginning of April 2020 for at least part of the Austrian basket of goods and services.

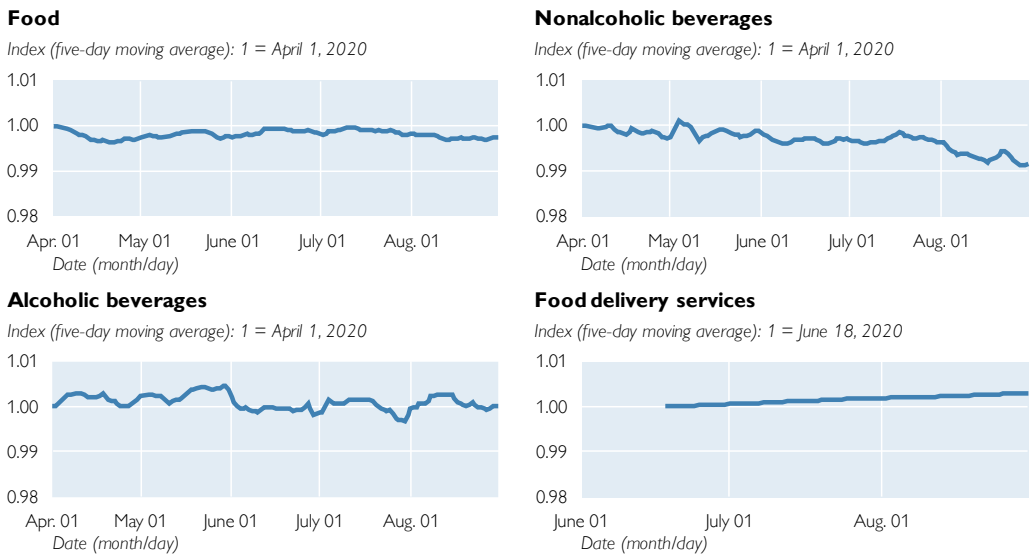
Chart 1 shows the development of the price indices for food and beverages. For these product categories, we find only minor price changes over the observation period. According to our data, food prices dropped slightly in the first half of April 2020 (by approximately 0.36%). During the second half of April and in May 2020, prices returned to their initial levels, before decreasing again in August. At the end of the observation period, i.e. August 31, 2020, overall food prices were approximately 0.25% lower than on April 1, 2020. To hide the high frequency movements of food prices, we also calculated monthly averages of the price indices. According to these monthly averages, food prices in Austria increased slightly from April to July 2020, before decreasing again in August and eventually returning to the level observed in April.

With regard to beverages, we see different developments in prices for alcoholic and nonalcoholic beverages. While prices for nonalcoholic beverages steadily decreased over the observation period, closing at levels that were 0.86% lower at the end of August than at the beginning of April 2020, prices for alcoholic beverages developed more ambiguously: During April and May 2020, they went up. Around June 1, 2020, however, they suddenly fell. As explained in the box below, this sudden change can (partially) be explained by the (anticipation of) the de facto abolition of the sparkling wine tax. Later, prices for alcoholic beverages followed

[11] *See e.g. Kronen Zeitung. 2020. Auf Todeswelle folgt Preislawine. May 6. https://www.pressreader.com/austria/kronen-zeitung-9qf1/20200506/281487868517835. The article reports price increases in Italy, in particular. The Italian consumer protection association Codacons observes strong price increases for agricultural products and transport services at the beginning of stage 2 of the containment measures in Italy, see https://www.kleinezeitung.at/international/corona/5809359/Lebensmittel-und-Reisen_Phase-2-in-Italien-brachte-saftige.*

Chart 1

Price indices



Source: OeNB.

an overall positive trend although two dips occurred at the end of June and July, respectively. Concerning monthly averages, we find that average prices for alcoholic beverages rose in April and May 2020. On average, they were 0.14% higher in May than in April. In June 2020, they were about 0.2% lower than in April; they increased again later and, at the end of the observation period, returned almost to the average levels observed in April.

Turning to online meal delivery services, we must note that such services, although increasingly popular, are not part of the COICOP as they are basically a combination of two different services: the preparation of the meal and its delivery. As these services are provided by two different companies, the price considered here is a composite price of two businesses. For online meal delivery services, we observe a monotonous and fairly smooth rise in prices from the beginning of the observation period (June 18, 2020) to end-August 2020. However, at roughly 0.3%, the change observed in meal delivery prices over the entire observation period was relatively small.

Box 1

Pass-through of tax cuts to online consumer prices[12]

In response to the COVID-19 crisis, the Austrian federal government introduced several tax changes. We can use our data to analyze the impact on consumer prices of two of these measures: the reduction, or de facto abolition, of the sparkling wine tax and the VAT change in the HORECA[13] sector.

On May 11, 2020, the Austrian government announced that the tax rate on sparkling wine would be set to zero from EUR 100 per hectoliter, starting on July 1, 2020. Before that date, the sparkling wine tax had been levied on sparkling wine, champagne and certain brands of Prosecco spumante if they were sold in bottles with sparkling wine stoppers fixed by a special holding device. Frizzante and slightly sparkling wines were not subject to this definition of sparkling wines.

For a standard bottle of sparkling wine (0.75l), the cut in the sparkling wine tax reduced the tax burden by EUR 0.9 per bottle (EUR 0.75 sparkling wine tax plus EUR 0.15 VAT) or EUR 1.2 per liter. Austria's revenue from the sparkling wine tax amounted to around EUR 24 million in 2019.

The supermarkets included in our dataset offer about 95 products that were subject to the sparkling wine tax. By comparing absolute prices observed in a period before the announcement of the tax cut (e.g. from April 16 to May 8, 2020) with those observed in the period beginning two weeks after its implementation (July 16 to July 26, 2020), we see that the median price of sparkling wines fell by EUR 1 per bottle. This price drop may be explained by the fact that supermarkets often set round prices or attractive prices (e.g. prices ending in 99 cents), which can only be preserved if prices per bottle are cut by exactly EUR 1. We find that the average price for a bottle of sparkling wine dropped by around EUR 0.67 (see table B1). As about 16% of the sparkling wines in our dataset do not show any price changes, the average price reduction is below the median price reduction. The median of the pass-through of the sparkling wine tax cut, i.e. of the proportion of the tax cut that is passed on to consumers as a price cut, amounted to 111% of the tax cut; the average amounted to 82%. One of the reasons for the disproportionate pass-through was probably the sharp drop in demand for sparkling wines as a result of the COVID-19 pandemic in combination with the relatively short shelf life of sparkling wine. According to our data, sparkling wines did not show significant price increases in August 2020. Hence, so far, the abolition of the sparkling wine tax seems to have had a lasting effect. In contrast, however, the prices of wines not affected by the sparkling wine tax were raised slightly at around the time the prices for sparkling wine were reduced. Since the HICP weight of sparkling wine is only 0.14%, the reduction of prices for sparkling wines is not expected to have any noticeable effect on the aggregate inflation rate.

In the HORECA sector, the VAT rate was reduced to 5% from the former rates of 10% for food and accommodation and 20% for beverages as of June 1, 2020. This tax cut was initially intended to be effective until December 31, 2020, but meanwhile, the government has announced that it will be extended to end-2021. Apart from applying to meals served in restaurants, the VAT reduction also applies to the pick-up and delivery of meals and open drinks that are normally consumed on site. It does not apply to meals bought in supermarkets or to packaged meals and drinks. The Austrian federal government explicitly announced that this VAT reduction was intended as a measure to support the HORECA sector, in particular to help businesses achieve greater liquidity. Therefore, it was not expected that this tax cut would be passed on to consumers by way of price reductions. Moreover, the Austrian Nationalrat (national council) adopted a resolution requesting that the subsequent VAT increase, which will most likely be implemented in January 2022, should not lead to higher prices.

Regarding meal delivery services, chart 1 (in the main text) suggests that the VAT reduction did not result in price drops, neither around the date when it came into force nor in the weeks that followed. On the contrary (as discussed in the main text), meal delivery prices even increased. Thus, the VAT reduction was not passed on to consumers but used by the companies – as the government had intended – to build up liquidity and shore up profits.

Table B1

Price change and pass-through of cut in tax on sparkling wine and champagne

	Median	Mean
Absolute price change (EUR)	–1.0	–0.7
Relative price change (%)	–8.3	–8.2
Pass-through (%)	111.1	82.3

Source: OeNB.

Note: Comparison periods: April 16 to May 8, 2020 and July 16 to July 26, 2020.

2.2 Development of prices for personal care products, medical products and IT equipment

The price indices for personal care products, medical products and IT equipment are presented in chart 2. As mentioned earlier, additional online shops entered the sample during the observation period, causing significant changes in the number of products in certain categories. Hence, the entry dates of these additional shops were treated as data breaks. The data breaks are indicated by black vertical lines in chart 2.

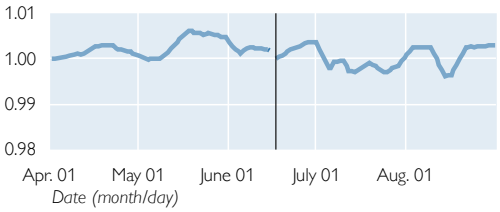
For personal care products, we find a rather steep price increase in the second half of May 2020 (+0.9%), which was followed by a price decline in June. Overall, from the beginning of the observation period until mid-June 2020, prices for personal care products went up by about 0.6%. After the data break in mid-June, they fell again – by a total of 1.3% until the end of the observation period. Compared to the other product categories analyzed, this decrease was the largest price change in the entire sample.

Chart 2

Price indices

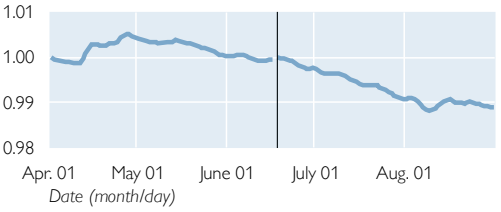
Medical products

Index (five-day moving average): 1 = April 1, 2020, and June 17, 2020



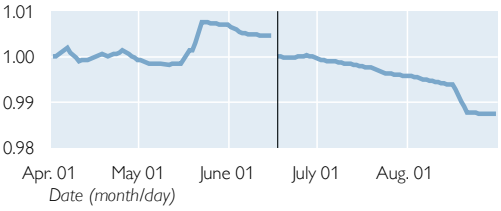
IT equipment

Index (five-day moving average): 1 = April 1, 2020, and June 18, 2020



Personal care products

Index (five-day moving average): 1 = April 1, 2020, and June 17, 2020



Source: OeNB.

Note: Black vertical lines indicate index rescaling due to data breaks.

Regarding medical products, we find a clear upward movement in prices around mid-May 2020, followed by a price decline that lasted until mid-June. Prices for medical products were found to be 0.2% higher in mid-June than at the beginning of the observation period. After the data break, when prices from an online pharmacy entered the dataset, medical product prices decreased in July 2020 before increasing again in August. Overall, at end-August 2020, prices for medical products were 0.26% higher than at the time of the data break in mid-June.

Finally, for IT equipment, we find that after an initial price increase during April 2020 (by about 0.5%), prices fell steadily until end-August. More specifically, prices dropped by about 1.2% from mid-June (right after the data break) until the end of the observation period at end-August 2020.

2.3 Comparison of webscraped data and HICP data

Table 1 compares price changes in the respective COICOP categories according to our webscraped data with price changes according to HICP data as published by Statistics Austria. To increase the comparability of the two data sources, we calculated the rate of change from the first to the last month of the observation period for our webscraped data, using only data from the 6th to the 12th day of these

months as this corresponds to the period in which Statistics Austria conducts its monthly price data collection.[14] As table 1 shows, price developments according to the two data sources are quite similar for the product categories of food and personal care products, while there are considerable differences for most other product categories. Most likely, these differences stem from methodological differences in data collection.

Webscraped price data differ conceptually from HICP data. The HICP contains price data for specifically selected products. These products are chosen according to the expenses of a representative household as determined every five years by the household budget survey. This means that the HICP only considers goods that are important to a representative household. Price data for the HICP are collected every month and a special focus is put on the continuity of data for each specific product. This approach also involves the special treatment of changes in the products that are offered. For example, when a store decides to stop selling a product, a comparable product has to be found to replace the incumbent product in data collection. Thus, HICP data are quite specific in the sense that they contain narrowly defined products.

Compared to HICP data, our webscraped price data are much more broadly defined since we collected data for all products that are being offered. Furthermore, we collected price data for different variants of each product. For instance, we did not focus on a specific type of flour that we define as being representative for all types of flour consumers buy. Instead, we collected data on any type of flour offered by the stores in our sample.

To sum up, the two data sources offer two different perspectives on inflation as they cover rather different parts of the price universe. Consequently, our results differ from HICP inflation statistics. More specifically, the differences depend on the similarity of the underlying products covered by the two data sources. As table 1 shows, the inflation rates calculated from both data sources are quite similar for

Table 1

Comparison of price changes based on webscraping and HICP data

	Webscraping[1, 2]	HICP[1]
Food	–0.1	–0.2
Nonalcohlic beverages	–0.6	0.3
Alcoholic beverages	–0.0	–1.7
Medical products (observation period: April to June 2020)	0.2	–0.5
Medical products (observation period: July to August 2020)	0.3	–0.0
Personal care products (observation period: April to June 2020)	0.5	0.2
Personal care prodcuts (observation period: July ro August 2020)	–0.4	–0.4
IT equipment (observation period: April to June 2020)	0.1	–1.4
IT equipment (observation period: July to August 2020)	–0.8	–0.0

Source: Statistics Austria, OeNB.

[1] *Change in monthly index over the entire observation period in %.*
[2] *The monthly index was calculated using the mean of the daily index from the 6th to the 12th day of the corresponding month.*

[14] *For medical products, personal care products and IT equipment, we performed this calculation separately for the period before the data break and for the period after the data break (April 6 to April 12, 2020 vs. June 6 to June 12, 2020; and July 6 to July 12, 2020 vs. August 6 to August 12, 2020).*

food, where webscraped price data and HICP price data are based on very similar product baskets. By contrast, the calculated inflation rates are rather different for medical products since for these, the respective product baskets differ substantially. Our webscraped data, for instance, do not contain prescription medication. Furthermore, for personal care products, medical products and IT equipment, we see that figures match better in the periods after the data break than in the periods before the data break. This potentially follows from the fact that the representativeness of the webscraped data increased as product variety augmented when we included additional stores in our sample.

While webscraped price data might be used in the future for nowcasting HICP inflation (see e.g. Macias and Stelmasiak, 2019), using different measures for inflation may be reasonable as well, especially in case of disruptive economic events. In case of the COVID-19 pandemic, for example, webscraped data offer timely and highly disaggregate information on price developments.

3 Conclusions

The COVID-19 pandemic and the accompanying policy measures have affected both the demand and supply side of the Austrian economy, and consequently also consumer prices, in multiple ways. The overall impact of the COVID-19-related economic shocks on the direction and magnitude of price changes is, a priori, not clear. To gain insights into price developments during the COVID-19 pandemic, the OeNB has collected price data from a number of online shops via webscraping since the beginning of April 2020.

Based on these webscraped data, we analyzed developments in the prices for certain product categories that became especially relevant during the COVID-19 crisis. For most products, the period of analysis stretched from April to August 2020. This relatively short observation period, however, does not allow for the calculation of year-on-year inflation rates and makes it difficult to interpret seasonal price patterns.

In brief, we observed the following price developments: Prices for food and alcoholic beverages changed only slightly over the observation period. Nonalcoholic beverages were about 0.9% cheaper at the end of August than at the beginning of April 2020. For meals delivered by the meal delivery service provider in our sample, we observe a steady – albeit small – price increase. Eventually, the prices of delivered meals ended up 0.3% above those observed at the beginning of the observation period. Regarding the fiscal measures intended to cushion the effects of the COVID-19 crisis, our data show that the abolition of the sparkling wine tax was passed on to consumer prices, whereas the VAT reduction for meals and drinks offered by restaurants and catering services did not result in price decreases for delivered meals.

Personal care products saw the largest price changes of all products in our sample. Prices went up by about 0.5% between April and mid-June 2020, before dropping again by about 1.3% until the end of the observation period. Prices for medical products increased slightly and for IT equipment we observe an overall small drop in prices.

When we compare our results with HICP data for the same COICOP categories, we find similar developments for food and personal care products, but considerable differences for the remaining categories, which might be attributable to

conceptual differences in product and store coverage. Webscraped data have both advantages and disadvantages when compared to the data underlying the CPI and HICP: On the one hand, webscraping collects price data for all products offered by the respective online shops, while only prices of precisely specified products are collected for the CPI and HICP. On the other hand, webscraped price data are only downloaded from a limited number of online shops, whereas for the CPI and HICP price data are collected from a broader variety of shops and types of businesses. Bearing this in mind, we find that inflation measures based on webscraped price data provide important information complimentary to HICP-based measures.

References

Baker, S., R. Farrokhnia, S. Meyer, M. Pagel and C. Yannelis. 2020. How Does Household Spending Respond to an Epidemic? Consumption During the 2020 COVID-19 Pandemic. NBER Working Paper 26949.

Beer, C., T. Messner and F. Rumler. 2020. Schwerpunktthema – Inflation aktuell Q2/20 – Haben sich die Preise im Onlinehandel während der COVID-19-Krise verändert? Eine Analyse basierend auf Webscraping-Daten. In: Inflation aktuell Q2/20.

Beer, C. and D. Prammer. 2020. Steuersenkungen und Pass-Through auf Preise in Österreich am Beispiel der Schaumweinsteuer und der Umsatzsteuer. In: Inflation aktuell Q4/20.

Macias P. and D. Stelmasiak. 2019. Food inflation nowcasting with web scraped data. NBP Working Paper No. 302.

Ritzberger-Grünwald, D. and F. Rumler. 2019. Challenges for measuring inflation in a digital world from a monetary policy perspective. In: Monetary Policy & the Economy Q3/19.

Statistics Austria. 2020. https://www.statistik.at/web_de/presse/123395.html.

Annex

Table A1

Sample description

Online shop	Sampling period		Goods covered in the following COICOP categories[2]
	Start	End	
Supermarket 1	April 1, 2020	August 31, 2020	Food, nonalcoholic beverages, alcoholic beverages, medical products, personal care products
Supermarket 2	April 1, 2020	August 31, 2020	Food, nonalcoholic beverages, alcoholic beverages, medical products, personal care products
Drugstore	April 11, 2020	August 31, 2020	Food, nonalcoholic beverages, medical products, IT equipment, personal care products
Electronics store 1	April 1, 2020	August 31, 2020	Nonalcoholic beverages, medical products, IT equipment, personal care products[3]
Electronics store 2	June 18, 2020	August 31, 2020	Medical products, IT equipment, personal care products[3]
Electronics store 3	August 10, 2020	August 31, 2020	Nonalcoholic beverages, medical products, IT equipment, personal care products[3]
Pharmacy[1]	June 17, 2020	August 31, 2020	Food, nonalcoholic beverages, medical products, personal care products
Meal delivery service provider	June 18, 2020	August 31, 2020	Not applicable
Clothing store 1	June 17, 2020	August 31, 2020	Personal care products[3]
Clothing store 2	April 10, 2020	August 31, 2020	Personal care products[3]

Source: OeNB.

[1] *From August 25, 2020, pharmacy data have been collected on a weekly basis only.*
[2] *The COICOP 5 categories represented in our analysis (including catering services categories represented by the meal delivery service provider) cover about 30% of the total Austrian HICP basket.*
[3] *Personal care products in clothing stores primarily comprise cosmetic and perfumery products; in electronics stores, personal care products comprise appliances (e.g. hair dryers). Medical products in electronics stores mainly comprise medical appliances (e.g. blood pressure gauges).*

Have mitigating measures helped prevent insolvencies in Austria amid the COVID-19 pandemic?

Claus Puhr, Martin Schneider[1]
Refereed by: Atanas Pekanov, Austrian Institute of Economic Research (WIFO)

We employ a novel modeling approach to capture the impact of the COVID-19 pandemic on sectoral insolvency rates in Austria. Turnover shocks derived from a macroeconomic scenario generate stress to firms' profits and cash flows. Over time, both the equity and the liquidity (cash and bank) positions deteriorate, which causes insolvencies if firms fall under certain thresholds. Our model builds on data for nonfinancial incorporated Austrian enterprises available from the BACH and SABINA databases. Since only two firm-level variables (equity ratio, cash and bank) are available at sufficient coverage, we generate a hypothetical firm-level dataset for 17 NACE 1 sectors by using a Monte Carlo simulation.

The granularity of our model allows us to assess the impact of mitigating measures implemented in light of the COVID-19 shock. Such measures serve to cushion the loss of companies' revenue and households' income triggered by the COVID-19 containment measures. Put differently, they are meant to minimize the damage resulting from the deliberate temporary reduction in economic activity. In our analysis, we only investigate measures aimed at firms. These measures include equity injections via grants and subsidies (e.g. short-time work), long-term payment deferrals (e.g. credit guarantees) and short-term payment deferrals (e.g. social security contributions). We used all available data sources to calibrate the mitigating measures, with August 31, 2020, as cutoff date.

The model indicates a marked increase of COVID-19-induced insolvency rates, but mitigating measures reduce such insolvencies substantially. Without mitigating measures, the insolvency rate would rise to 5.8% by the end of 2020, more than quintupling its pre-crisis average (2017–2019: 1.0%). By end-2022, 9.9% of all Austrian firms would fail, which corresponds to an annual insolvency rate of 3.3%. With mitigating measures in place, the insolvency rate is significantly lower, reaching 2.1% by end-2020, and 6.9% by end-2022.

Projected insolvency rates should be interpreted with caution. The merit of this novel approach, however, lies less in the calculated sectoral insolvency rates themselves, but in the model's capacity to compare and rank the efficiency and efficacy of various mitigating measures. As to the current measures, we, for instance, find that credit guarantees appear most effective, followed by fixed cost support and short-time work. In the short term, delayed filing for insolvency is most efficient, but is set to mostly reverse itself in 2021, once public institutions recommence their usual practice.

At the OeNB, the model has also been used to assess implementation delays and the extension of mitigating measures. We intend to continuously extend the model, both in terms of its core functionality and the calibration of mitigating measures to address questions from (1) a macroeconomic perspective, in particular the loss of productive capacities (potential output), (2) a fiscal policy perspective, to estimate the costs of mitigating measures, and (3) a macro- and microprudential banking supervisory perspective, to provide a basis for estimating credit default probabilities for the banking system.

JEL classification: C15, E47, G33
Keywords: insolvencies, bankruptcy, COVID-19 pandemic, forecasting, firm-level data

[1] *Oesterreichische Nationalbank, Supervision Policy, Regulation and Strategy Division, claus.puhr@oenb.at; Economic Analysis Division, martin.schneider@oenb.at.* *Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the OeNB or the Eurosystem. The authors would like to thank Dieter Huber, Michael Kaden, Doris Oswald, Christoph Prenner and Ralph Spitzer (all OeNB) for helpful comments and valuable support.*

The COVID-19 pandemic hit almost all countries worldwide in an unprecedented way. The supply side of economies was hit by measures implemented to contain the spread of the virus – lockdowns, business closures and social distancing – and by disruptions of global supply chains. At the same time, a drop in demand caused production to fall. Consumer demand was dampened by a combination of layoffs and heightened uncertainty about future income prospects. Investment decisions were hampered by extreme uncertainty about the path, duration and magnitude of the pandemic. These developments pose a serious threat to the survival of firms. Hence, the Austrian government has implemented a variety of measures meant to mitigate the negative economic impact on firms.

To assess the impact of these developments on sectoral insolvency rates, we developed a novel corporate insolvency model to forecast sectoral insolvency rates for Austrian firms and to assess the impact of the Austrian government's and other public institutions' mitigating measures.[2] The model is based on a simulated firm-level dataset that contains balance sheet, profit and loss as well as cash flow data. To our knowledge, we are among the first to develop such a model. There has, however, been some recent research that looks at how firms' liquidity position has evolved during the COVID-19 pandemic based on firm-level data.

The OECD (2020) evaluates the risk of a widespread liquidity crisis, using a cross-sector sample of almost 1 million European firms (Orbis database), and discusses the pros and cons of different kinds of public support measures. Without any policy intervention, 20% of the firms in the sample would run out of liquidity after one month, 30% after two months and 38% after three months. If the confinement measures lasted seven months, more than 50% of the firms would face a shortfall of cash, with this result mainly driven by the hardest-hit sectors. Among the broad range of measures introduced by OECD countries, direct and indirect wage subsidies seem to be the policy most critical to curbing the liquidity crisis, given the high share of wage costs in total spending. Adding up different policy measures (tax deferral, debt moratorium and wage subsidies at 80% of the wage bill), the simulation suggests that, after two months, government interventions would decrease the share of firms running out of liquidity from 30% to 10%, compared to the non-policy scenario.

De Vito and Gomez (2020) investigate to what extent COVID-19 might affect the liquidity of listed firms across 26 countries. They use consolidated firm-level data for the fiscal year 2018, obtained from the Compustat Global and North America databases. They stress-test three liquidity ratios for each firm with full and partial operating flexibility in two simulated distress scenarios. In addition, they study the impact of two different fiscal policies, namely tax deferrals and bridge loans. In the most adverse scenario, an average firm with partial operating flexibility would exhaust its cash holdings within about two years. About 10% of all sample firms would become illiquid within six months.

Guerini et al. (2020) simulate the COVID-19 impact on corporate solvency from a sample of 1 million French companies (FARE data 2017). They find that the share of firms with negative equity increases by 1.4 percentage points (from 1.8% in a world without crisis to 3.2%), which corresponds to an increase of almost

[2] *In addition to the government, Austria's health insurance providers (deferral of social security contributions) and the banking sector (debt moratoria) also introduced mitigating measures.*

80%. At the same time, they observe an increase of firms with liquidity problems from 3.8% to more than 10%.

Gourinchas et al. (2020) estimate the COVID-19 impact on business failures among small and medium-sized enterprises in 17 countries, using a large representative firm-level database (Orbis). They use a simple model of firm cost minimization and measure each firm's liquidity shortfall during and after COVID-19, arriving at a quasi-doubling of business failures: the non-COVID-19 bankruptcy rate of 9.4% rises to 18.2% amid the coronavirus pandemic, which reflects an 8.8-percentage-point increase. Schivardi and Romano (2020) propose a simple method based on firms' balance sheet data from the Orbis database and sectoral predictions of sales growth to determine the number of illiquid firms for Italy on a monthly basis. They find that, at the peak of the pandemic, almost one-third of the firms become illiquid. Carletti et al. (2020) use the Orbis dataset of 80,000 Italian firms to study the impact of the pandemic on firms' net worth. They find that 17% of the firms would have negative net worth by the end of 2020. What is unique in our approach compared to the cited studies above is our parsimonious approach to firm-level data, while we still model measures at a very granular level.

The paper is structured as follows. In section 1, we present a macroeconomic projection scenario at the sectoral level that is the main driver of stress for firms. In section 2, we present the mitigating measures implemented by the Austrian government and other public institutions. Section 3 explains the corporate insolvency model. In section 4, we discuss how we implemented the mitigating measures in the insolvency model. In section 5, we present the Monte Carlo approach that we use to simulate our firm-level data. Section 6 presents the results, and section 7 concludes.

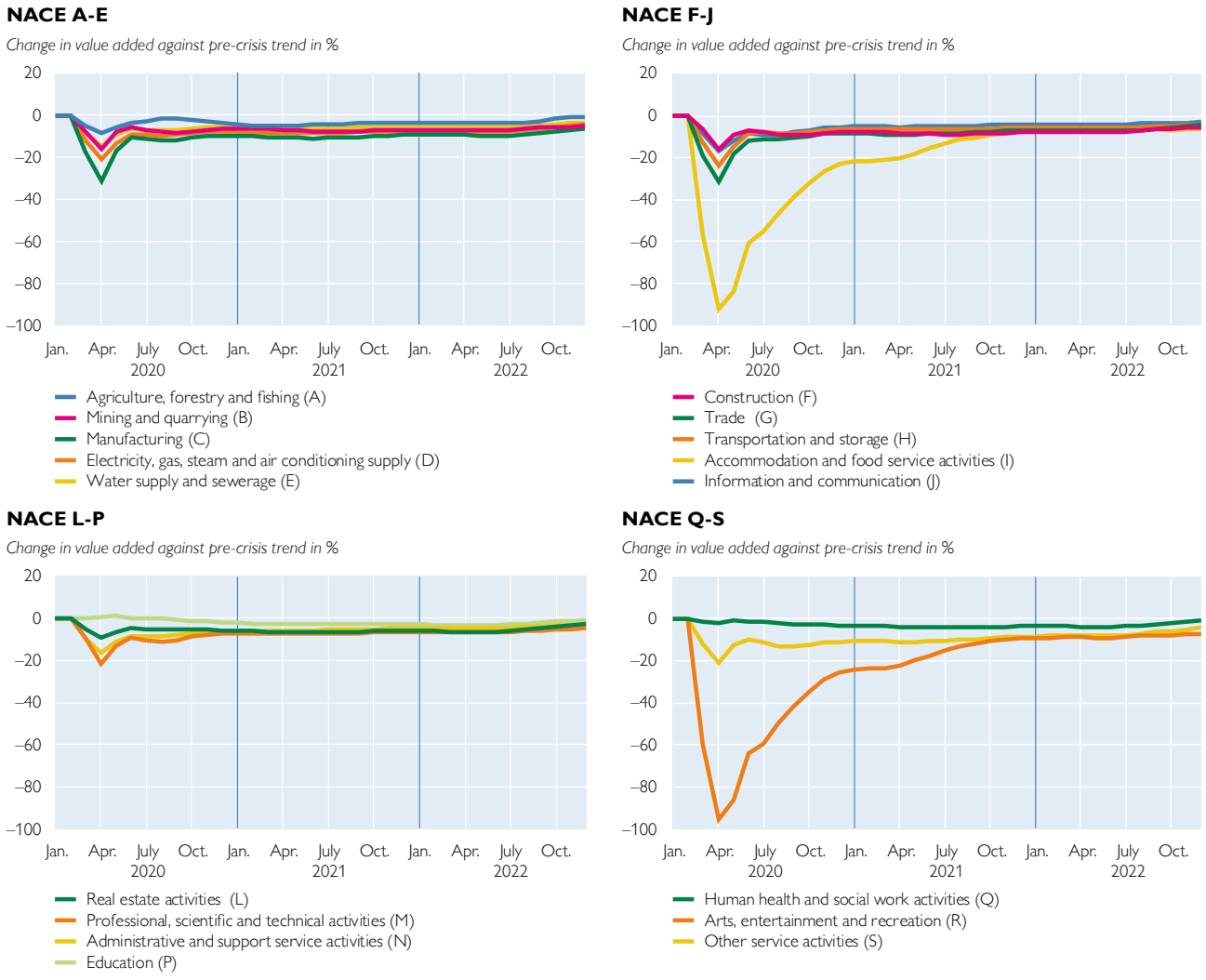
1 A macroeconomic projection scenario at the sectoral level

The macroeconomic scenario is the main driver of stress to firms. The impact of the COVID-19 pandemic on the economy is huge and unprecedented in combining negative supply and demand shocks. Our projection scenario is based on the June 2020 forecast of the OeNB. In this forecast, the OeNB expects real GDP to decline by 7.2% in 2020, followed by increases of 4.9% and 2.7% in 2021 and 2022. This forecast was produced based on quarterly national accounts data. Instead of projecting highly aggregated quarterly national accounts variables, we base the scenario spanning the period up to end-2022 on a monthly forecast of 13 demand components: 7 private consumption components (food and beverages; housing (including energy and water); clothing, footwear and furnishings; recreation, sports and culture; restaurants and accommodation services; transport; other consumption), 2 investment categories (construction, other investment), 2 export categories (tourism, other), government consumption and changes in inventories. We map the 13 demand components to the 74 goods categories of an input-output model that we developed for this purpose. We use this model to calculate the effects this demand shock has on the output of all 74 industries due to intermediate goods linkages.

The results of our projection scenario for the NACE-1-digit sectors can be found in chart 1 and table A1. Two sectors clearly stand out. Arts, entertainment and recreation (NACE R) and accommodation and food service activities (NACE I) are expected to suffer output losses of 46% and 43%, respectively, relative to the

Chart 1

COVID-19 impact on the Austrian economy



Source: OeNB.

pre-crisis trend in 2020. Manufacturing (–12%), trade (–12%), other service activities (–11%), professional, scientific and technical activities (–9%), electricity, gas, steam and air conditioning supply (–9%) and administrative and support service activities (–8%) will also be hit to a considerable extent. The reported output loss figures relate to the mean loss over all firms of each sector.

In addition, even within the same sector, the shock will impact firms differently. To account for this, we assumed that, for individual firms within each sector, the shock is distributed according to a normal distribution. This assumption allows us to model various effects more realistically, and it is an outright necessity to address fixed cost grants properly. The mean of the distribution equals the shock

size per sector for each period. We calibrated the variances based on the heterogeneity of the sector and the shock magnitude.[3]

2 Mitigating measures

Mitigating measures serve to cushion the loss of firms' revenue and households' income triggered by the COVID-19 containment measures in order to minimize the damage from the deliberate temporary reduction in economic activity. In our analysis, we investigate measures aimed at firms.[4] These include fiscal measures by the Austrian government and other legislative measures as well as private initiatives, such as private bank moratoria. For the purpose of this paper, we classify them, within our model, by their mechanics. We distinguish between equity injections via grants and subsidies (e.g. short-time work), long-term payment deferrals (e.g. credit guarantees) and short-term payment deferrals (e.g. social security contributions). We used all available data sources to calibrate the mitigating measures (see figure 1). Where we had no data on the actual use, we assumed that all eligible firms apply to maximize payouts. Note that August 31,2020, is the cutoff date for all mitigating measures and associated reporting included in this analysis.

We are now going to briefly describe each of the four categories of mitigating measures.

Figure 1

Overview of mitigating measures

	Characteristics			2020				2020				2020			
	Available *EUR billion*	By whom	In model *EUR billion*	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Capital injections via grants and subsidies															
Fixed cost support (FKZ)	8	Government	3.4												
Fixed cost support 2 (FKZ II)	12[1]	Government	7.8												
Short-time work	11	Government	11												
Sector-specific measures	0.6 + 0.5	Government	0.6 + 0.5												
Long-term deferrals of payment obligations															
Credit guarantees	16	Government/	7.6												
Debt moratoria	n. a.	Banks	1.9[2]												
Short-term deferrals of payment obligations															
Reduction of corporate tax advance payments	n. a.	Government	0												
Deferral of social security contributions	n. a.	Social security	3.0 (peak)												
Delayed insolvency filing due to deferral	-	Social security	-												
Changes to the insolvency regime															
Temporary change to the insolvency law	-	Government	-												
Suspended bankruptcy filings (public sector)	-	Social security	-												

Source: Authors' compilation.

[1] *Including fixed-cost support (FKZ).*
[2] *Actual long-term liquidity support.*

[3] *An additional criterion was that the share of firms with output losses during the shutdown phase above 100% (for which we set the loss to 100%) is lower than 1%.*

[4] *There are several other mitigating measures in place, most importantly the hardship fund, which, however, do not specifically address firms. For this reason, we excluded them from our analysis.*

2.1 Capital Injections via grants and subsidies

Financing of fixed costs for particularly hard-hit industries[5]

With the initial funding guidelines for grants for fixed costs (Fixkostenzuschuss-Richtlinie – FKZ) and their extension (FKZ II), the Austrian government introduced grants to cover firms' operating costs. Such grants are awarded to companies that have suffered a loss in sales of at least 40% (FKZ) or 30% (FKZ II). The fixed cost subsidy is staggered and capped depending on the turnover loss. In addition, several eligibility criteria are meant to ensure that firms that came into trouble because of the COVID-19 containment measures may apply, but not firms that were already struggling before. The overall volume of this measure amounts to EUR 12 billion.

COVID-19 short-time work[6]

The COVID-19 short-time work allowance is a modification of an instrument that was already used during the financial crisis. It was initially designed for a duration of three months (phase 1: until the end of June 2020), with an option to extend it by another three months (phase 2: until the end of September 2020). In July, the Austrian government extended the short-time work scheme by six months until the end of March 2021 (phase 3). Under this scheme, employees receive income support amounting to between 80% and 90% of their previous net wage or salary. The amount depends on their original net wage or salary and is capped at the maximum contribution basis for social security. During the first two phases, it was possible for firms to reduce employees' working hours – and thus remuneration – by 10% to 90%. In phase 3, working time may be reduced by 20% to 70%.

Sector-specific measures[7]

The support package for hospitality venues such as restaurants ("Wirtshauspaket"), which amounts to EUR 500 million, combines tax relief with measures aimed at stimulating demand. The emergency aid for the tourism sector includes bridge financing of up to EUR 100 million for domestic tourism. The overall volume of support measures comes to EUR 600 million.

[5] *Fixed cost support is based on Article 3b paragraph 3 of the Act establishing a government-owned holding company for wind-down purposes (Bundesgesetz über die Einrichtung einer Abbaubeteiligungsaktiengesellschaft des Bundes – ABBAG; Federal Law Gazette I No. 12/2020), and two guidelines, namely guidelines for grants for fixed costs (phase 1) (Fixkostenzuschuss-Richtlinie, Federal Law Gazette II No. 225/2020) and guidelines for grants for fixed costs (phase 2)(Fixkostenzuschuss-Richtlinie 800.000, Federal Law Gazette II No. 326/2020).*

[6] *Short-time work is based on Article 37b Public Employment Service Act (Arbeitsmarktservicegesetzt – AMSG; Federal Law Gazette I No. 71/2020).*

[7] *The measures supporting restaurants are mainly based on a temporary tax relief granted pursuant to Article 28 paragraph 52 VAT Act 1994 (Federal Law Gazette I No. 60/2020).*

2.2 Long-term payment deferral

Credit guarantees[8]

The Austrian government introduced several measures to provide support by guaranteeing new loans. Note that the new framework was put on top of existing structures and their guarantee products. As at end-August 2020, eight different guarantee schemes had been designed, each with its own terms and eligibility criteria. The overall volume of earmarked guarantees amounts to EUR 15 billion. By end-August 2020, Austrian companies had drawn roughly EUR 6 billion of this amount according to data reported to the OeNB (EBA, 2020b).

Debt moratoria[9]

While the Austrian government also introduced a legislative moratorium on bank debt, eligibility restrictions mostly exclude incorporated firms. However, a private, i.e. nonlegislative, sector-wide debt moratorium (EBA, 2020a) peaked at EUR 14 billion (of affected credit volume) in June 2020, according to data reported to the OeNB (EBA, 2020b).

2.3 Short-term payment deferral

The Austrian government agreed on a tax relief package that contains various measures, including a reduction of 2020 corporate tax advance payments to zero, and a deferral of social security contributions. Since we focus on firms that suffer losses and hence face bankruptcy risk, we do not consider the former measure in our model. The deferral of social security contributions, by contrast, has an impact on all firms. Firms directly affected by the lockdown measures were automatically selected for the (interest-free) deferral for the period from February to April 2020. Other firms with COVID-19-related liquidity problems can apply for this measure. From August to December 2020, all firms can apply for an additional three-month deferral. Firms must pay the contributions until mid-January 2021. In case of persistent payment difficulties, they can also apply for payment in eleven installments, beginning in February 2021. Interest must be paid for all post-April 2020 contribution periods.

2.4 Changes to the insolvency regime

The Austrian government also introduced a temporary change to the Austrian insolvency law.[10] From April to October 2020, overindebtedness was suspended as a basis to open insolvency procedures. In addition, tax authorities and public health insurance providers agreed to suspend bankruptcy filings from March to May 2020.

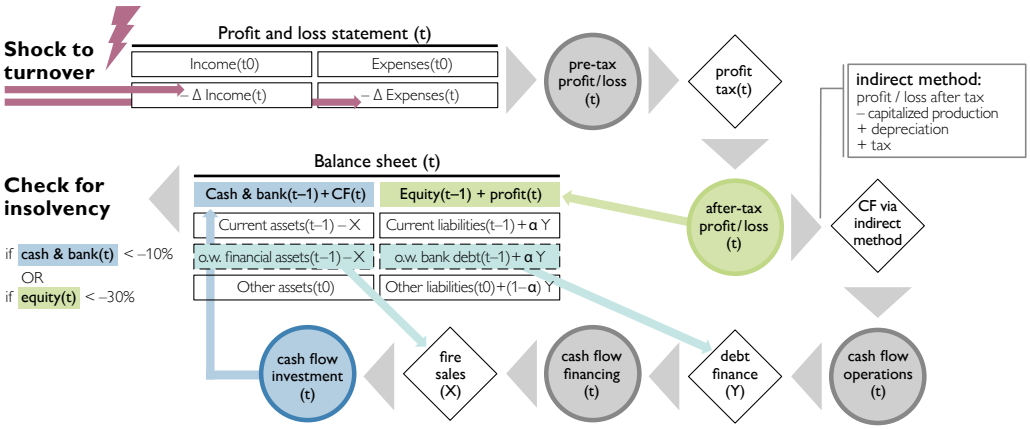
[8] *Credit guarantees are based on three different laws and extended by COFAG, the Austrian COVID-19 financing agency, pursuant to Article 6a paragraph 2 of the Act establishing a government-owned holding company for wind-down purposes (Bundesgesetz über die Einrichtung einer Abbaubeteiligungsaktiengesellschaft des Bundes – ABBAG; Federal Law Gazette I No. 12/2020); austria wirtschaftsservice (aws), a state-owned bank providing funding for Austrian companies, pursuant to Article 1 paragraph 2a Guarantee Act 1977 (Federal Law Gazette I No. 23/2020); the Austrian Hotel and Tourism Bank ÖHT and aws, pursuant to Article 7 paragraph 2a SME Promotion Act (Federal Law Gazette I No. 16/2020).*

[9] *The public debt moratorium is based on Article 2 2nd COVID-19 Act (Federal Law Gazette I No. 58/2020), the private sector-wide debt moratorium is based on EBA (2020a).*

[10] *The insolvency moratorium is based on Article 9 2nd COVID-19 Act (Federal Law Gazette I No. 58/2020).*

Figure 2

Stylized overview of the insolvency model without mitigating measures



Source: Authors' compilation.

Note: CF stands for cash flow, and o.w. for of which.

3 The corporate insolvency model

Figure 2 shows a stylized version of the corporate insolvency model. For each firm, the model considers that firm's profit and loss statement, its cash flow statement and its balance sheet. We simulate 100,000 firms per sector and calculate the effects of sector- and firm-specific shocks to profitability and, subsequently, liquidity, with liquidity being a function of a firm's profitability and balance sheet characteristics. We evaluate on a monthly basis whether firms fall below specific thresholds for solvency or liquidity, which triggers insolvency. This section explains the model in more detail. The model equations can be found in annex 2.

3.1 Profit and loss statement

A turnover shock in period *t* derived from a macroeconomic scenario generates stress to firms' income that can only be partly offset by a reduction in expenses. We stress financial income in line with the sectoral turnover shock and account for production-related costs and various fixed costs, including interest payments and depreciation. A crucial part here is the calibration of firms' responses to a fall in turnover.

In our simulation experiment, firms react by reducing their nominal cost components. We do not distinguish between the reduction of the quantity of the cost components and their prices. We do this by calibrating response elasticities of the different cost components with respect to changes in turnover (see table A2 in annex 1). Such an elasticity describes the percentage decline of a cost component relative to the percentage decline of turnover. We distinguish between cost components that are (partly or completely) related to the volume of production and cost components that are fixed in the short run. The costs of intermediate goods are directly related to the volume of production, which suggests an elasticity of 1. Due to firms' contractual obligations, we assume a slightly lower elasticity of 0.9 for all industries. Expenses for external supplies and services (e.g. maintenance of plants and buildings or the consumption of energy and water) are only partly

related to the volume of production. Hence, we assume an elasticity of 0.5 for all industries. For staff costs, we use data on unemployment and on the take-up of short-time work. We calculated sector-specific elasticities by dividing the cost savings (in % of the total wage bill), derived from laying off workers and receiving payments for short-time work at the beginning of May 2020, by the decline of turnover in April 2020. In the scenario without short-time work, we assumed that firms lay off 50% of the workers for whom they, in fact, used short-time work.

Income and expense positions at time t are calculated as changes versus the starting value *t0*. This yields a new pre-tax profit, which is booked against equity (from *t–1*). In case of a positive pre-tax profit, we tax it with the implicit corporate tax rate of 15%.[11]

3.2 Cash flow statement

We derive the operating cash flow of each firm in period *t* based on the indirect method, which uses the pre-tax profit as a starting point, and adjust it for all noncash transactions. In our case, we account for capitalized production and depreciation/amortization but exclude any other structural changes of the balance sheet, such as a decrease (increase) in accounts receivable or a decrease (increase) in inventories. These simple accounting identities yield the net cash flow from operating activities.

For the cash flow impact of financing activities, we solely focus on refinancing bank debt. As we take the starting balance sheet structure as a given, we do not account for the possibility of firms' access to new credit in the standard model. For refinancing, we introduce active banks. Any given firm with an equity ratio above zero is assumed to refinance its current bank debt, i.e. maturing bank debt and installments. To reflect the repayment of loans, firms do not refinance 100% but only 80%. We use this rate to match the historical ratio of interest to principal payments (see Schneider and Waschiczek, 2018).

Firms with an equity ratio of zero or less, however, will not be able to refinance their current bank debt. Yet, they will be able to use undrawn credit lines, which are significant according to data reported by banks to the OeNB. Hence, in our model the impact on firms' cash flow is 80% of the simulated current bank debt position.[12]

Finally, we assume that firms' debt profile is stable over time, i.e. repayment is spread evenly across months for the first year, and current bank debt in the second and third year resembles current bank debt at *t0*. No other firm behavior is considered for calculating the cash flow after financing.

For the cash flow impact of investment activities, we take an even more restrictive approach. In line with the static balance sheet assumption, we assume that firms do not invest. There is one important exception: firms with a negative cash flow (first occurrence) can divest. The result is an unrealistic evolution of surviving

[11] *While 15% does not match Austria's statutory corporate tax rate of 25%, aggregate simulation results without a turnover shock based on the lower figure match the historical tax rates (measured as a share of the total balance sheet) of the BACH time series.*

[12] *Undrawn credit lines are part of banks' supervisory reporting to the OeNB (previously for the central credit register, now granular credit data reporting or GCR). It is, however, not possible to directly match the BACH/SABINA databases with banks' reporting. Hence, the calibration of 20% – while broadly matching aggregates – has to be considered experimental or preliminary.*

firms' balance sheets, but as we are mostly interested in the insolvency rates at this stage, investments would hardly play a role. As far as divestments go, firms can only sell current other financial assets (restrictive), but they can sell at book value at short notice, i.e. without an additional equity impact due to a fire sale haircut.[13] Additional cash flows from divestment leave us with the cash flow after investments, which is used to update the cash and bank position in each firm's balance sheet.

3.3 Balance sheet

Broadly speaking, we model three categories of assets and liabilities: first, the buffers against insolvency, i.e. an aggregate liquidity position (cash and bank) on the asset side and an equity position on the liability side (equity). Second, we include current assets and liabilities, broken down into three subcategories to model firms' cash flows. However, at this juncture, only current other financial assets (available for divestment) and current bank debt (that needs to be refinanced) are considered in our model. Third, we combine all other assets and liabilities, respectively, as they do not yet play a role in our model.

3.4 Insolvency thresholds

Both in general and according to Austrian insolvency law, corporate insolvencies can be triggered either by overindebtedness or illiquidity. To reflect these two dimensions in our model, we consider the equity and the aggregate cash and bank positions relative to total assets as best measure, respectively. We introduce two separate thresholds, namely –30% for the equity ratio and –10% for the liquidity ratio, i.e. cash and bank, to flag insolvency. A firm becomes insolvent if it falls below one of these thresholds, and the firm remains insolvent even if future profitability leads to a return above the threshold. While the threshold for overindebtedness is well justified by empirical evidence[14], the foundation for the illiquidity threshold is weaker. We use a negative liquidity threshold (instead of zero) since the firms can rely on undrawn credit lines from banks.

4 Implementation of the measures in the insolvency model

Figure 3, which adds mitigating measures to figure 2, shows how the above-mentioned measures are implemented in the model. Note that the current calibration assumes maximum efficiency for all stakeholders: firms know when they are eligible for a measure and apply right away and the institutions charged with executing the measures pay out immediately.[15] This section explains the calibration in more detail.

4.1 Capital injections via grants and subsidies

The *fixed cost grant* can be implemented easily, as both the eligibility criteria and the subsequent payouts are codified in law: the criteria as thresholds for lost turn-

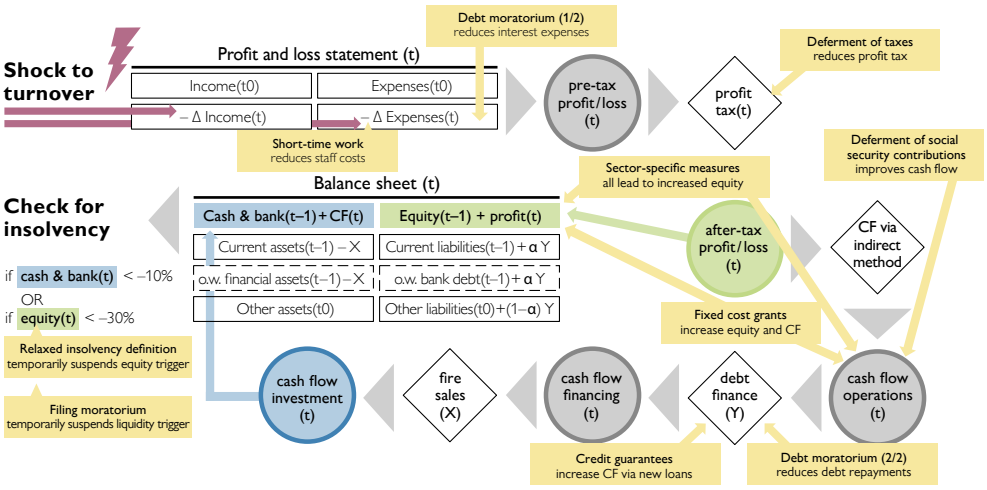
[13] *Of all the assumptions in our model, these probably have the weakest economic foundation and need to be considered purely ad-hoc-ish.*

[14] *We set the overindebtedness threshold at –30% for two reasons: (1) based on this threshold, we replicated recent insolvency rates per sector at the starting point, and (2) cross-country empirical studies show that the equity ratio commonly associated with insolvency ranges from –30% to –35% (see Davydenko, 2007).*

[15] *One of the next model development steps is to relax this assumption and to replace it by more realistic assumptions based on experience gained with the measures.*

Figure 3

Stylized overview of the insolvency model with mitigating measures



Source: Authors' compilation.

Note: CF stands for cash flow, and o.w. for of which.

over for a period of up to three months, namely from mid-March to end-July 2020 (phase 1 or FKZ), or up to four months, namely from June 2020 to mid-March 2021 (phase 2 or FKZ II), and the payouts as a share of fixed costs. Grants are not mutually exclusive, i.e. firms can apply for FKZ and FKZ II. They must, however, provide proof that they did not request support for the same expenses twice. In the insolvency model, we include these payout shares for the BACH positions operating charges and interest expenses. As some optionality is included, firms that apply for fixed cost support maximize payout. Nevertheless, of the overall FKZ volume, less than EUR 4 billion, or half of the endowment, is paid out in our simulation. This changes with FKZ II, when more than EUR 11 billion (of 12) are paid out. The payouts are modeled as even shares from the month after the first possible application to one month after the application deadline.

The impact of *short-time work* on staff costs is based on data on the take-up of short-time work as explained above. Short-time work reduces staff costs and hence directly impacts on profits. Payout is assumed to be immediate.

Given the multitude of transmission channels of the measures sketched out above and the lack of eligibility criteria, we treat *sector-specific measures* as an equity injection to all firms of a given sector and calibrate the volume as a share of turnover. A 2.5% share of turnover leads to a payout of EUR 600 million across all firms of the sector. Payout is again immediate.

4.2 Long-term payment deferral

At end-August 2020, eight different *credit guarantee schemes* were in place. In our model, we cannot replicate them given the current granularity of simulated data. Hence, our modeling strategy relies on broader, common characteristics of the guarantees that are applied evenly across all firms. A firm will apply for a guaranteed loan the first time it faces a negative cash flow in an observation period. In line

with most guarantee schemes, the credit-issuing bank will vet the applicant firm and only grant credit in case of a positive equity ratio (the same criterion is applied for rolling over credit). However, these restrictions are still too soft and would result in the issuance of guaranteed credit of more than EUR 32 billion. This figure is more than twice the overall volume available or four times the guarantees that have been granted to incorporated firms by end-August 2020. Consequently, we introduce a random approval rate of between 40% and 70% to match data that are available on a monthly basis. Payout is immediate.

Debt moratoria somewhat resemble credit guarantee schemes. Again, we have to make some broad-based assumptions in light of the different types of moratoria and, even more so, the lack of details regarding private moratoria. However, the OeNB disposes of reporting data – from April 2020 onward – that shed light on the use of debt moratoria. To match these data, we apply the following rules: any firm that makes a loss in April 2020 (worst monthly turnover shock for all sectors) applies for this measure. 15% of applicants are granted relief from interest and principal payments from April to June 2020. From July to December 2020, the moratoria are phased out in equal steps, which we calibrated based on data reported for July and August 2020. Payout is again immediate.

4.3 Short-term payment deferral

The deferral of corporate tax payments has no effect on insolvency rates in our model, since only firms with a negative profit can become insolvent. While impacting on the cash flow, the deferral of social security contributions has no impact on profits, since incorporated firms must use the accrual principle when preparing their balance sheet. The filing moratorium was implemented such that 50% of illiquidity-induced insolvencies are not triggered for the year 2020. This reduced share equals the share of filed bankruptcies seen by tax authorities and public health insurance providers in normal times. Moreover, it is assumed that these institutions postpone their filings further as firms are offered the option to apply for payment in installments until end-2021. For this reason, we phase out the 50% in equal steps from February 2021 onward. This is meant to reflect a lack of filing opportunities due to the deferral of payments and administrative red tape. In other words, not all insolvencies can be immediately filed in February 2021, when the first deferred social security payments will become due.

4.4 Changes to the insolvency regime

We model the temporarily relaxed insolvency law by excluding the overindebtedness trigger from April to June 2020.

5 A Monte Carlo exercise to simulate firm-level data

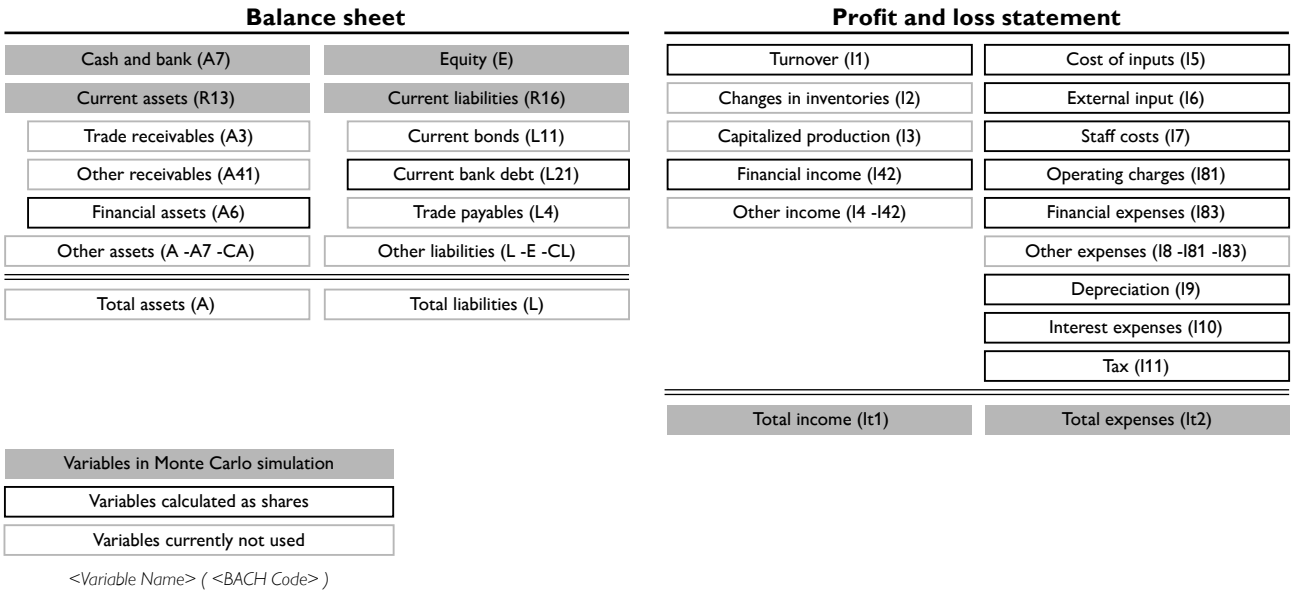
The model builds on a firm-level dataset for nonfinancial incorporated Austrian enterprises with 18 firm-specific variables[16] for 17 NACE-1 sectors.[17] We use data

[16] *See table A3 in annex 1 for a detailed description of the variables.*

[17] *Although the firm-level data set has been constructed for incorporated firms, the projected sectoral insolvency rates hold for all firms of a sector. The reason is that we have calibrated the model to fit sectoral historical insolvency rates. The firm-level data set gives information on the structure of the balance sheet and the profit and loss account only, but not on the size of the firms. We make the simplifying assumption that all firms within a sector have the same size.*

Figure 4

Variables of the firm-level dataset



Source: Authors' compilation.

from the BACH[18] and SABINA[19] databases to construct this dataset. Since only two variables at the firm level (equity ratio, cash and bank) are available to a sufficient extent in the SABINA database, we generate a hypothetical firm-level dataset. To this effect, we proceed in two steps. First, we simulate a firm-level dataset for six core variables (equity ratio, cash and bank, current assets, current liabilities, total income, total expenses) by means of a Monte Carlo method[20]. These core variables are shaded in gray in figure 4. Second, we calculate all other variables used (black font) as shares of the simulated variables on a sectoral basis.

What we need to perform the Monte Carlo simulation is the distribution of each variable over all firms in that sector and a covariance matrix that describes the joint distribution of all variables. We use a copula[21] approach, since it provides a flexible way to separately model the dependence structure between the variables and the marginal distributions (McNeil et al., 2015).

The first step of the Monte Carlo simulation is to estimate marginal distributions for all variables. For the equity ratio and cash and bank, we draw on firm-level data that are available in the SABINA database for more than 110,000 firms.

[18] *BACH is a database of aggregated and harmonized accounting data of nonfinancial incorporated enterprises of 13 European countries. It contains over 100 variables for 17 NACE sections, about 80 NACE divisions and 4 firm size classes (https://www.bach.banque-france.fr/?lang=en). Besides the weighted mean, data for the quartiles of the distribution for each variable are available.*

[19] *The SABINA database contains firm-level accounting data compiled by Bureau van Dijk for more than 130,000 Austrian firms.*

[20] *Monte Carlo simulation is a mathematical technique that generates random variables for modeling risk or uncertainty of a certain system. The random variables or inputs are modeled based on probability distributions such as normal or gamma distributions.*

[21] *A copula is a multivariate cumulative density distribution for which the marginal distribution for each variable is uniform.*

Table A4 in annex 1 shows some statistics of the equity and cash and bank ratios from the SABINA database. The other four core variables (current assets, current liabilities, total income, total expenses) are taken from the BACH database, which contains aggregated data for the weighted mean and for the quartiles. We use the weighted mean and the first quartile to estimate the distributions for these variables. We assume a normal distribution for total income and total expenses and a gamma distribution for current assets and current liabilities.

Using a copula makes the simulation an easy task. For each sector, we generate 100,000 draws from a multivariate normal distribution $X = N(0,1,\sigma)$. Therefore, we need a correlation matrix that describes the dependencies between the variables. Since we have no micro data to estimate this matrix, we use correlations over time between the means of pairs of variables as a proxy. We then compute the cumulative density function (cdf) of this multivariate normal distribution, which is uniformly distributed in the interval [0,…,1]. The final step involves specifying the inverse cumulative density function for each variable. We can use any distribution family if we are able to compute the inverse cdf. For the equity ratio and cash and bank, we use the inverse cdf of the data[22]. For the other variables, we either use the inverse normal or the inverse gamma cdf.

Our simulated dataset has all the properties that we need to perform our analysis (marginal distributions that are identical to the estimated distributions and a correlation structure that is given by the estimated correlation matrix[23]). The blue lines in chart 2 show the simulated marginal distributions for our six core variables for manufacturing (NACE C). For the equity ratio and the cash and bank ratio, we also plotted the empirical distributions (red line). Four points are worth mentioning. First, our simulation approach effectively reproduces the empirical marginal distributions. Second, the distribution for the equity ratio is far from normal, which highlights the importance of the availability of firm-level data for this variable[24]. Third, a considerable share of firms has negative equity in 2018 (14% for manufacturing, 17% across all sectors). Fourth, we removed firms with equity of less than –30% from our dataset since such firms are insolvent according to our definition. It is evident from the panels in chart 2 that some firms have an equity ratio of below –30% (and some of above 100%). This is because the panels are based on a kernel density estimator, which smoothens the distributions.

6 Results

The model indicates a marked increase of insolvency rates, with mitigating measures reducing COVID-19-induced insolvencies more strongly in the short than in the medium term. Without mitigating measures, the insolvency rate would rise to 5.8% at the end of 2020, reaching more than five times its pre-pandemic

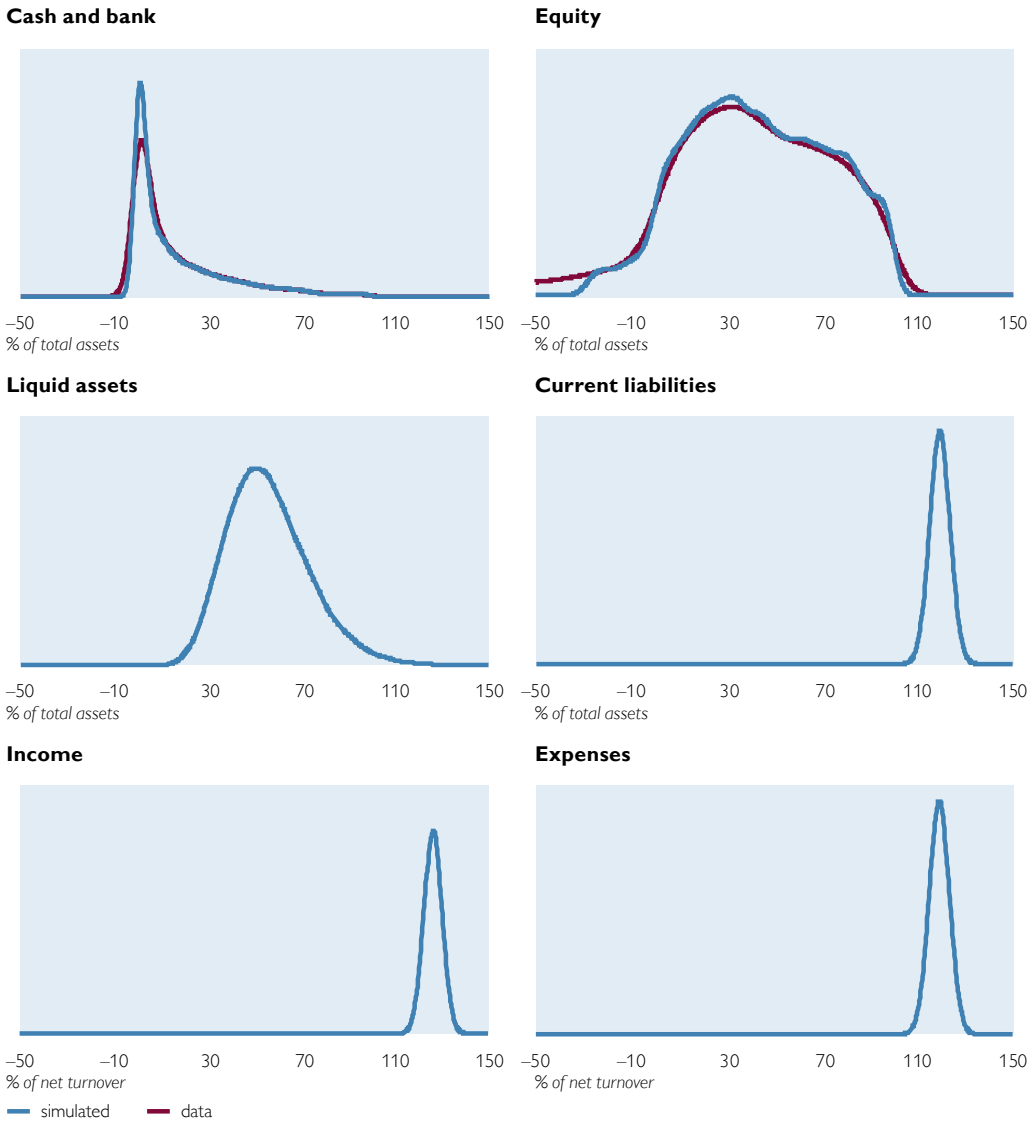
[22] *In this case, the inverse cdf simply involves referring to the i*Nth element of the sorted data, where i is the uniformly distributed value of the simulated copula for that variable and N the number of firms.*

[23] *Note that the copula approach does not allow to exactly reproduce the correlation structure for all families of marginal distributions other than normal distributions. What can be reproduced exactly is the rank correlation matrix. However, the error is marginal for our data.*

[24] *It would be possible to construct the firm-level dataset with variables from the BACH database only. However, according to SABINA firm-level data, the distribution of the equity ratio deviates considerably from a normal distribution for most sectors. For the cash and bank ratio, the distributions are very similar to a gamma distribution for all sectors.*

Chart 2

Marginal distributions of the simulated dataset for manufactoring (NACE C)



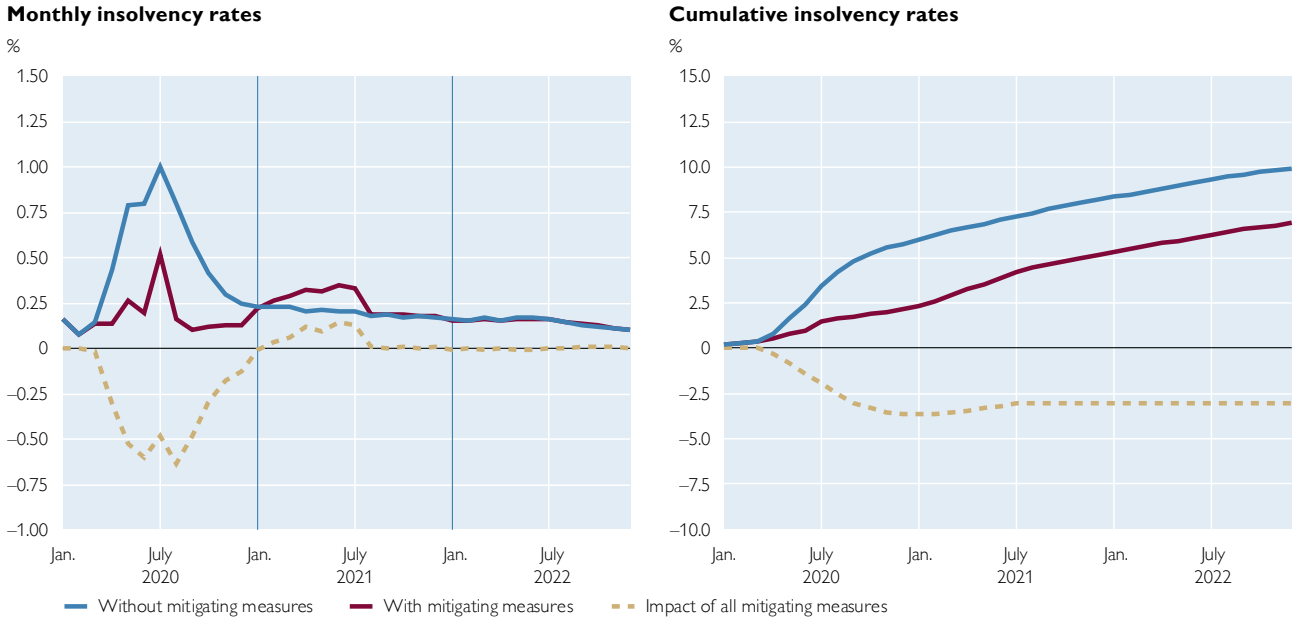
Source: Authors' calculations.

average (2017–2019: 1.0%). By end-2022, 9.9% of all Austrian firms would fail, which corresponds to an annual insolvency rate of 3.3%. With mitigating measures in place, the insolvency rate is significantly lower, reaching 2.1% by end-2020[25]

[25] *By the time of publication, the historically low realised insolvency rates according to KSV data end up well below our model results. The explanation is two-fold: (i) the underlying macroeconomic scenario underestimated the economic rebound in Q3 2020, particularly for the hardest hit sectors (most importantly NACE I but also R, i.e., accommodation and food service activities and arts, entertainment and recreation). Including a scenario with the Q3 rebound in the model would drive down insolvency rates significantly, however, not to the empirically observed levels. (ii) is based on economic intuition and anecdotical evidence: in light of an expanding set of mitigating measures – and the corresponding hope to turn things around – firms do not have any incentives to open insolvency proceedings right now (which is corroborated by anecdotical evidence). As for our models predicted insolvency rates, given what we know now – at the time of publication – they are indeed too high for 2020, but should not fall to empirically observed levels, because firms' strategic behaviour indicates a back log of future insolvencies.*

Chart 3

Impact of COVID-19 and of all mitigating measures on Austrian firms' insolvency rates



Source: Authors' calculations.

and 6.9% by end-2022. Such measures therefore help reduce additional, COVID-19-induced insolvencies by two-thirds in 2020 and by one-third by end-2022. For the aggregate economy, chart 3 shows monthly insolvency rates without (solid blue line) and with mitigating measures (solid red line), as well as the difference (dotted yellow line) for both monthly insolvency rates (left panel) and the cumulative insolvency rate (right panel).

As is evident from chart 3, at the height of the COVID-19-induced lockdown in the second quarter of 2020, even mitigating measures could only reduce the impact on insolvency rates so far. Yet, the substantial support offered to firms in the second half of 2020 brings rates down substantially. However, in case of short-term liquidity measures and the filing moratorium, this partially comes at the expense of higher insolvency rates in 2021 – note that the solid red line moves above the blue line in the left panel.

So, what drives the results in our model? As described in section 3, the stylized profit and loss statement of simulated firms is at the core of the corporate insolvency model. To understand aggregate dynamics, it is therefore useful to look at the impact on the profitability of modeled firms. Due to the static balance sheet assumption (meaning no investments over time), a good measure to investigate the impact of firms' profitability is their capitalization. To this end, recall that all after-tax profits are simply added to the equity position (or subtracted in case of a loss). The left-hand panels in chart 4 show that, on aggregate under both scenarios (without and with mitigating measures), firms' equity grows by 12.5% without and by 17.0% with mitigating measures until end-2022. Dispersion measures show a similar dynamic across sectors (except for accommodation and food service

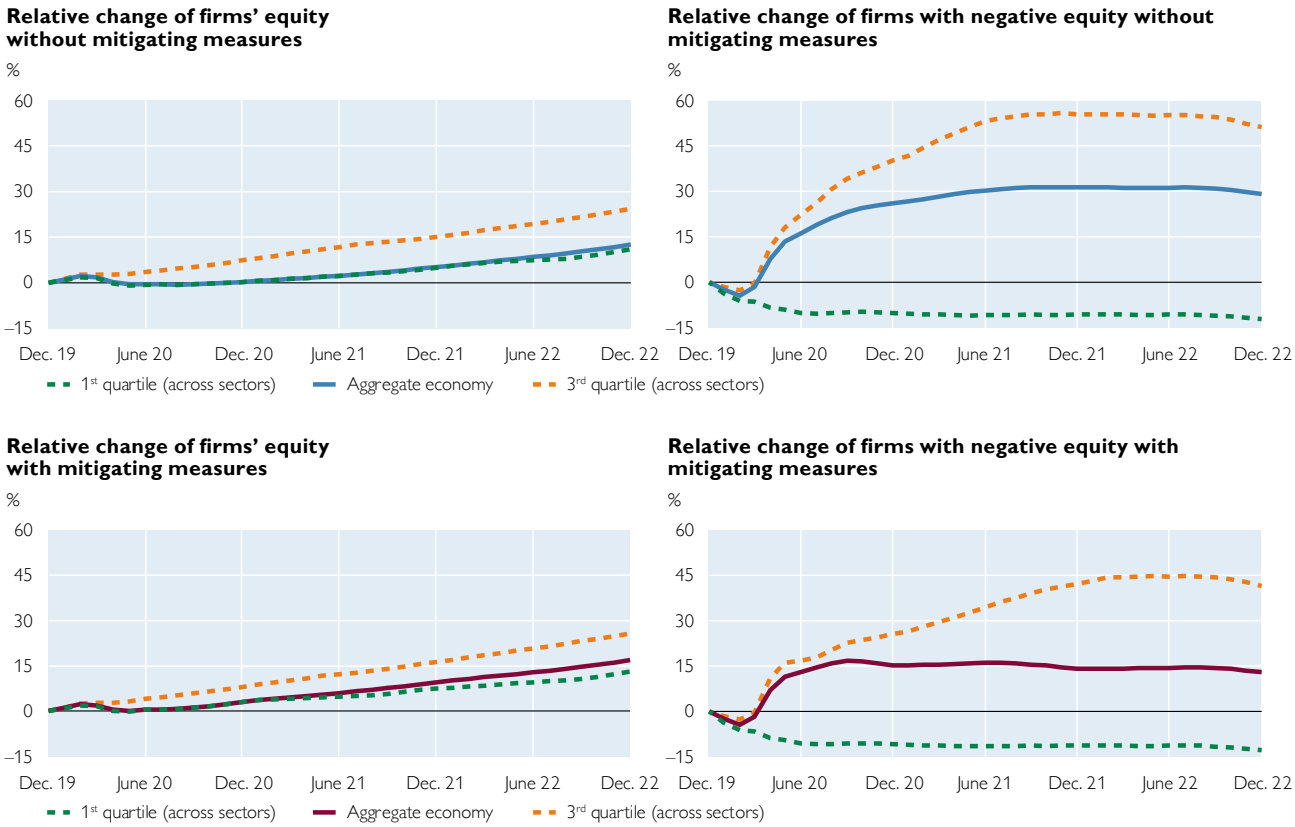
activities (NACE I) as well as arts, entertainment and recreation (NACE R) – for details, see section 6.1).

This perspective on positive aggregate profitability/aggregate capitalization, however, only tells half of the story. The right-hand panels in chart 4 show that the number of undercapitalized firms increases significantly despite an aggregate increase in capital: in the scenario without mitigating measures, by almost one-third, and with mitigating measures by up to 15.0%. Moreover, a much higher dispersion of results is visible even when we leave out the hardest-hit sectors. Undercapitalized firms increase by roughly one-half (somewhat less with measures, a little more without, see the orange lines, which represent the 3rd quartile in the right hand panels, i.e. the fifth hardest hit sector). Other sectors are barely hit by the pandemic. Despite COVID-19 and even without mitigating measures, the share of undercapitalized firms decreases (see the green lines, which represent the 1st quartile, i.e. the fifth least hit sector).

In section 6.1, we discuss the contributions to these results by economic sector and by individual measure to shed more light on the insolvency dynamic and the impact of mitigating measures in our model. But before we turn to that, we want to present the last important driver of our results. While profitability and its impact on firms' capitalization is at the core of the underlying dynamic, insolvencies are mostly driven by illiquidity. Chart 5 shows the aggregate insolvency rate

Chart 4

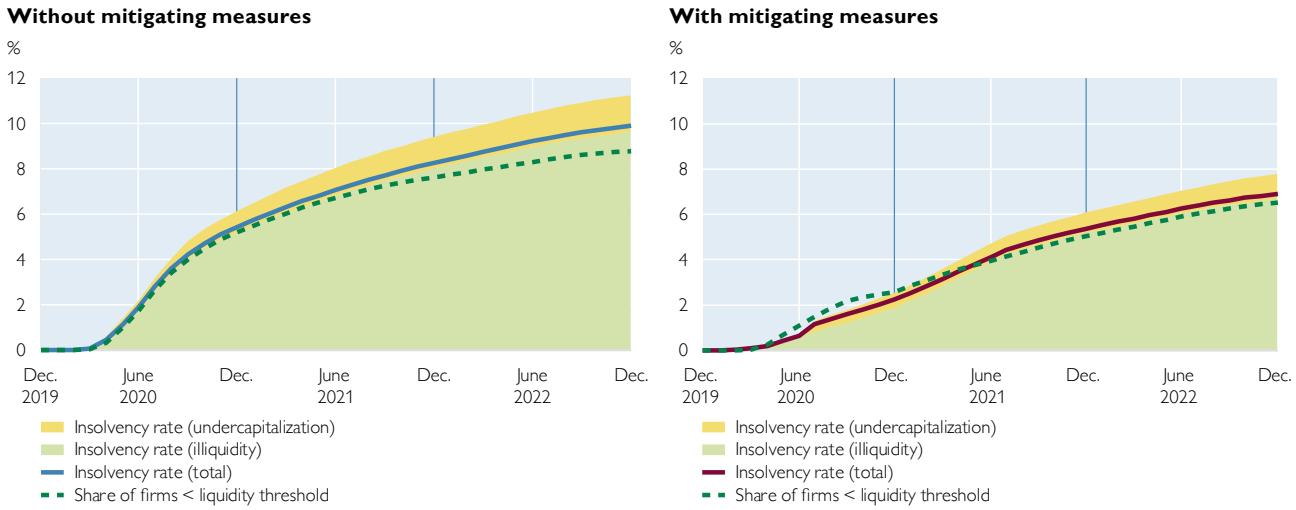
COVID-19 impact on Austrian firms' capitalization



Source: Authors' calculations.

Chart 5

Impact of COVID-19 and mitigating measures on Austrian firms' liquidity



Source: Authors' calculations.

(blue line on the left hand side without mitigating measures, red line on the right hand side with mitigating measures) and the corresponding share of firms that fail to meet the liquidity threshold (green dotted lines in both panels). Moreover, the surfaces show the share of firms that become insolvent due to liquidity constraints (light green) and due to capital constraints (light yellow). Note that there is indeed some overlap; hence, the aggregate insolvency rate lies above the liquidity and below the liquidity plus solvency share.

Three issues are noteworthy. First, in either scenario, liquidity constraints drive more than 90% of the modeled insolvency rates across sectors. Second, in the scenario without measures (left panel of chart 5), the share of firms that falls below the liquidity threshold of all insolvent firms at end-2022 is substantially lower compared with the scenario with mitigating measures (right panel of chart 5). Third, this is, among other things, due to measures that allow firms to earn their way out of the liquidity constraint (particularly the filing moratorium), as evidenced in the green dotted line's placement above the blue line on the right hand panel. In other words, not every firm that fails to meet the threshold becomes insolvent, and by the time insolvencies are again enforced, such firms are indeed no longer insolvent.

6.1 Impact on individual sectors

There are huge differences between the various sectors of the economy. Table 2 shows that two sectors stand out, namely accommodation and food service activities (NACE I) and arts, entertainment and recreation (NACE R). Without mitigating measures, 35% of the firms in each sector would become insolvent in 2020, and approximately 45% by end-2022. Mitigating measures help bring down insolvency rates to 12% in 2020 for both sectors, and to under 20% by end-2022, thus preventing two-thirds of insolvencies in the short term and about half of them in the medium term. Other sectors are substantially less hard hit.

Table 1

Cumulative annual insolvency rates

Insolvency rates	KSV average	Without mitigating measures			With mitigating measures		
	2017–2019	2020	2021	2022	2020	2021	2022
	%						
Total	1.0	5.8	8.2	9.9	2.1	5.2	6.9
Agriculture, forestry and fishing (A)	0.2	0.9	2.5	3.7	0.0	1.9	3.0
Mining and quarrying (B)	0.5	0.5	1.1	1.7	0.5	1.1	1.7
Manufacturing (C)	0.7	4.0	7.2	9.0	1.6	5.4	7.2
Electricity, gas, steam and air conditioning supply (D)	0.3	0.7	1.3	2.1	0.7	1.3	2.0
Water supply and sewerage (E)	0.7	1.5	3.7	6.6	1.4	3.5	6.3
Construction (F)	2.0	2.4	7.3	12.9	2.3	6.5	11.8
Trade (G)	1.0	6.8	9.6	11.0	2.1	7.5	9.2
Transportation and storage (H)	2.6	2.7	5.4	8.1	2.6	5.2	7.9
Accommodation and food service activities (I)	2.0	35.5	38.3	39.5	12.3	17.4	19.6
Information and communication (J)	0.6	1.4	2.4	3.2	1.3	2.3	3.1
Real estate activities (L)	0.3	0.7	1.5	2.3	0.0	1.5	2.3
Professional, scientific and technical activities (M)	0.5	0.6	1.3	2.1	0.4	1.0	1.7
Administrative and support service activities (N)	1.6	2.8	5.2	7.2	1.6	4.8	6.9
Education (P)	0.4	0.4	1.0	1.6	0.3	0.8	1.2
Human health and social work activities (Q)	0.4	0.5	1.9	3.1	0.0	0.0	0.3
Arts, entertainment and recreation (R)	0.6	36.7	42.1	42.5	12.4	16.7	18.0
Other service activities (S)	0.7	2.5	5.8	7.6	1.2	4.7	6.5

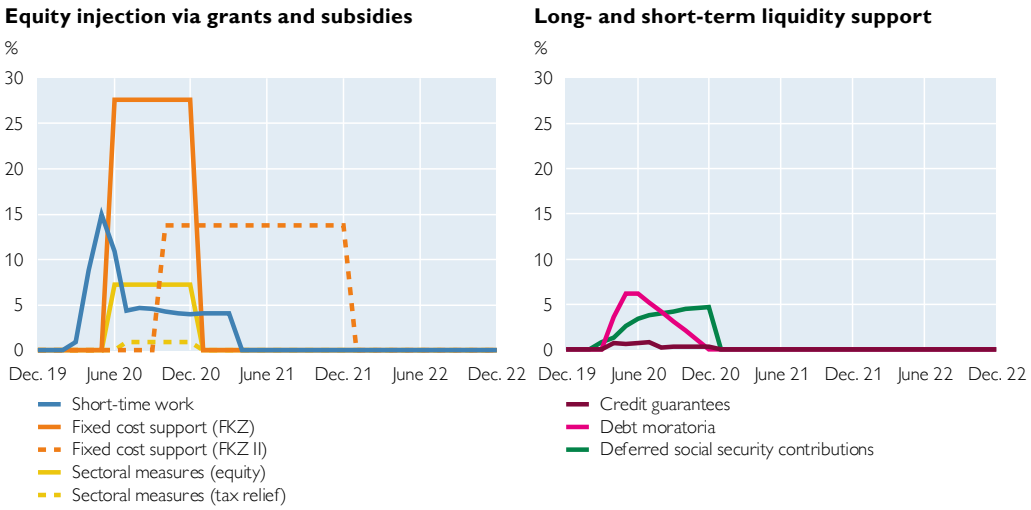
Source: KSV1870, authors' calculations.

6.2 Impact of the mitigating measures

As we have seen above, mitigating measures can only partly offset the COVID-19-induced shock to Austrian firms. In this subsection, we will delve into individual measures. In chart 6, we present the share of firms of the aggregate economy that make use of a measure in our model at any observation interval. Note that some measures have already been calibrated to actual use via reports available at the OeNB as on the cutoff date of August 31, 2020 (e.g. short-time work, credit guarantees and debt moratoria), while others are calibrated to maximum use given eligibility criteria and endowment (e.g. fixed cost grants, sector-specific measures and deferred social security contributions). In general, the use of measures declined where reporting data became available; certainly, the share of firms decreased, but also – albeit to a lesser degree – the euro amount disbursed.

Chart 6

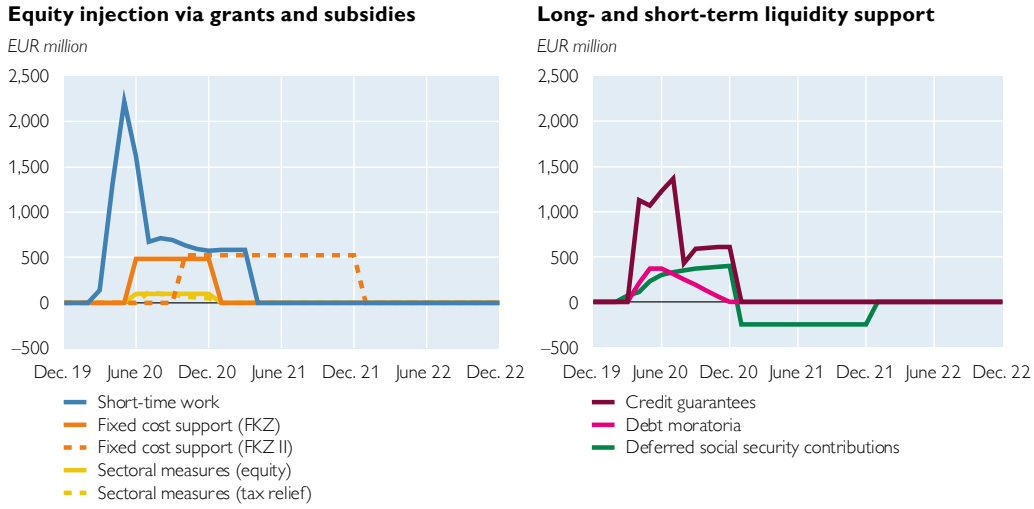
Share of Austrian firms with access to mitigating measures



Source: Authors' calculations.

Chart 7

Impact of mitigating measures on Austrian firms (monthly data)

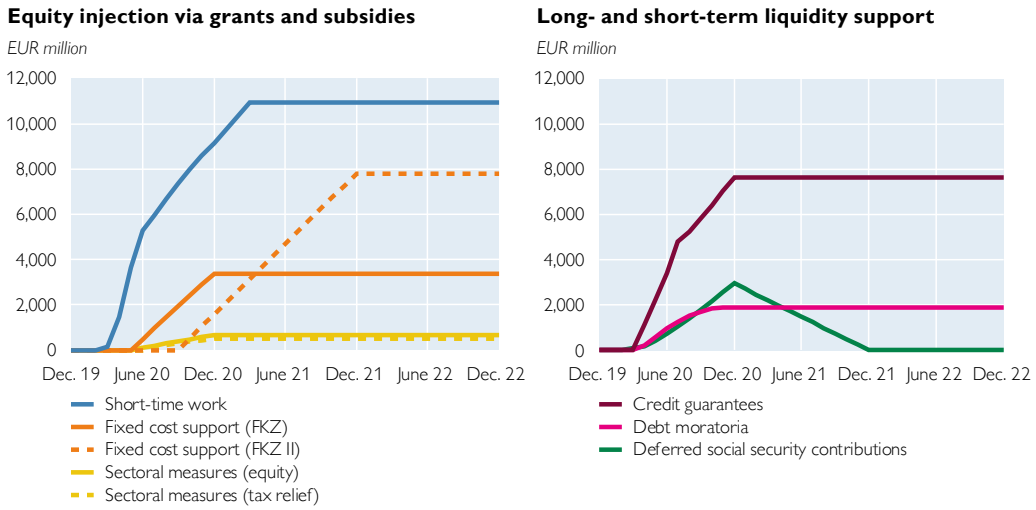


Source: Authors' calculations.

In chart 7, we show the corresponding cash flows. Combining the results in chart 6 with those in chart 7, it is self-evident that the average payout per firm vastly differs from measure to measure. For example, fixed cost grants are used by twice as many firms as short-time work, but the payouts are about the same for both measures. Another noteworthy feature shown in chart 7 is the impact of short-term liquidity measures. The green line in the right panel of chart 7 first shows a positive contribution (when payments are deferred) and a negative contribution in 2021 (once deferred payments need to be paid back). This is the driver of the effect also shown in chart 3.

Chart 8

Cumulative impact of mitigating measures on Austrian firms



Source: Authors' calculations.

Chart 8 illustrates the cumulated cash flows over time. We can see the persistence of equity injections via grants and subsidies as well as of long-term liquidity measures. Put differently, they do not recede over the course of our modeling horizon. By contrast, social security contributions are paid back slowly during the course of 2021 (green line).

Next, we look at the effects of the individual measures on insolvency rates. The first three columns of table 2 show the annual insolvency rates and the annual impact of the mitigating measures. Columns 4–6 show the cumulative results. The first two rows show the insolvency rates of all Austrian incorporated firms at the end of 2020, 2021 and 2022, without and with mitigating measures. The third row shows the combined impact of all measures. To assess the impact of each individual measure, we run the model with only this measure in place. Since many firms profit from two or more measures simultaneously, the sum of the impact of the individual measures is larger (–4.9 percentage points in 2020) than the combined effect, when all measures are in place simultaneously (–3.5 percentage points). Note that this picture reverses in 2021, since the phaseout of some measures leads to a stronger impact on annual insolvency rates with measures (1.8%) than without measures (0.5%).

Table 2

Impact of individual mitigating measures on Austrian firms' insolvency rates

	Annual insolvency rates			Cumulative insolvency rates		
	2020	2021	2022	2020	2021	2022
	Insolvency rates in %; contributions to the reduction of insolvency rates in percentage points					
COVID-19 shock without mitigating measures	5.8	2.4	1.7	5.8	8.2	9.9
COVID-19 shock with mitigating measures	2.1	3.1	1.7	2.1	5.2	6.9
Combined effects	–3.7	0.7	0.0	–3.7	–3.0	–3.0
Sum of marginal effects	–5.1	2.2	0.0	–5.1	–3.1	–3.1
Marginal effects of individual measures						
Capital injections via grants and subsidies	–1.7	–0.5	0.0	–1.7	–2.1	–2.0
Fixed cost support (FKZ)	–0.6	0.0	0.0	–0.6	–0.6	–0.5
Fixed cost support (FKZ II)	–0.3	–0.5	0.0	–0.3	–0.8	–0.7
Short-time work	–0.4	–0.0	0.0	–0.4	–0.4	–0.4
Sector-specific measures	–0.3	0.0	0.0	–0.3	–0.3	–0.3
Long-term delay of payment obligations	–0.6	–0.3	0.0	–0.6	–0.8	–0.9
Credit guarantees	–0.4	–0.4	0.0	–0.4	–0.7	–0.8
Debt moratoria	–0.2	0.1	0.0	–0.2	–0.1	–0.1
Short-term deferral of payment obligations	–2.8	3.0	0.0	–2.8	–0.2	–0.2
Filing moratorium	–1.9	2.1	0.0	–1.9	–0.0	–0.0
Deferral of social security contributions	–0.9	0.8	0.0	–0.9	–0.1	–0.1
Changes to the insolvency regime	–0.0	0.0	0.0	–0.0	–0.0	–0.0

Source: Authors' calculations.

In the short term, i.e. in 2020, short-term deferrals of payment obligations in general and the filing moratorium in particular have the strongest effect on insolvency rates (–2.8 percentage points). These measures clearly far outweigh the impact of long-term liquidity measures and equity injections via grants and subsidies.

However, as liquidity support is reversed (e.g. deferred social security contributions need to be paid eventually), the picture changes dramatically. At the end of 2022, credit guarantees and short-time work appear to be the most effective measures across sectors, while fixed cost grants play an important role in the hardest-hit sectors (arts, entertainment and recreation (NACE R) and accommodation and food service activities (NACE I)).

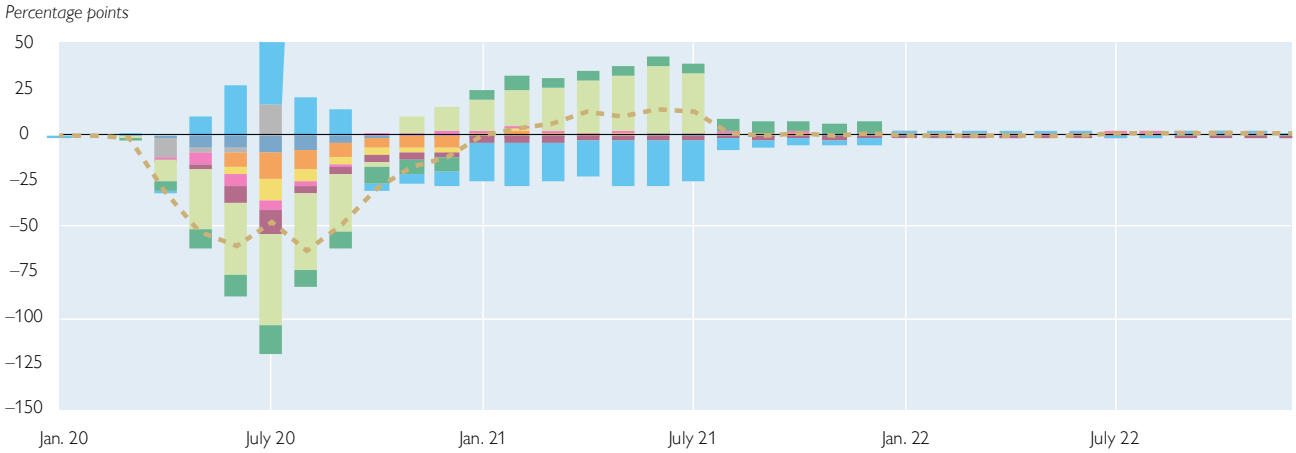
Another observation, not captured in table 2 or in the charts, is an artifact related to credit guarantees. While not covering many of the most affected firms due to eligibility constraints, credit guarantees appear to be very effective and cost efficient, providing liquidity support for firms in the months when shocks are highest. Survival rates of firms that availed themselves of credit guarantees turn out to be very high even in the most affected sectors (and at least until the end of the observation period). Moreover, the medium-term impact of credit guarantees is indeed highest across all measures, and this measure is also cost efficient. To sum up these findings, we present the aggregate picture in chart 9, first on a quarterly basis (left panel), then on a cumulative basis (right panel).

All support measures notwithstanding, while many firms can avoid bankruptcy in the model, many cannot rebuild their capital reserves and survive with a weaker balance sheet (see also chart 4). This is of particular importance in light of two opposing arguments related to credit guarantees. On the one hand, credit guarantees appear to generate by far the highest marginal impact of all measures for our

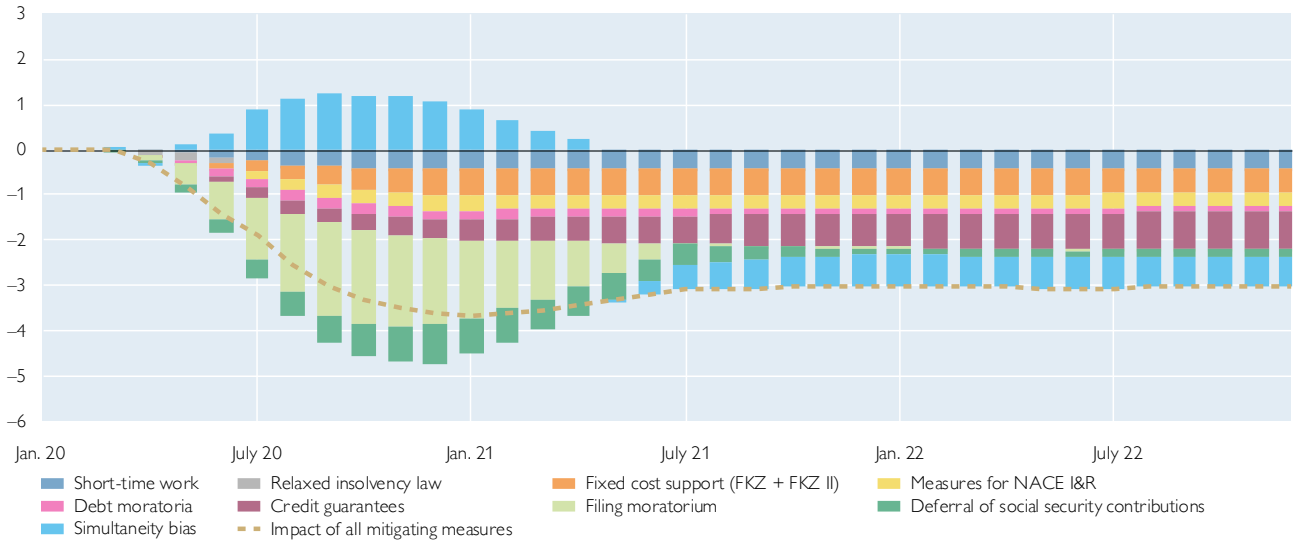
Chart 9

Impact of COVID-19 and individual mitigating measures on Austrian firms' insolvency rates

Effects of individual measures (monthly data)



Effects of individual measures (cumulated)



Source: Authors' calculations.

observation period until end-2022. Given that they are also cost efficient compared to equity injections via grants or subsidies, we conclude that they are not only the most effective measure but also the most efficient in terms of their cost to the Austrian government. On the other hand, and admittedly outside the scope of our model and therefore this paper, debt overhang will almost certainly prove a challenge for some firms once credit extended with guarantees becomes due. This issue certainly merits further investigation.

7 Summary and conclusions

The final section tries to do justice to the twofold nature of our paper. On the one hand, we introduced a novel approach for modeling corporate insolvencies in Austria, and on the other, we also presented results of this model. Hence, we start

out with important disclaimers regarding the new modeling approach with a view to providing guidance as to the interpretation of the model results presented here. We conclude the paper by identifying next steps that we have in mind going forward.

7.1 Important disclaimers

The macroeconomic forecast is subject to a high degree of uncertainty. There are substantial downside risks and, at the time of writing, a renewed increase of COVID-19 infections was well underway and eventually materialized. After the cut-off date of the study, the Austrian government has decided to impose further lockdowns in Q4 2020 and Q1 2021. At the same time, the macroeconomic impact seems to be much lower than in spring 2020.

The corporate insolvency model is highly stylized and relies on several heroic assumptions. Balance sheets are static (no structural changes/no growth/no investments) and no new firms are incorporated over the horizon of the projection. While balance sheet and profit and loss statement breakdowns are drawn from the multivariate distribution, subitems reflect the relative size of the sectoral means. Moreover, a single draw from the distribution determines how profitably a firm conducts its business over the entire projection horizon. In a similarly crude manner, we calibrate elasticities – i.e. firms' ability to reduce fixed costs – at an aggregate sector-specific or economy-wide level; here, we would certainly benefit from further investigation. In a similar vein, the link between solvency and liquidity is too mechanistic due to an oversimplified role banks play rolling over corporate credit. This also restricts the mitigating measures that firms facing a liquidity crunch can take by themselves. Overall, the calibration of the model probably errs on the conservative side.

The effects of the mitigating measures are also subject to considerable uncertainty. On the one hand, they could be overestimated, since we assume a quick payout of funds based on the eligibility criteria. Delays in application and/or payment would certainly lead to higher insolvency rates and thus make measures less effective. On the other hand, the measures could reduce insolvencies more strongly than assumed due to possible impacts on GDP growth. We based the insolvency rate projection with and without mitigating measures on the same macroeconomic scenario. This can be justified since the mitigating measures are not designed as economic stimulus packages but aim at maintaining the solvency and/or liquidity of the corporate sector. Hence, they do not lead to an increase in demand and thus in production (except for some sector-specific packages). While this holds in the short term (during lockdown and initial easing phase), in the longer term, a scenario without mitigating measures and more insolvencies would negatively impact GDP via production linkages and confidence effects. This would trigger a feedback loop with higher insolvencies. Hence, the effects of the mitigating measures could be even higher than reported.

In light of these important qualifiers, a healthy distrust of absolute results – mainly the projected insolvency rates – should, however, not diminish the valuable structural insights our model provides. While mitigating measures can only partly offset the COVID-19-induced shock to Austrian firms, they play an important role in lowering insolvency rates on aggregate and in the hardest-hit sectors.

It is important to note, however, that their impact is more pronounced in 2020, due to the short-term deferral of payment obligations that is part of some measures. Consequently, insolvency rates will be higher in 2021 with mitigating measures than without, but they will not reach their cumulated level.

Long-term liquidity support is much harder to assess. Of all measures, credit guarantees in particular appear to have the highest marginal impact in our observation period until end-2022. However, as mentioned above, many firms cannot rebuild their capital reserves and survive with a weaker balance sheet. While it is outside the scope of our model and therefore also this paper, this issue would merit further investigation.

Finally, equity injections via grants and subsidies provide at best a mixed story of success. Short-time work and fixed cost grants, which are the second and third most effective measures in our model for the entire observation horizon, have a rather limited impact compared to their cost to the Austrian government. The more than EUR 20 billion distributed to firms with few strings attached drive down the aggregate insolvency rate by 1 percentage point. While short-time work is arguably a measure with objectives beyond the support of firms, this does not apply to other grants and subsidies in the same way. Given that firms' illiquidity turned out to be the main driver of insolvencies according to our results, the question remains whether more cost-efficient alternatives in form of further medium- or long-term liquidity support could not have yielded better results at a lesser cost.

7.2 Next steps

Within the current framework, i.e. without addressing the above weaknesses, the most important refinement relates to the recalibration of the mitigating measures included in the model as more empirical data become available. For instance, data on credit guarantees and debt moratoria take-up by incorporated firms are reported to the OeNB on a weekly basis. By the time this article is published, data until year-end 2020 will have become available. Also, if existing measures are extended, endowments change or further measures are put into law, our model allows for a quick integration thanks to the way it is designed. Similarly, the model allows for a simple assessment of counterfactuals. Examples are the integration of frictions with regard to the payout of existing mitigating measures, the recalibration of existing or introduction of additional measures that are not (yet) on the table. Since its first iteration in June 2020, the model has been re-run multiple times to inform internal policy debates.

Beyond the current framework, i.e. when we address the above weaknesses, we see multiple avenues to improve the model. Most importantly, the static balance sheet assumption currently limits the conclusions that can be drawn from our work. An enhancement in this regard would, however, rely on more realistic investment behavior of firms, as profitable firms improve their equity position throughout the observation horizon, while not expanding their business. We believe that this does not impact the lower rung of firms in or close to insolvency, but it is certainly a requirement to be able to draw broader conclusions on a sectoral level. Unfortunately, an extension of the model in this regard is not a straightforward procedure: while we currently assume passive reactions to outside

circumstances, firms would have to be transformed into active agents with objective functions.

In the meantime, we can turn to low-hanging fruit to improve the model. Many of the empirical calibrations mentioned throughout the paper merit revisiting. Whenever we chose to rely on economy-wide parameters, we can move to sectoral calibrations, e.g. regarding the calibration of the elasticities of how many firms can reduce fixed costs, but also regarding sectoral differences regarding access to credit in difficult macroeconomic circumstances. Finally, further research could be put into the simulation of firms, be it the extrapolation of profit and loss subitems via sectoral means or the single draw that determines medium-term profitability. Any improvements in these areas will certainly help make our model output more realistic and therefore more valuable for the policy discussions it was initially designed to enlighten.

Finally, we want to mention that we use our insolvency model together with the OeNB's top-down stress testing framework ARNIE to assess the impact of the COVID-19 pandemic on the banking system (see Guth et al., 2020). Rather than employing large-scale regression models to derive risk parameters for credit risk, we infer default probabilities of banks' credit exposure from our results described above. For nondomestic exposures of the Austrian banking system, we extrapolate insolvency rates based on the assumptions that individual sectors face similar challenges across countries and that the overall severity with which individual countries are affected by the pandemic is reflected in country-specific GDP forecasts. To this end, we utilize GDP forecasts by the European Central Bank (ECB) for other countries/country aggregates to calculate scaling factors based on the relative GDP-level deviation.

References

Carletti, E., T. Oliviero, M. Pagano, L. Pelizzon, M.G. Subrahamanyam.2020. The COVID-19 shock and equity shortfall: firm-level evidence from Italy. SAFE Working Paper No. 285.

Davydenko, S.A. 2007. When do firms default? A study of the default boundary. Mimeo. www.semanticscholar.org/paper/When-Do-Firms-Default-A-Study-of-the-Default-Boundary.

De Vito, A., and J.P. Gomez. 2020. Estimating the COVID-19 cash crunch: global evidence and policy. Forthcoming in Journal of Accounting and Public Policy.

EBA. 2020a. Guidelines on legislative and non-legislative moratoria on loan repayments applied in the light of the COVID-19 crisis. GL 02/2020.

EBA. 2020b. Guidelines reporting and disclosure of exposures subject to measures applied in response to the COVID-19 crisis. GL 07/2020.

Fenz, G., C. Ragacs, M. Schneider and K. Vondra. 2020. COVID-19-induced recession: biggest economic policy challenge for Austria in the "Second Republic". Economic outlook for Austria from 2020 to 2022 (June 2020). In: Monetary Policy & The Economy Q1-Q2/20. Vienna. OeNB. 213–250.

Gourinchas, P.O., S. Kalemli-Özcan, V. Penciakova and N. Sander. 2020. Covid-19 and SME failures. NBER Working Paper 27877, September 2020.

Guerini, M., L. Nesta, X. Ragot and S. Schiavo. 2020. Dynamique des défaillances d'entreprises en France et crise de la Covid-19. OFCE Policy Brief 73, June 19, 2020.

Guth, M., C. Lipp, C. Puhr and M. Schneider. 2020. Modeling the COVID-19 effects on the Austrian economy and banking system. In: Financial Stability Report 40. Vienna. OeNB. 63–86.

McNeil, A.J., R. Frey and P. Embrechts. 2015. Quantitative Risk Management: Concepts, Techniques and Tools. Princeton Series in Finance. Princeton University Press.

OECD. 2020. Corporate sector vulnerabilities during the Covid-19 outbreak. Assessment and policy responses. Tackling Coronavirus Series, 5 May 2020.

Schivardi, F. and G. Romano. 2020. A simple method to estimate firm's liquidity needs during the Covid-19 crisis with an application to Italy. In: Covid Economics, Issue 35, 7 July 2020. CEPR Press, 51-69.

Schneider, M. and W. Waschiczek. 2018. Schuldendienst der privaten Haushalte 2009–2017. VOWA-Notiz Nr. 047/18. Vienna. OeNB.

Annex 1: Tables

Table A1

Value-added effects for NACE 1 sectors

	2020	2021	2022
	Deviation from pre-crisis trend		
Total	–9.7	–7.2	–5.6
Agriculture, forestry and fishing (A)	–3.3	–4.5	–2.9
Mining and quarrying (B)	–7.0	–7.3	–6.6
Manufacturing (C)	–12.0	–10.5	–8.9
Electricity, gas, steam and air conditioning supply (D)	–9.2	–8.3	–7.0
Water supply and sewerage (E)	–6.7	–6.2	–5.3
Construction (F)	–7.4	–8.3	–7.2
Trade (G)	–11.7	–8.2	–6.3
Transportation and storage (H)	–8.8	–6.2	–5.3
Accommodation and food service activities (I)	–43.1	–14.9	–7.1
Information and communication (J)	–7.5	–4.8	–3.7
Real estate activities (L)	–4.9	–6.3	–5.4
Professional, scientific and technical activities (M)	–9.2	–7.1	–6.0
Administrative and support service activities (N)	–7.5	–5.5	–4.1
Education (P)	–0.2	–2.6	–2.4
Human health and social work activities (Q)	–1.6	–3.6	–3.0
Arts, entertainment and recreation (R)	–45.6	–16.8	–8.3
Other service activities (S)	–10.6	–10.2	–7.0

Source: OeNB.

Table A2

Elasticities with respect to changes in turnover[1]

	I5 Cost of goods sold, materials and consumables	I6 External supplies and services	I7 Staff costs[2]				I81 Operating taxes and other operating charges	I83 Financial expenses	I9 Depreciation	I10 Interest expenses	I11 Taxes on profits
			Layoffs	Short-time work	Total						
					without short-time work[2]	with short-time work					
Elasticities with respect to changes in turnover											
Agriculture, forestry and fishing (A)	0.90	0.50	0.64	0.55	1.19	0.92	0.00	0.00	0.00	0.00	1.00
Mining and quarrying (B)	0.90	0.50	0.38	0.54	0.92	0.65	0.00	0.00	0.00	0.00	1.00
Manufacturing (C)	0.90	0.50	0.10	0.92	1.02	0.56	0.00	0.00	0.00	0.00	1.00
Electricity, gas, steam and air conditioning supply (D)	0.90	0.50	0.02	0.15	0.17	0.10	0.00	0.00	0.00	0.00	1.00
Water supply and sewerage (E)	0.90	0.50	0.28	0.57	0.85	0.56	0.00	0.00	0.00	0.00	1.00
Construction (F)	0.90	0.50	0.68	0.58	1.26	0.97	0.00	0.00	0.00	0.00	1.00
Trade (G)	0.90	0.50	0.20	0.88	1.09	0.64	0.00	0.00	0.00	0.00	1.00
Transportation and storage (H)	0.90	0.50	0.43	0.70	1.13	0.78	0.00	0.00	0.00	0.00	1.00
Accommodation and food service activities (I)	0.90	0.50	0.35	0.26	0.61	0.48	0.00	0.00	0.00	0.00	1.00
Information and communication (J)	0.90	0.50	0.18	0.58	0.75	0.47	0.00	0.00	0.00	0.00	1.00
Real estate activities (L)	0.90	0.50	0.64	0.67	1.31	0.97	0.00	0.00	0.00	0.00	1.00
Professional, scientific and technical activities (M)	0.90	0.50	0.19	0.70	0.89	0.54	0.00	0.00	0.00	0.00	1.00
Administrative and support service activities (N)	0.90	0.50	0.90	0.80	1.70	1.30	0.00	0.00	0.00	0.00	1.00
Education (P)	0.90	0.50	0.20	0.00	0.20	0.20	0.00	0.00	0.00	0.00	1.00
Human health and social work activities (Q)	0.90	0.50	0.90	0.00	0.90	0.90	0.00	0.00	0.00	0.00	1.00
Arts, entertainment and recreation (R)	0.90	0.50	0.11	0.42	0.53	0.32	0.00	0.00	0.00	0.00	1.00

Source: Authors' assumptions.

[1] *These elasticities describe the percentage response of firms' cost components relative to the percentage drop in turnover.*
[2] *In the scenario without short-time work, we assumed that firms lay off 50% of the workers for whom they applied for short-time work.*

Table A3

Description of the variables of the firm-level dataset

Source	BACH code	Short description	Long description
SABINA	A7	Cash and bank ratio	Includes the amount available in cash, demand deposits and other deposits in financial institutions.
SABINA	E	Equity ratio	Total equity
BACH	R13	Current assets	Ratio of current assets (A2+A3+A41+A51+A6+A7) to total assets (A)
BACH	R16	Current liabilities	Ratio of current debt (L11+L21+L311+L321+L4+L5) to total balance sheet (A)
BACH	A6	Current financial assets	Includes financial assets held for trading and derivatives.
BACH	L21	Current bank debt	Amounts owed to credit institutions due to be settled within 12 months after the reporting period
BACH	I1	Turnover	Includes sales of goods and services net of returns, deductions and rebates. Sales include sales of goods and services net of returns, deductions and rebates. Sales are net of VAT and excise taxes.
BACH	I42	Financial income	Details of other income relating to financial income
BACH	It1	Total income	I1+I2+I3+I4
BACH	I5	Cost of goods sold, materials and consumables	Sum of costs for raw, auxiliary and operating materials, purchased goods and services
BACH	I6	External supplies and services	Expenses for services rendered by third parties that directly serve to provide own services and for other areas of the company (outside of production), for expenses incurred for purchased services (e.g. maintenance of plants and buildings), provided material consumption predominates; this also applies to expenses for the consumption of energy and water or waste disposal services.
BACH	I7	Staff costs	Wages, salaries and social contributions (expenses for severance payments and benefits to company employee pension funds, expenses for retirement benefits, expenses for statutory social security contributions as well as taxes and compulsory contributions dependent on remuneration)
BACH	I81	Operating taxes and other operating charges	Includes expenses that do not require separate disclosure, such as taxes (excluding taxes on income and profits), administrative expenses, sales expenses and operating expenses (e.g. transport costs, consulting expenses, rent, telephone, energy).
BACH	I83	Financial expenses	Expenses from financial assets and from securities held as current assets (e.g. correction of shares held by the company)
BACH	I9	Depreciation	Depreciation of intangible assets and property, plant and equipment as well as capitalized expenses for the start-up and expansion of a business
BACH	I10	Interest expenses	Interest payments for bank loans, bank overdraft and supplier credit
BACH	I8	Other expenses	Depreciation of current assets, insofar as these exceed the depreciation customary in the company and items I81 and I83.
BACH	It2	Total expenses	Sum of all expenses; consists of positions I5 + I6 + I7 + I8 + I9 + I10 + I11 (I11 = tax on profits).

Source: BACH and SABINA databases, authors' compilation.

Table A4

Statistics of equity and cash and bank ratios from the SABINA database (2018)

	Equity ratio							Cash and bank					Number of firms	Average size of balance sheet (EUR thousand)
					Share of firms with equity ratio							Share of firms with		
	Mean	1st quartile	Median	3rd quartile	<-100%	<–30%	<0	Mean	1st quartile	Median	3rd quartile	Cash and bank < 0		
TOTAL	39.9	8.7	37.7	71.1	5.4	9.9	17.4	7.7	1.8	9.9	32.9	2.5	129,239	5,506
A	55.5	6.1	29.5	63.3	3.1	7.6	16.2	6.7	1.6	5.4	19.4	0.1	956	2,549
B	50.3	16.4	42.1	70.0	6.2	10.1	14.4	2.4	–0.9	3.8	20.9	35.0	303	20,774
C	45.9	15.1	39.2	66.5	4.5	8.8	14.0	6.8	1.4	7.7	25.6	0.1	10,981	14,402
D	36.1	2.7	18.8	50.5	2.5	6.8	20.9	3.4	0.9	3.7	13.4	0.2	1,527	33,016
E	32.1	16.7	40.5	67.6	3.6	6.1	11.6	4.5	–0.5	6.2	25.4	28.0	621	7,585
F	31.4	10.8	36.1	64.9	3.2	6.8	14.2	11.7	1.5	9.5	29.0	0.1	15,648	2,426
G	42.7	11.1	38.4	69.5	6.8	12.0	17.8	10.0	2.0	10.3	31.6	0.1	27,337	4,067
H	32.7	6.3	29.2	58.4	4.9	10.6	19.6	5.6	2.1	9.8	26.6	0.2	4,672	10,631
I	26.3	–14.9	19.2	51.5	11.0	20.4	32.1	8.5	2.4	8.2	24.7	0.2	8,782	1,984
J	44.6	14.2	49.3	77.3	8.4	12.9	17.6	13.9	7.0	26.5	55.2	0.1	7,877	2,815
L	38.8	2.3	24.6	73.7	2.8	5.8	19.4	4.9	0.4	3.0	14.8	13.7	21,261	7,674
M w.o. 70100	49.5	25.9	58.3	83.9	4.2	6.9	10.4	17.5	4.5	20.1	47.9	0.1	18,427	1,537
N	27.5	10.7	36.3	67.0	5.6	10.3	16.3	8.7	3.9	16.3	41.9	0.2	5,505	5,059
PQ	30.9	9.4	37.4	70.6	6.7	12.1	18.2	17.9	3.6	17.2	45.2	0.1	2,287	1,805
RS	28.8	–8.2	29.1	65.3	11.2	19.4	28.4	16.0	2.3	11.2	34.4	0.2	3,055	2,410

Source: SABINA database, authors' compilation.

Annex 2: Equations of the insolvency model

A) Model without mitigating measures

Profit P of firm i in sector n at time t is calculated as total income $I^{t,n,i}$ minus total costs $C^{t,n,i}$. Total revenues $I^{t,n,i}$ are the sum of turnover $TO^{t,n,i}$ and financial income $FI^{t,n,i}$. We considered eight cost components $C_m^{t,n,i}$ in our analysis (cost of inputs, external inputs, staff costs, operating charges, financial expenses, interest expenses, depreciation and other expenses).

$$P^{t,n,i} = I^{t,n,i} - C^{t,n,i} = TO^{t,n,i} + FI^{t,n,i} - \sum_{m=1}^{M} C_m^{t,n,i} \quad (1)$$

Turnover in period t is calculated by multiplying pre-pandemic turnover $TO^{0,n,i}$ by 1 minus the relative shock size the firm faces. To obtain the shock size $\sigma^{t,n,i}$ for firm i in sector n, we assumed that the distribution of the sectoral macroeconomic shock over firms follows a normal distribution.

$$TO^{t,n,i} = TO^{0,n,i}(1 - \sigma^{t,n,i}) \quad (2)$$

For financial income $FI^{t,n,i}$, we assumed that it follows the development of turnover.

$$FI^{t,n,i} = FI^{0,n,i}(1 - \sigma^{t,n,i}) \quad (3)$$

The cost components are obtained in a similar way by multiplying the shock to turnover by the response elasticities of the respective cost components.

$$C^{t,n,i} = \sum_{m=1}^{M} C_m^{0,n,i}(1 - \sigma^{t,n,i}\varepsilon_m^n) \quad (4)$$

Positive profits are taxed with the corporate income tax rate cit.

$$P^{t,n,i} = P^{t,n,i}(1 - cit) \quad (5)$$

Each firm's equity position is updated by adding the profit in period t to the equity position of the previous period t-1.

$$E^{t,n,i} = E^{t-1,n,i} + P^{t,n,i} \quad (6)$$

The cash flow from operating activities $CF_{op}^{t,n,i}$ is calculated via the indirect method by subtracting debt repayment $DR^{t,n,i}$ (our sole source of financial expenses) and adding depreciation $DE^{t,n,i}$. Due to the *static balance sheet assumption,* we do not consider *capitalized production* or similar changes to the balance sheet in our cash flow calculation.

$$CF_{op}^{t,n,i} = P^{t,n,i} - CP^{t,n,i} - DR^{t,n,i} + DE^{t,n,i} \quad (7)$$

Again, due to the *static balance sheet assumption,* the cash flow after refinancing activities $CF_{fin}^{t,n,i}$ only considers bank refinancing of already existing debt $D^{t,n,i}$. Banks refinance existing debt minus the share of principal repayment α only if a

bank's equity $E^{t,n,i}$ is positive. If it is negative, firm $F^{t,n,i}$ can only make use of undrawn credit lines, expressed as the share of its debt β.

$$CF_{fin}^{t,n,i} = \begin{cases} if\ E^{t,n,i} \geq 0 & CF_{op}^{t,n,i} - \alpha D^{t,n,i} \\ if\ E^{t,n,i} < 0 & CF_{op}^{t,n,i} - (1-\beta) D^{t,n,i} \end{cases} \quad (8)$$

Again, due to the *static balance sheet assumption,* firms do not invest. Therefore, for most firms the cash flow after investments $CF^{t,n,i}$ (the actual cash flow in period t) equals the cash flow after refinancing activities $CF_{fin}{}^{t,n,i}$. However, firms with a negative cash flow after refinancing activities $CF_{fin}{}^{t,n,i}$ in period t are allowed to disinvest by fire-selling financial assets $FA^{t,n,i}$. We assume that this is possible at book value, i.e. without the application of a haircut. Obviously, firms can divest only once.

$$CF^{t,n,i} = \begin{cases} if\ CF_{fin}^{t,n,i} \geq 0 & CF_{op}^{t,n,i} \\ if\ CF_{fin}^{t,n,i} < 0 & CF_{op}^{t,n,i} + FA^{t,n,i} \end{cases} \quad (9)$$

The liquidity position of each firm $L^{t,n,i}$ is updated by adding the cash flow (after investments) $CF^{t,n,i}$ in period t to the liquidity position ("cash and bank") of the previous period *t-1*.

$$L^{t,n,i} = L^{t-1,n,i} + CF^{t,n,i} \quad (10)$$

A firm i in sector n becomes overindebted, i.e. insolvent, in period t if its equity ratio $E^{t,n,i}$ falls below –30%.

$$I_E^{t,n,i} = \begin{cases} if\ E^{t,n,i} \geq -30\% & 0 \\ if\ E^{t,n,i} < -30\% & 1 \end{cases} \quad (11)$$

The firm becomes illiquid if its liquidity ratio $L^{t,n,i}$ falls below –10%.

$$I_L^{t,n,i} = \begin{cases} if\ L^{t,n,i} \geq -10\% & 0 \\ if\ L^{t,n,i} < -10\% & 1 \end{cases} \quad (12)$$

The firm becomes bankrupt if it is either insolvent or illiquid.

$$I_{tot}^{t,n,i} = \begin{cases} if\ F_{Ins\,(E)}^{t,n,i} = 1 & 1 \\ elseif\ F_{Ins\,(L)}^{t,n,i} = 1 & 1 \\ else & 0 \end{cases} \quad (13)$$

B) Model with mitigating measures

The structure of the model with mitigating measures basically equals the structure of the model without these measures. Therefore, we just present the equations that include the measures. For this purpose, we classify mitigating measures according to their impact into *profit-related mitigating measures, cash flow-related mitigating measures and mitigating measures that suspend the filing for bankruptcy*. For the sake of simplicity, we refrain from presenting the implementation details of the mitigating measures in algebraic form.

Profit-related mitigating measures $MM_P^{t,n,i}$ include the fixed cost support, short-time work and sector-specific measures (equity injection for NACE I and decrease of value-added tax for NACE I and NACE R). The debt moratorium impacts on profits via deferred interest payments. These measures have a direct impact on firms' equity position. Note that all profit-related measures also impact on the cash flow and hence the liquidity position of firm *i*.

$$E^{t,n,i} = E^{t-1,n,i} + P^{t,n,i} + MM_P^{t,n,i} \tag{6}$$

In addition to profit-related measures, the liquidity position of firm *i* also depends on *cash flow-related mitigating measures* $MM_{CF}^{t,n,i}$ (credit guarantees, deferral of social security contributions and the deferral of the principal from the debt moratorium).

$$L^{t,n,i} = L^{t-1,n,i} + CF^{t,n,i} + MM_{CF}^{t,n,i} \tag{10}$$

In addition to profit- and cash flow-related *measures there are measures that suspend the filing for bankruptcy*. The relaxed insolvency law suspends firms' obligation to apply for bankruptcy in case of overindebtedness. Hence, the insolvency variable $I_E^{t,n,i}$ is set to zero for all firms.

$$I_E^{t,n,i} = 0 \tag{11}$$

The filing moratorium granted by health insurance providers and tax authorities directly impacts on the liquidity variable $I_L^{t,n,i}$. In normal times, half of all filings for bankruptcy due to illiquidity come from these two institutions, which is why we randomly draw from a uniform distribution between 0 and 1 and retain a firm as illiquid if the draw is below 0.5.

$$I_L^{t,n,i} = I_L^{t,n,i} * rand < 0.5 \tag{12}$$

How has COVID-19 affected the financial situation of households in Austria?

Nicolas Albacete, Pirmin Fessler, Fabian Kalleitner, Peter Lindner[1]
Refereed by: Sylvia Kritzinger, University of Vienna

This study discusses the potential effects of the COVID-19 crisis on the finances of households in Austria. Different individuals and households have been exposed to the crisis in very different ways and to varying degrees. In the first part of this study, we discuss different types of households and different channels through which the COVID-19 crisis may affect households' financial situation. The second part of the study uses data from the Austrian Corona Panel Project (ACPP) carried out by the University of Vienna as well as data from the Eurosystem Household Finance and Consumption Survey (HFCS) for Austria to analyze (potential) impacts of the crisis. We find that those households who had already found themselves in a difficult social, economic and financial situation before the COVID-19 crisis were the ones suffering the largest income losses (e.g. low-income households or households with an unemployed reference person).

JEL classification: I18, H12, D14, G5
Keywords: COVID-19 crisis, coronavirus, Austrian Corona Panel Project (ACPP), Household Finance and Consumption Survey (HFCS)

The COVID-19 crisis started as a health crisis and remains a health crisis. Thus, the end of COVID-19 will depend on healthcare solutions, i.e. a vaccine and/or effective treatment. However, the coronavirus (SARS-CoV-2) that causes the COVID-19 disease has also had economic and financial effects, basically through the following two channels: First and foremost, individuals might contract COVID-19 and become contagious, which interferes with usual life activities. They can no longer take care of their children, nor of others in need of care. They can no longer go to work, and they have to restrict their social life to get healthy and/or to protect others. Second, governments have imposed various restrictions to stop the spread of the disease, to save lives and to prevent the health systems from collapsing under the pressure of COVID-19. Moreover, both channels have also had an impact on individuals' expectations not only of their private lives but also as managers and owners of companies. This, in turn, has led to a change in behavior, i.e. people have aligned their behavior with their expectations, which have mostly been accompanied by increased uncertainty about the future state of the world.

Taken together, the effects caused by the coronavirus pandemic amount to a huge negative shock. The latter has already led to lower (than before) income for some households, as will be explained in more detail later on, and will lead to lower income (relative to a potential trajectory if it were not for the COVID-19 crisis) for most households. Households must deal with lower income and their

[1] *Oesterreichische Nationalbank, Economic Analysis Division, nicolas.albacete@oenb.at; Oesterreichische Nationalbank, Foreign Research Division, pirmin.fessler@oenb.at; University of Vienna, Department of Economic Sociology, fabian.kalleitner@univie.ac.at; Oesterreichische Nationalbank, Economic Analysis Division, peter.lindner@oenb.at. Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the Oesterreichische Nationalbank or the Eurosystem, neither do they necessarily reflect the views of the University of Vienna.*

ability to cope with this situation depends on their financial resources. The latter consist of households' private financial wealth, income and potential public transfers. Also, the possibility of having access to private financial resources of relatives and friends can play an important role.

To understand which households have been affected in what way and in line with the debate on possibly rising inequalities due to COVID-19 (see e.g. Schnabel, 2020), it is important to analyze income changes beyond the national aggregate, which reflects an income-weighted mean of changes at the household level. Furthermore, economic expectations at the firm, household and individual level are formed based on the corresponding income trajectories and not only based on the trajectory of aggregate developments. Therefore, to analyze households' economic expectations and behavioral changes in response to the crisis, we need to take into account the disaggregated level of the economy.

The problems that households face and the speed of economic recovery once the health crisis is over are closely related to how well households can cope with this shock and how much economic, social and human capital has been destroyed or has simply not been created. We take the above-mentioned microeconomic, empirical perspective and ask which households are affected by the COVID-19 crisis and in what way. Moreover, we look at how financially resilient households are in weathering the crisis.

The remainder of this study is structured as follows. Section 1 introduces the two datasets we use. In section 2, we describe households in Austria from the perspective of the potential channels through which they are affected by the COVID-19 crisis, before characterizing their financial resilience to the crisis in section 3. In section 4, we analyze and hypothesize about actual financial developments during the pandemic, putting an emphasis on households' consumption and savings preferences. Section 5 discusses the problem of household finances in times of crisis from a more general point of view and concludes.

1 Data

To analyze the impact COVID-19 has had on Austrian households to date, we use data from the Austrian Corona Panel Project (ACPP) carried out by the University of Vienna (Kittel et al., 2020a). Starting at the end of March 2020, the project has generated panel survey data recording the social, political and economic impacts of the COVID-19 crisis on the Austrian population. Particular attention has been paid to changes over the course of the crisis with the aim of answering questions such as: (i) what psychosocial consequences have the lockdown periods had; (ii) what effects have the relaxations of lockdown measures had on people's risk assessments, behavior and consumption patterns and (iii) according to the Austrian population, how should the government deal with coronavirus. In the panel survey, around 1,500 people over the age of 14 living in Austria were surveyed initially on a weekly basis (from March to June), then on a bi-weekly basis (from June to July) and finally on a monthly basis (from July onward). Respondents were invited to participate in the survey using a commercial online access panel provided by Marketagent and a quota sampling procedure. To ensure that the results are representative of the Austrian population, the data are weighted by gender, age, level of education and region. In the case of incomplete surveys, we apply pairwise deletion of missing values. For details on sampling, representativeness, weighting

and data access, see Kittel et al. (2020b). For the survey questions of the variables used in this study, see the annex.

In addition to data from the ACPP, we use data from the third wave of the Eurosystem Household Finance and Consumption Survey (HFCS) for Austria to examine several aspects of households in Austria. The HFCS is a euro area-wide project that gathers information on household balance sheets including detailed measurements of wealth and income along with a rich set of socio-economic variables. The unit of observation is the household. The HFCS data have been used extensively by the Eurosystem, international organizations such as the OECD and the IMF as well as numerous academic researchers for a large variety of topics. They are gathered using the highest quality standards in terms of sampling, weighting and multiple imputations. For the corresponding first results report of the third wave, see Fessler et al. (2018), and for the methodological report including the HFCS questionnaire, see Albacete et al. (2018) as well as the online appendix available at www.hfcs.at.[2] The third wave (2017) of the HFCS gives us a clear and concise picture of the financial situation of households in Austria before the COVID-19 crisis. As the distributions of income, wealth and debt were very stable in Austria between 2010 and 2017, we assume that the 2017 data describe quite well households' financial situation in 2020 before the COVID-19 crisis. The fourth wave, which should have been carried out during the first half of 2020, was postponed due to the crisis. To still be able to analyze its impact, we therefore use additional data provided by the ACPP.

Both datasets allow us to simulate the potential financial impact of the coronavirus crisis on Austrian households, with the ACPP data providing an input for the assumptions needed for the simulations based on HFCS data on household balance sheets and characteristics. Hence, we integrate the information obtained from both datasets to enrich the analysis of the impact resulting from the COVID-19 crisis (for more details, see section 3).

2 Who is affected and in what way?

To better understand how individuals are affected financially by the COVID-19 crisis, it is advisable to take the household perspective, as the household is the economic unit in which individuals share most of their financial resources. It is crucial to know on how many sources of income household members rely and what types of income they receive, as the latter go hand in hand with the actual risks brought about by this crisis. For example, a household consisting of a single mother and her child who rent their home and whose household income only consists of the income the mother earns as a waitress and the child allowance the child receives from the state is at a higher risk than a household consisting of a retired couple who live in their own home. While the mother can lose her job and with that most of the household income, the retired couple will continue to receive their pensions. While the mother has to pay rent and may even be at risk of losing her home, the retired couple owns their home and receives imputed rent in the form of non-cash capital gains. On top of that, the mother may have to pay for childcare or may even have to stop working if childcare facilities are closed due to COVID-19. Such examples illustrate in what ways one household can be more exposed and/or less

[2] *For international results, see ECB (2020a) and ECB (2020b).*

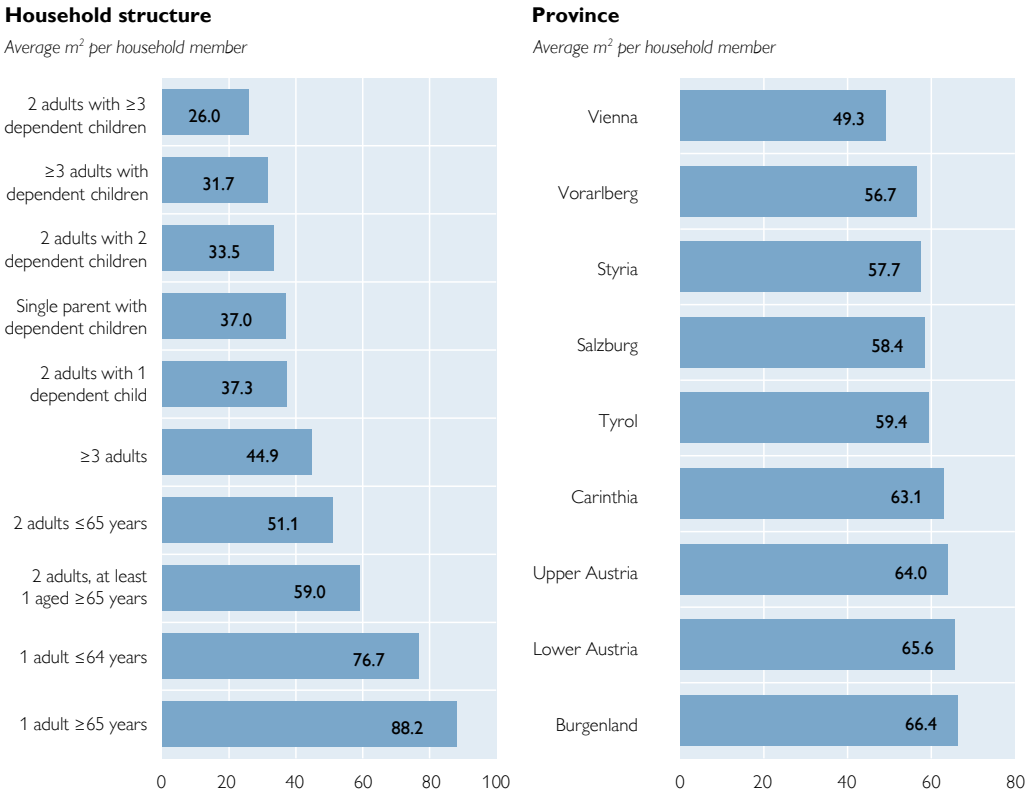
resilient to the COVID-19 shock than another household. In what follows, we demonstrate the heterogeneity in exposure to different channels of the shock by shedding light on the variety of household structures and the level of exposure that comes with the shock.

If a household member is infected with the coronavirus, transmission of the virus to other household members is possible, if not likely, and self-quarantine measures are imposed. In such cases, the size of living space is even more important. Chart 1 shows the living space in square meters per household member broken down by household structure and province. On average, larger households with children as well as single parents have less than half the space per household member compared to single households. Moreover, households living in densely populated areas like Vienna have less living space per household member than those living in areas with low population density like the province of Burgenland. Hence, the severity of potential quarantine measures is strongly related to the region households live in as well as household structure.

Table 1 shows the mean number of household members in different age groups broken down by household size. Almost 40% of Austrian households consist of only one person, and less than 30% consist of more than two persons. Less than every fifth household has children below the age of 16. Most children live in larger households with four or more household members. Living alone potentially comes

Chart 1

Living space of households



Source: HFCS Austria 2017, OeNB.

Table 1

Household structure by household size and age

	Share	Average number of persons aged…				% of households with persons aged…			
	%	*16 or below*	*16 to 25*	*25 or over*	*Total*	*16 or below*	*16 to 25*	*25 or over*	*Total*
1 person	37.0	0.00	0.06	0.94	1.0	0.0	6.4	93.6	100
2 persons	35.1	0.04	0.14	1.82	2.0	2.0	6.8	91.2	100
3 persons	12.7	0.57	0.43	2.00	3.0	19.1	14.3	66.6	100
4 persons	9.6	1.28	0.57	2.15	4.0	31.9	14.3	53.7	100
5 or more persons	5.6	1.98	0.92	2.45	5.3	37.0	17.2	45.7	100

Source: HFCS Austria 2017, OeNB.

– together with psychological hardship[3] – with a large impact resulting from a shock on household income, particularly if people lose their job.

In table 2, Austrian households are grouped into categories relative to the national median equivalized net income.[4] 10% of Austrian households have an income below 60% of the median equivalized net income, a threshold commonly used to determine whether a household lives in poverty. Households with an equivalized income above 60% but below 100% of median income are almost equally distributed between the category with an equivalized income of 60% to 80% of median income (19% of households) and that with an equivalized income of 80% to 100% of median income (about 21% of households). The income distribution is more skewed above the median, with almost 37% of households having an equivalized income between 100% and 150% of median income, but only 3.5% of households having an equivalized income of more than 200% of median income. Lower-income households are somewhat smaller in size and have far fewer household members in active employment. Moreover, they are more likely to be tenants who do not own their home. While some 56% of households who are in the lowest income category (classed as households in poverty) rent their home, only about 31% rent in the highest income category. Net wealth is also related positively to income, as is financial wealth. Tenants have much less median financial wealth than homeowners. Thus, financial wealth and real wealth are, overall, complements and not substitutes. We selected these variables for a reason. During the COVID-19 pandemic, many households have experienced income shocks. As capital income and public transfers proved more resilient to the COVID-19 crisis than labor income, the probability of households being hit by additional income shocks was higher the more household members were employed (including self-employed). Given similar household income and household size, it also matters for households whether they have to pay rent from their income or whether they generate non-cash income (imputed rent) as owner-occupiers instead. Financial wealth also plays a role in how well households weather periods of potentially lower income. While households with lower equivalized income are smaller in size and have fewer employed household members and are therefore less likely to be hit by an income shock due to the COVID-19 crisis, they more often rent

[3] *See, for example, Stolz et al. (2020).*

[4] *We use the (new) OECD scale.*

Table 2

Household characteristics by equivalized net income categories in % of median income

	Share	Household members	Employed household members	Tenants	Net wealth	Financial wealth	Financial wealth (tenants only)
	% of households	*Mean (number)*	*Mean (number)*	*% of households*	*Median (EUR thousand)*	*Median (EUR thousand)*	*Median (EUR thousand)*
below 60% of median	10.0	1.9	0.4	56.4	8.0	2.5	1.0
60% to below 80%	19.0	2.1	0.8	56.0	19.0	6.3	4.2
80% to below 100%	21.2	2.2	1.0	45.5	80.0	12.9	8.2
100% to below 150%	36.8	2.2	1.2	43.8	136.2	20.9	15.0
150% to below 200%	9.5	2.0	1.3	39.1	238.3	38.8	32.2
200% or more	3.5	2.1	1.4	30.5	514.6	92.7	75.9

Source: HFCS Austria 2017, OeNB.

their main residence and pay for it from their income. Furthermore, low-income households hold less financial wealth than households in the same income category who own their home, which reduces their ability to compensate for losses in income by using their savings. On top of that, tenants tend to suffer more from lockdown restrictions, as their main residence usually is an apartment which less often includes direct access to a garden, terrace, balcony or other outdoor space. In sum, tenants seem to be less well equipped to overcome the COVID-19 crisis than homeowners.

Table 3 illustrates the composition of annual gross household income, again broken down by income categories. More specifically, we show the mean value for each source of income within the income categories, as they sum up to the total average gross household income. One reason for lower household income in lower equivalized net income categories is, among other things, the fact that fewer household members are employed.

While all values of the different income sources (except for the one of other social transfers) rise strongly with equivalized net income in absolute terms, income from pensions and other social transfers plays a less important role in relative terms the higher the equivalized net income is. Pensions and other public transfers

Table 3

Composition of annual gross household income by equivalized net income categories in % of median income

	Share	Labor		Pension		Other social transfers		Capital		Total	
	% of households	*Mean (EUR thousand)*	*%*	*Mean (EUR thousand)*	*%*	*Mean (EUR thousand)*	*%*	*Mean (EUR thousand)*	*%*	*Mean (EUR thousand)*	*%*
below 60% of median	10.0	10.4	(52.5 +)	6.8	(34.4 +)	2.2	(11.1 +)	0.4	(2.1 =)	19.8	(100)
60% to below 80%	19.0	18.2	(61.5 +)	8.9	(30.1 +)	2.0	(6.6 +)	0.5	(1.8 =)	29.6	(100)
80% to below 100%	21.2	26.6	(64.2 +)	12.3	(29.8 +)	1.5	(3.5 +)	1.0	(2.5 =)	41.5	(100)
100% to below 150%	36.8	40.0	(70.9 +)	13.9	(24.6 +)	1.2	(2.2 +)	1.3	(2.4 =)	56.5	(100)
150% to below 200%	9.5	58.5	(72.6 +)	18.9	(23.5 +)	0.7	(0.9 +)	2.4	(3.0 =)	80.5	(100)
200% or more	3.5	126.9	(78.4 +)	20.3	(12.5 +)	0.7	(0.5 +)	13.9	(8.6 =)	161.8	(100)

Source: HFCS Austria 2017, OeNB.

serve as a financial buffer for poorer households against potential impacts of the COVID-19 crisis, as pensions and other public transfers have not (yet) been exposed to the effects of the crisis. As pensions and other social transfers as a share of income decrease with household income, the effect of shocks of labor and capital income of similar size across the income distribution is stronger for those with higher income.

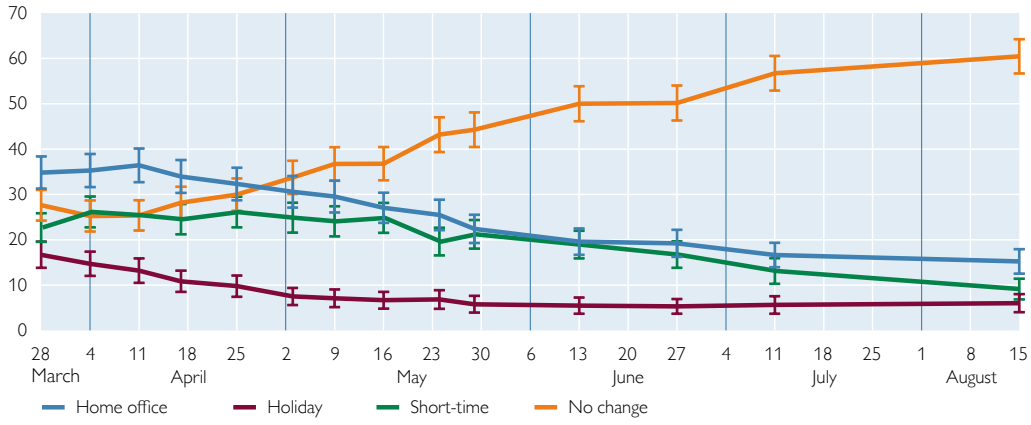
Looking at the data obtained from the ACPP allows us to gain insights into how employees were affected by the COVID-19 crisis. Chart 2 shows that during the first peak of the crisis in mid-April 2020, almost 40% of employed respondents were working from home. Although this rate has since fallen significantly, about 17% of respondents were still working from home in mid-August. Furthermore, the high proportion of people on vacation at the beginning of the crisis shows that taking vacation was one of the strategies to be able to react to the crisis at short notice. How often this approach was used becomes particularly evident when comparing the number of employees on vacation in spring with that during popular vacation times, such as during the summer months, which trails behind the 17% share of employees on vacation at end-March. Despite the increasing normalization of everyday life and the easing of several coronavirus restrictions in the summer, only 60% of respondents surveyed in August stated that their working conditions were the same as before the coronavirus outbreak (as measured by the proportion of people who said that they did not experience any unusual working conditions). This shows that for many employees everyday working life has been heavily influenced by the crisis, even if government protection programs, such as short-time working, or Kurzarbeit in German, were less widely used.

Despite better labor market conditions in the summer, respondents' expectations of how long the crisis would last (as measured by the time it takes until life in Austria is back to normal) were still consistently high and have even increased again since June (see chart 3). By mid-August, over 80% of those questioned expected that it would take more than six months until Austria would find its way back to "normality".

Chart 2

Employment status

% of employed persons

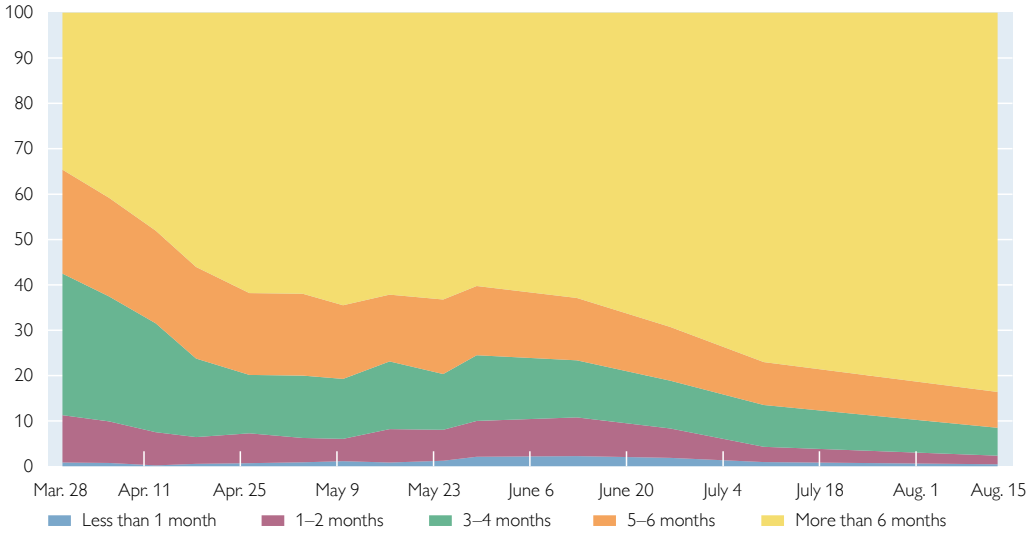


Source: Austrian Corona Panel Project (ACPP) 2020.

Chart 3

How long will it take until life gets back to normal?

% of respondents



Source: Austrian Corona Panel Project (ACPP) 2020.

As people's expectations about the duration of the crisis increased and summer did not bring back regular employment situations and conditions for a significant share of Austrians, it is crucial to ask how long household finances would last in case of different types of income disruptions. For this, we turn back to the information obtained from the HFCS in the next section.

3 How financially resilient are households to the COVID-19 crisis?

Table 4 identifies financially vulnerable households based on their financial margin, which we define (following Ampudia et al., 2016) as net income after deducting basic living costs[5], debt service for debtors and net rent (i.e. rent excluding utilities) for tenants. Austrian households' median financial margin amounts to around EUR 900 per month. This is the amount households can spend on additional consumption (other than basic consumption needs; see footnote 5) or save each month. It increases strongly with household income, net wealth or the education level of the household reference person.[6] Households with a particularly low median financial margin are those composed of a single parent with dependent children (about EUR 100) or those with an unemployed reference person (about –EUR 400). The latter is also the group with the highest proportion of households holding a negative financial margin (78%).

[5] *According to the European Commission (2011) and Ampudia et al. (2016), basic living costs in Austria come to 40% of median net household income. In addition, the basic living costs are adjusted by the number of members for each household, in line with the new OECD-modified scale.*

[6] *The household reference person is defined according to the UN/Canberra definition (UNECE, 2011), i.e. this person is uniquely determined by applying sequentially the following steps: household type (one of the partners in a de facto or registered marriage with, then without dependent children, lone parent with children, the person with the highest income, and finally the eldest person).*

Table 4

Vulnerability of households by household characteristics

	Share	Financial margin	Negative financial margin	Liquid assets	Liquid assets-to-financial margin ratio
	% of households	*Median (EUR thousand)*	*% of households*	*Median (EUR thousand)*	*Median (number of months)*
All	100.0	0.9	19.0	13.9	11.6
Age					
16–34	15.1	0.3	31.3	6.5	5.5
35–44	16.2	0.9	21.5	14.4	9.2
45–54	20.2	1.2	15.3	16.8	10.8
55–64	18.1	1.1	17.1	18.9	13.2
65–74	16.7	0.9	13.5	18.2	15.4
75+	13.6	0.5	17.1	12.6	15.7
Gender					
Male	64.9	1.1	15.0	17.2	12.3
Female	35.1	0.4	26.3	9.1	9.5
Level of education					
Primary education	0.8	0.1	35.3	9.0	0.8
Lower secondary or second stage of basic education	12.0	0.2	34.8	7.1	6.6
Upper secondary education	61.4	0.8	18.9	12.9	11.4
Post-secondary education	2.0	0.0	14.6	0.0	.[1]
Short-cycle tertiary education	23.8	1.5	11.0	23.7	13.8
Employment status					
Employed	51.4	1.0	15.0	14.5	11.1
Self-employed	6.9	1.8	15.7	22.8	10.2
Unemployed	3.6	–0.4	78.1	0.3	0.0
Retired	36.6	0.7	17.2	14.1	15.0
Other	1.4	–0.4	72.6	4.8	–2.7
Household structure					
Two adults younger than 65 years	18.3	1.5	11.0	18.4	11.1
Two adults, at least one aged 65 years or over	14.5	1.3	9.1	22.0	14.8
Three or more adults	5.6	2.4	3.2	23.0	9.8
Single parent with dependent children	3.4	0.1	43.4	5.0	0.7
Two adults with one dependent child	7.4	1.2	13.2	16.7	11.8
Two adults with two dependent children	7.1	1.2	16.5	22.8	14.3
Two adults with three or more dependent children	3.0	0.1	47.1	17.5	3.9
Three or more adults with dependent children	3.6	1.7	13.7	22.5	10.3
One adult, younger than 64 years	21.2	0.3	31.2	6.1	6.6
One adult, older than 65 years	15.9	0.4	21.1	10.8	18.2
Gross income					
1st quintile	20.0	–0.1	64.3	3.3	–0.5
2nd quintile	20.0	0.4	18.3	8.5	14.6
3rd quintile	20.0	0.9	8.6	14.2	15.0
4th quintile	20.0	1.5	3.0	20.3	13.9
5th quintile	20.0	3.0	0.6	36.2	12.3
Net wealth					
1st quintile	20.0	0.0	48.1	1.3	0.0
2nd quintile	20.0	0.6	17.2	11.2	12.2
3rd quintile	20.0	1.0	14.1	22.6	15.4
4th quintile	20.0	1.3	8.8	21.5	13.3
5th quintile	20.0	2.0	6.7	50.3	23.1
Homeownership status					
Owner/free user	53.2	1.3	11.2	21.4	14.5
Tenant	46.8	0.5	27.8	8.3	7.7
Province					
Vorarlberg	4.2	1.2	9.6	18.5	13.7
Tyrol	8.3	0.5	28.3	17.9	15.0
Salzburg	6.3	0.8	21.2	15.6	12.9
Upper Austria	15.9	0.9	14.6	16.6	14.7
Carinthia	6.4	0.5	23.2	8.0	9.0
Styria	13.8	0.7	26.7	7.9	6.8
Burgenland	3.1	1.2	7.4	16.0	10.7
Lower Austria	18.9	1.0	13.8	16.3	13.9
Vienna	23.0	0.8	19.8	12.9	10.4

Source: HFCS Austria 2017, OeNB.

[1] *Results are suppressed because of too few observations.*

Notes: Financial margin = monthly net income – debt service – basic living costs – net rent. Liquid assets = deposits + mutual funds + bonds + value of non self-employment private businesses + publicly traded shares + managed accounts.

Table 4 furthermore shows the amount of liquid assets[7] held by the households. Households' median liquid assets amount to about EUR 14,000. Households with higher financial margins tend to have higher amounts of liquid assets, with the median financial margin of homeowners being almost three times higher than that of tenants (EUR 1,250 vs. EUR 450) and their liquid assets being almost three times higher, too (EUR 21,000 vs. EUR 8,000). However, there are also exceptions to the positive correlation between financial margins and liquid assets: Households composed of two adults with three or more dependent children have a relatively low median financial margin but a relatively high amount of liquid assets (EUR 60 vs. EUR 18,000). Finally, in the table, households' financial margin and liquid assets are combined into a single ratio to determine the number of months during which a median household would be able to compensate for potential financial margin losses by drawing on its liquid assets. As can be seen from the table, the median household has the financial capacity to compensate for such losses for more than 11 months. However, there are households who cannot compensate for such losses at all (e.g. households in the lowest income quintile or those with an unemployed reference person), and there are households who can cope with such losses for an even a longer period (e.g. households in the highest net wealth quintile or those with a retired reference person). This finding connects nicely with respondents' expectations of how long it will take to get back to normal times. It shows that the median household might be able to compensate for financial losses for a relatively long time. Focusing on those households who are not able to make up for losses as a result of the COVID-19 crisis seems warranted.

4 How have households been affected by the COVID-19 crisis?

4.1 Simulation results

To give some indication of the extent to which households have been affected by the COVID-19 crisis, we extended the microsimulation model by Albacete and Fessler (2010) and Albacete et al. (2014) to take into account shocks experienced not only at the level of households but also at the level of household members. The microsimulation model is based on the third wave of the HFCS.

The information obtained from the ACPP regarding the socio-economic characteristics (specifically the education level) of employees on short-time work together with the current short-time and unemployment statistics (across NACE sectors) compiled by the Public Employment Service Austria (AMS) provide the input for the simulations based on HFCS data on household balance sheets and characteristics.

Based on this input, several working household members are simulated to be either newly unemployed or on short-time work. While unemployed workers are chosen randomly according to an unemployment probability distribution estimated using a logit regression, short-time workers are chosen randomly according to the parameters coming from the ACPP and AMS data. The final step of the simulations consists in aggregating the household member level to the household level and it is after this step that it becomes clear whether the losses in income have been substantial or not and how many households (and household members) have been

[7] *Liquid assets include deposits, mutual funds, bonds, non-self-employment private businesses, publicly traded shares and managed accounts.*

Table 5

Microsimulation of the potential impact of shocks on household income

	Affected households	Net household income	Income loss	
			Absolute	Relative to household income
	% of households	*Mean (EUR thousand)*	*Mean (EUR thousand)*	*Mean (%)*
Baseline scenario: situation before the COVID-19 crisis	0.0	3.2	0.0	0.0
Scenario 1: +32 percentage points (short-time workers) and +5 percentage points (unemployed workers)	29.0	3.1	0.4	11.9
Scenario 2: identical to scenario 1, but one-third of short-time workers becomes unemployed	29.0	3.1	0.9	25.3

Source: HFCS Austria 2017, OeNB and authors' calculations.

affected. The simulations follow the commonly used Monte Carlo approach, as the simulation steps are repeated 1,000 times before the means are calculated.

Table 5 shows the simulated potential impact of two COVID-19 scenarios on household income. In the first scenario, the rate of short-time workers in the total labor force population increases by 32 percentage points and the unemployment rate by 5 percentage points. According to the microsimulation model, 29% of households are affected in some way (placed on short-time work, laid off or both) in such a scenario which is comparable to the situation observed during the lockdown in April 2020. Overall, the monthly mean net household income decreases from EUR 3,200 to EUR 3,100. Among the households affected, the average income loss amounts to EUR 500 per month or about 12% of household income before the crisis. In the second scenario, we assume that one-third of the short-time workers in scenario 1 becomes unemployed in addition to those already unemployed in scenario 1. Thus, the second scenario shows an extreme situation that could materialize in Austria in the future and that would lead to average income losses twice as high as in the previous scenario both in absolute and relative terms. This is mainly due to unemployment benefits in Austria being lower than short-time work subsidies (55% vs. 85%[8] of income).

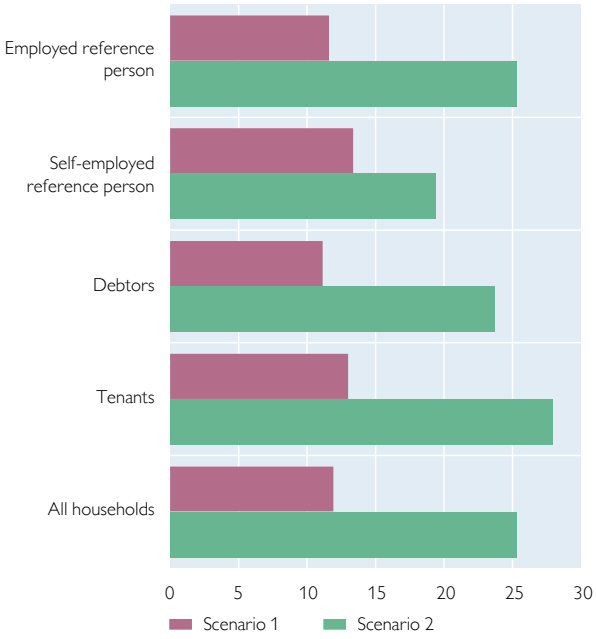
Chart 4 shows that the predicted relative income losses differ across households. For example, tenants suffer relatively large income losses, losing around 28% of their monthly net household income (about EUR 800) on average in the second scenario. Furthermore, households with a self-employed reference person suffer above-average relative income losses in the first scenario (–13%), but below-average relative income losses in the second scenario (–19%). The reason is

[8] *Our microsimulation model assumes that the rate of short-time work subsidies comes to 85% of employees' disposable income. However, in reality, the exact rate of short-time work subsidies depends, on the one hand, on employees' income level: It comes to 90% if disposable income is less than EUR 1,700, to 85% if disposable income lies between EUR 1,700 and EUR 2,685 and to 80% if disposable income is higher than EUR 2,865. On the other hand, the exact rate of subsidies depends on the amount of short-time working hours: The rates listed above only apply if the amount of short-time working hours is less than 100% of the work time ; otherwise, the rate of short-time work subsidies would come to 100% of disposable income.*

Chart 4

Microsimulation of income losses of affected households by household characteristics

% of household income



Source: HFCS Austria 2017, OeNB and authors' calculations.

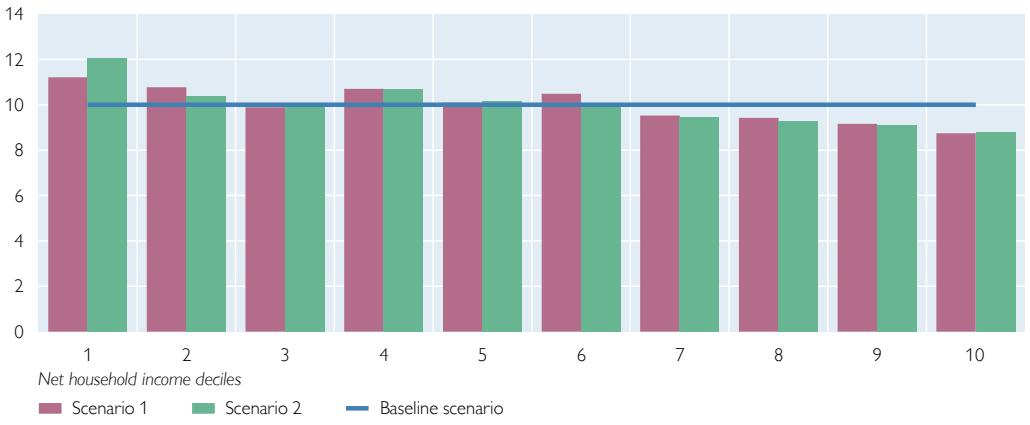
that self-employed workers have lower unemployment probabilities than other workers (e.g. employees).

Chart 5 displays the potential impact of the two COVID-19 scenarios on the distribution of net household income. We first divide the household income distribution into deciles based on the situation before the COVID-19 crisis (baseline scenario). Then, after having simulated each of the two COVID-19 scenarios, we compute for each household its new income and, if applicable, reassign the household, according to its new income, to one of the ten decile groups. On the one hand, chart 5 shows that the COVID-19 crisis has led to a decrease in the number of households in the upper income deciles. For example, the proportion of households in the highest income group drops from 10% to 8.7% under the first COVID-19 scenario (and remains stable under the second scenario). On the other hand, the chart shows that the COVID-19 crisis has caused the number of households in the lower income

Chart 5

Microsimulation of the impact of COVID-19 scenarios on the net household income distribution

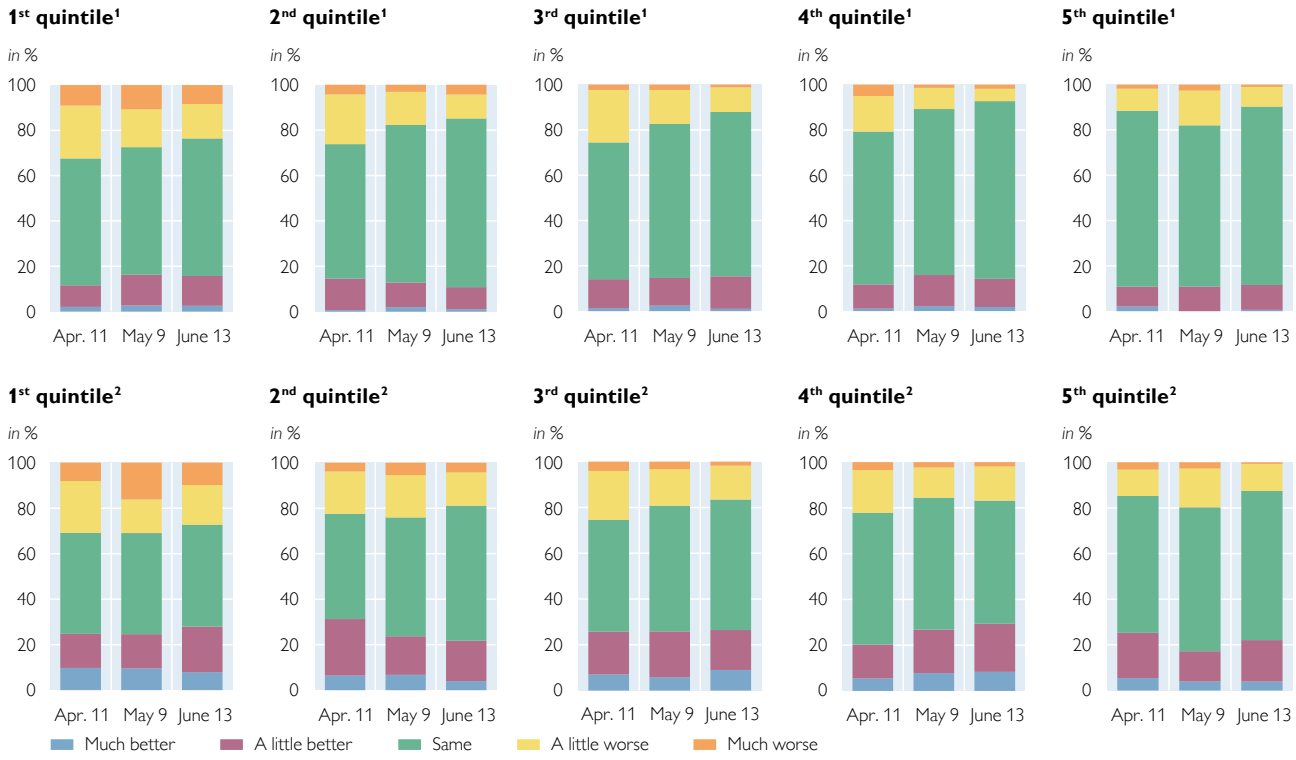
% of households



Source: HFCS Austria 2017, OeNB and authors' calculations.

Chart 6

Economic expectations of the financial situation by income quintiles



Source: Austrian Corona Panel Project (ACPP) 2020.

[1] Own financial situation in 3 months.
[2] Own financial situation in 1 year.

deciles to increase, especially in the lowest one. The proportion of households in the lowest income group increases from 10% to 11.2% under the first scenario and to 12.1% under the second scenario. These results suggest that unemployment represents a real threat for many households.

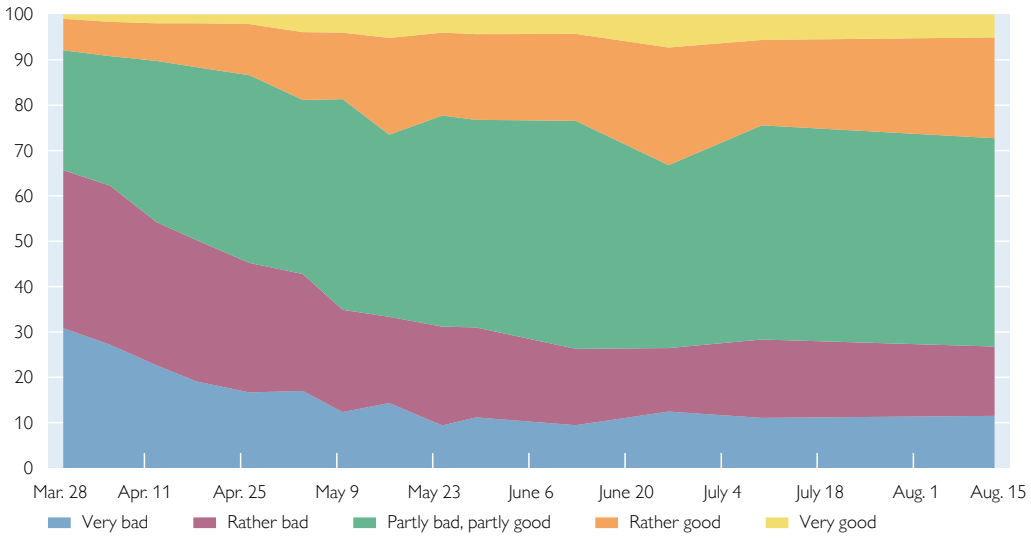
Looking again at data from the ACPP, we can see whether these simulations are also reflected in the financial expectations of Austrian households during the coronavirus crisis. Chart 6 shows that the largest shares of those expecting a slightly or much worse financial situation looking three months or one year ahead can be found in the lowest disposable household income quintile.

In the medium term (i.e. in three months' time), more respondents expected to be worse instead of better off. However, economic expectations were not only negative. In the long term (i.e. in one year's time), the number of respondents expecting to be financially better off was nearly as high as the number of those expecting financial losses. This long-term perspective highlights the high level of income volatility expected by respondents in the lowest income quintile, as the share of those expecting income stability in this quintile is smaller than in any of the other quintiles. When looking at changes over time, we found that the level of negative expectations decreased slightly between April and June 2020, as the general economic situation improved during that period.

Chart 7

Good or bad time to buy home appliances?

% of respondents



Source: Austrian Corona Panel Project (ACPP) 2020.

4.2 Consumption and saving in times of crisis

Modeling the impact of potential crisis scenarios on household income is only one part of the analysis in this study. As the crisis distorts income and income expectations of households, which, in turn, are expected to affect households' consumption and saving behavior, we should also look at the latter two. The ACPP provides additional information on this topic.

In chart 7, we see that early on in the crisis, a majority of households considered it a rather bad or very bad time to buy home appliances, which we take as an example for larger purchases. Over time, this attitude changed to the point where in August, the share of respondents who thought that it was a rather good or very good time for such purchases was as high as the share of those who considered it to be a bad time. A large fraction, however, was still unsure. This increase in consumer confidence could result from improved labor market conditions in the summer which stabilized incomes; yet, consumer sentiment could also be affected by the possibility to go out and do some shopping (i.e. by shutdowns and reopenings). It was only after some time that eased lockdown restrictions allowed consumers to go to shops and over time, perceived risks associated with shopping (potential additional health costs due to consumption) decreased (see e.g. Chetty et al., 2020). Thus, at this point, it remains difficult to isolate the effect of reduced income expectations on household consumption and consumption intentions.

Unlike consumption, saving money is not within reach of every household. According to the HFCS, about one-quarter of Austrian households does not save regularly.[9] Table 6 shows that these are mainly households with an equivalized net income below 60% of median income. The unconditional median saving rate amounts to 8.4% and the unconditional median amount of money saved by

[9] *These households indicate that they can neither save regularly nor do they currently have any outstanding debt to be serviced.*

Table 6

Household saving rates by age and equivalized net income categories in % of median income

	Share of households able to save	Saving amount per month	Saving rate
	%	*Unconditional median (in EUR)*	*Unconditional median (%)*
All	75.0	200	8.4
Age			
16–34	68.5	159	7.1
35–44	77.3	300	9.2
45–54	79.6	349	10.1
55–64	73.9	264	7.9
65–74	75.5	200	7.3
75+	73.8	150	8.5
Income categories			
below 60% of median	64.0	100	5.9
60% to below 80%	82.0	300	9.4
80% to below 100%	85.4	400	11.0
100% to below 150%	91.5	518	13.4
150% to below 200%	91.5	1,500	21.1
200% or more	98.7	3,129	22.0

Source: HFCS Austria 2017, OeNB.

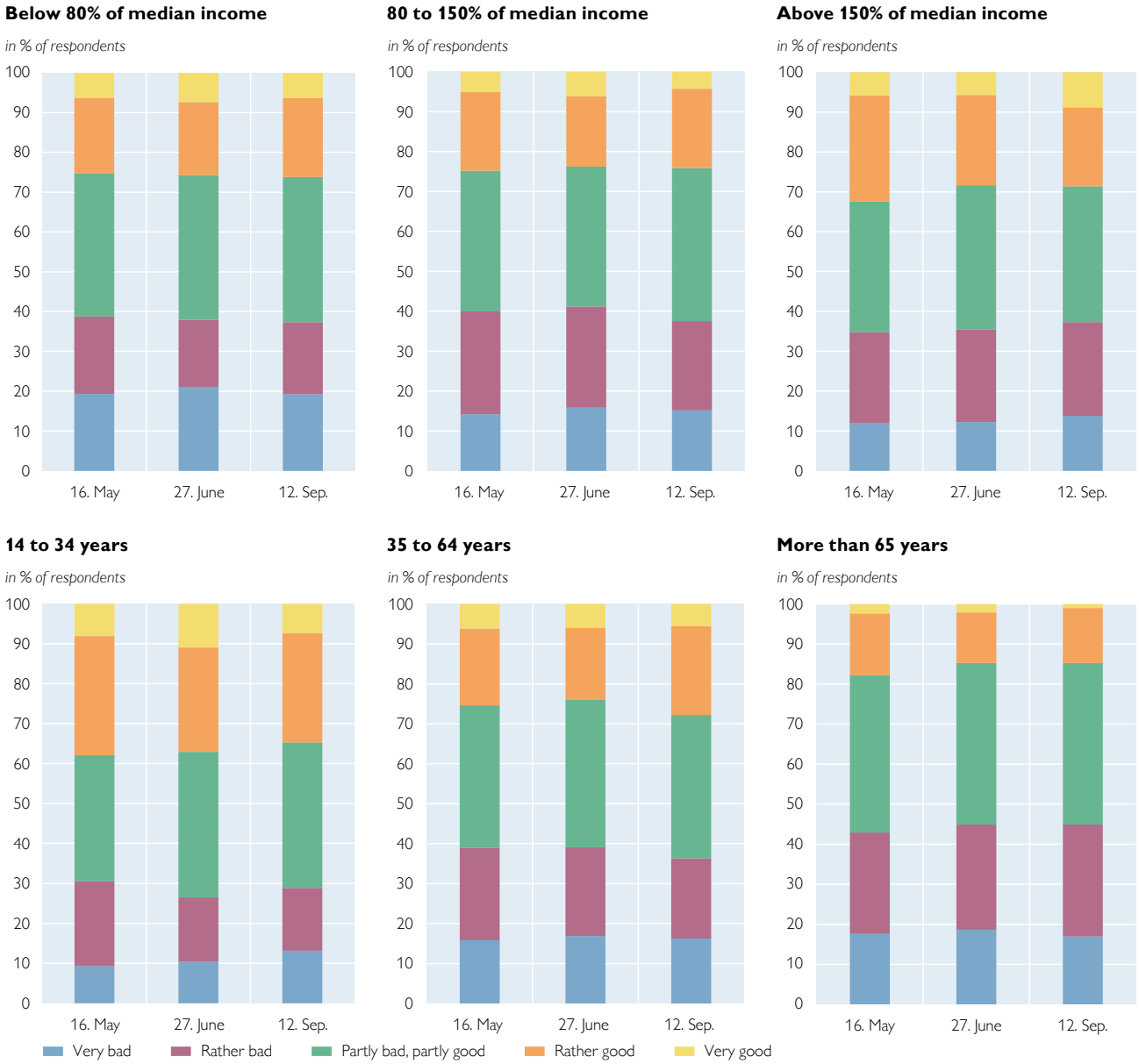
households is around EUR 200 per month. Table 6 also shows that both the amount saved and the saving rate rise with income. Low-income households need to spend a higher share of their income on consumption. Therefore, they save less in absolute terms and relative to their income. While the bottom income group has a median saving rate of less than 6%, the median saving rate of the top income group amounts to 22%. The bottom income group saves about EUR 100 per month at the median, while the top income group saves more than EUR 3,100 per month at the median.

Furthermore, the relationship between both the amount saved and the saving rate and age is hump-shaped. First, the saving rate increases with the household reference person's age up to 54 years or less; second, the rate clearly decreases afterwards (see table 6). This pattern is consistent with the life cycle hypothesis (see Modigliani and Brumberg, 1954), which states that individuals seek to smooth consumption throughout their lifetime by borrowing when their income is low and saving when their income is high. This would mean low saving rates when individuals are young, increasing saving rates during middle age and decreasing saving rates during old age. However, note that, as we look at a cross section of the population, age patterns have to be interpreted with caution, as they are likely to reflect some combination of age and cohort effects (which they actually do; see Fessler and Schürz, 2017).

To analyze changes in Austrian households' attitudes toward saving money over time, we again draw on data from the ACPP 2020. In three ACPP survey waves, respondents were asked whether they thought that it was a good time to save money, which allows insights into respondents' attitudes toward saving shortly after infection numbers had gone down and employment started to pick up in mid-May, at the end of June and when infection numbers started to rise again in mid-September.

Chart 8

Saving preferences by income and age categories



Source: Austrian Corona Panel Project (ACPP) 2020.

We distinguish between three income groups[10] and three age groups. As is shown in chart 8, respondents' attitudes toward saving money remain quite stable over time. Thus, little seems to have changed on average between May and September; yet, we cannot rule out that attitudes have improved compared to earlier points in time during the lockdown in April for which we lack comparable data. However,

[10] *Household income was measured based on ten income categories that roughly resemble Austrian households' income deciles. We calculate absolute income using the midpoints of the closed intervals as scores for those categories. The midpoint of the open-ended top category is extrapolated from the next-to-last category using a formula based on the Pareto curve (Hout, 2004). Afterwards, we calculate groups relative to the median equivalized net income of the first ACPP survey wave (EUR 1,650) using the (new) OECD scale.*

one small difference we did observe between income groups was that respondents in the highest income category exhibited an increasing propensity over time to say that it was a very good time to save money. This indicates that changes in attitudes toward saving money over time could be related to income. This pattern becomes more evident when the highest income category is even more narrowly defined. However, this comes at the cost of a very low number of cases in this category (not shown in chart 8).

Similar to the breakdown by income groups, the answer patterns broken down by age groups also remain quite stable over time, with differences between the individual age groups being large, however. As can be seen, the share of respondents who thought that it was a rather good time to save money slightly decreased for the youngest and oldest age group over the three survey waves. Contrary to that, respondents aged between 35 and 64 were increasingly inclined (between May and September) to answer that it was a rather good time to save money.

5 Conclusions

This study discussed the potential effects of the COVID-19 crisis on household finances in Austria. In the first part of this study, we illustrated the heterogeneity in exposure to different channels of the COVID-19 shock by shedding light on the variety of household structures and the level of exposure that comes with the shock. Households with little living space per household member, such as larger households with children, households with single parents or households living in densely populated areas like Vienna, are more exposed to disruptions stemming from COVID-19. As regards household income, pensions and other public transfers serve as a financial buffer for poorer households against potential impacts of the COVID-19 crisis, as pensions and other public transfers have not (yet) been exposed to the effects of the crisis. As far as households' financial vulnerability is concerned, we find that the median household might be able to compensate for financial losses for a relatively long time by drawing on their liquid assets. This finding suggests that focusing on those households who are not able to make up for losses as a result of the COVID-19 crisis, such as single-parent households or those with unemployed household members, seems warranted.

In the second part of the study, we used data from the Austrian Corona Panel Project (ACPP) carried out by the University of Vienna as well as data from the Eurosystem Household Finance and Consumption Survey (HFCS) for Austria to analyze potential impacts of the crisis. Our analysis suggests that household income losses averaged about 12% during the lockdown in April 2020; this percentage would double if one-third of short-time workers became unemployed. Tenants are among those suffering in particular from large income losses. Although households' attitudes toward consumption were negatively affected at the onset of the COVID-19 crisis, they have improved over time. However, uncertainties are still high. Also, saving attitudes are surrounded by high uncertainties, but we find some weak evidence of increasingly positive attitudes for high-income households over time.

References

Albacete, N., S. Dippenaar, P. Lindner und K. Wagner. 2018. Eurosystem Household Finance and Consumption Survey 2017: Methodological notes for Austria. Monetary Policy & the Economy Q4/18 – Addendum. OeNB.

Albacete, N., J. Eidenberger, G. Krenn, P. Lindner and M. Sigmund. 2014. Risk-bearing capacity of Households – Linking micro-level data to the macroprudential toolkit. In: OeNB Financial Stability Report 27. 95–110.

Albacete, N. and P. Fessler. 2010. Stress Testing Austrian Households. In: Financial Stability Report 19. 72–91.

Ampudia, M., H. van Vlokhoven and D. Żochowski. 2016. Financial fragility of euro area households. In: Journal of Financial Stability. Volume 27, Pages 250–262.

Chetty, R., J. Friedman, N. Hendren, M. Stepner and the Opportunity Insights Team. 2020. How Did COVID-19 and Stabilization Policies Affect Spending and Employment? A New Real-Time Economic Tracker Based on Private Sector Data. In: NBER Working Paper Series. No. 27431. June 2020.

ECB. 2020a. The Household Finance and Consumption Survey: Methodological report for the 2017 wave. Statistical Paper Series No. 35. March 2020.

ECB. 2020b. The Household Finance and Consumption Survey: Results from the 2017 wave. Statistical Paper Series No. 36. March 2020.

European Commission. 2011. The Measurement of Extreme Poverty in the European Union.

Fessler, P., P. Lindner and M. Schürz. 2018. Eurosystem Household Finance and Consumption Survey 2017: First Results for Austria. In: Monetary Policy & the Economy Q4/18. OeNB. 36–66.

Fessler, P. and M. Schürz. 2017. Zur Verteilung der Sparquoten in Österreich. In: Monetary Policy & the Economy Q4/17. OeNB. 13–33.

Hout, M. 2004. Getting the Most Out of the GSS Income Measures. GSS Methodological Report 101.

Kittel, B., S. Kritzinger, H. Boomgaarden, B. Prainsack, J.-M. Eberl, F. Kalleitner, N. Lebernegg, J. Partheymueller, C. Plescia, D.W. Schiestl and L. Schlogl. 2020a. Austrian Corona Panel Project (SUF Edition). https://doi.org/10.11587/28KQNS.

Kittel, B., S. Kritzinger, H. Boomgaarden, B. Prainsack, J.-M. Eberl, F. Kalleitner, N. Lebernegg, J. Partheymueller, C. Plescia, D.W. Schiestl and L. Schlogl. 2020b. The Austrian Corona Panel Project: Monitoring Individual and Societal Dynamics amidst the COVID-19 Crisis. European Political Science. https://doi.org/10.1057/s41304-020-00294-7.

Modigliani, F. und R. H. Brumberg. 1954. Utility analysis and the consumption function: an interpretation of cross-section data. In: Kurihara, K. K. (Hrsg.). Post-Keynesian Economics. Rutgers University Press. New Brunswick. 388–436.

Schnabel, I. 2020. Unequal scars – distributional consequences of the pandemic. Speech 18 September, Frankfurt am Main. https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200918~8aaf49cd79.en.html

Stolz, E., H. Mayerl and W. Freidl. 2020. The impact of COVID-19 restriction measures on loneliness among older adults in Austria. Working Paper. https://www.medrxiv.org/content/10.1101/2020.09.08.20190397v1

United Nations Economic Commission for Europe. 2011. Canberra Group Handbook on Household Income Statistics. 2nd edition. Geneva. United Nations.

Annex: Selected questions, Austrian Corona Panel Project

Chart 2: Employment status

Which of the following aspects apply to your current professional situation? Please select all answers that apply. (multiple choice)

a. I am in home office.
b. I am reducing hours, in compensatory time-off and on holiday.
c. I have been dismissed.
d. I have an increase of working hours.
e. I am on short-time.
f. I receive unemployment benefits.
g. I receive money from the hardship fund.
h. I receive Bridge-Finance-Guarantees.
i. I get social benefits (minimum income, emergency).
j. No change.
k. No answer.

Chart 3: How long will it take until life gets back to normal?

What is your estimate: How long will it take until life in Austria returns to normal, i.e. to the way it was before the crisis? (single mention)

a. Less than 1 month.
b. 1–2 months.
c. 3–4 months.
d. 5–6 months.
e. More than 6 months.
f. Don't know.
g. No answer.

Chart 6: Economic expectations by household income categories

How will the financial situation of your household develop in the future compared to your current situation? (matrix question)

a. In 3 months.
b. In 12 months.

Matrix labels:
1 = Much better.
2 = A little better.
3 = Same.
4 = A little worse.
5 = Much worse.
Don't know.
No answer.

Chart 7: Good or bad time to buy home appliances?

Do you think now is a good or bad time to buy larger household items such as furniture, a refrigerator, a stove, a television and the like? (single mention)
a. 1 = Very bad time
b. 2 = Rather bad time
c. 3 = Partly bad/good time
d. 4 = Rather good time
e. 5 = Very good time
f. Don't know.

Chart 8: Saving preferences by income and age categories

Do you think now is a good or bad time for you personally…? (matrix question)
a. to save money or leave it on the account?

Matrix labels:
1 = Very bad time
2 = Rather bad time
3 = Partly bad/good time
4 = Rather good time
5 = Very good time
Don't know.

The effects of the monetary policy response to the COVID-19 pandemic: preliminary evidence from a pilot study using Austrian bank-level data

Claudia Kwapil, Kilian Rieder[1]
Refereed by: Olivier Vergote, European Central Bank

The Eurosystem's monetary policy response to the COVID-19 crisis has been swift and powerful. Its policy package contained both extensions and enlargements of existing unconventional monetary policy measures, including the further loosening of their respective conditions. The Eurosystem also introduced new measures to meet the extraordinary challenge posed by the economic fallout of the COVID-19 pandemic. In this paper, we provide a pilot study to analyze the credit supply effects of one important building block of the monetary policy rescue package: the Eurosystem's targeted longer-term refinancing operations (TLTROs). The modalities and conditions of the current vintage of TLTRO, TLTRO III, were significantly relaxed in spring 2020 in response to the COVID-19 pandemic. We draw on Austrian bank-level data and exploit an instrumental variable strategy to approximate the effects of the June 2020 TLTRO uptake on banks' supply of new loans. We find evidence for an unambiguously positive effect of TLTRO participation on the supply of new loans in Austria. The estimated credit supply elasticity, however, differs substantially (ranging between 0.26 and 1.00), depending on the specification and caveats considered.

JEL classification: E44, E51, E52, E58
Keywords: COVID-19, monetary policy, targeted longer-term refinancing operations, credit supply

The COVID-19 shock resulted in a worldwide economic downturn. According to the latest estimates by Eurosystem staff (2020), the associated recession in the euro area will reduce the euro area's GDP level by 7.3% in 2020. Fenz and Schneider (2020) expect Austria's GDP to decline by approximately 7% as well. This downturn in economic activity is going hand in hand with lower inflation. The December Eurosystem staff economic projections (2020) show that the COVID-19 pandemic and the related containment measures will leave inflation rates in the euro area only slightly above zero in 2020. Moreover, the shock will dampen inflation developments over a prolonged period of time and will thus be likely to cause increases in the Harmonised Index of Consumer Prices (HICP) that will be significantly below the Eurosystem's price stability objective in the years to come.

Moreover, in view of the spreading of the coronavirus, financial markets showed severe signs of stress. At the end of February and the beginning of March 2020, global risk aversion rose sharply. Consequently, market volatility surged, equity prices plummeted, and risk premia widened. Safe-haven flows led to a

[1] *Oesterreichische Nationalbank, Economic Analysis Division, claudia.kwapil@oenb.at and kilian.rieder@oenb.at.* *Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the Oesterreichische Nationalbank or the Eurosystem. The authors would like to thank Olivier Vergote (European Central Bank), Ernest Gnan, María Teresa Valderrama (both OeNB) and Clemens Jobst (University of Vienna) for their helpful comments and valuable suggestions.*

marked decline of euro area long-term risk-free rates, while spreads between sovereign bonds in some euro area countries increased. Following the spreading of the coronavirus and the related lockdowns, money market rates increased. In other words, banks' financing conditions deteriorated significantly, posing a threat to the stable supply of credit and, as a corollary, also to economic activity.

To prevent a reduction in credit supply that would worsen the economic situation and to bring inflation back to its target level of close to, but below, 2% in the medium term, the Eurosystem has put together a comprehensive package of monetary policy measures. First, it increased the purchasing volume of its current securities purchase program (extended asset purchase programme – APP) and introduced a new program (pandemic emergency purchase programme – PEPP) that complements the APP by introducing higher flexibility in proportion to the severity of the crisis. Together, the purchasing volume of both programs amounts to nearly EUR 2.5 trillion. Thus, the Eurosystem central banks significantly increased the amount of corporate bonds, bank-issued covered bonds and sovereign bonds they will buy until the end of March 2022.[2] The Eurosystem's corporate sector purchasing operations address the deteriorating market conditions in the wake of the COVID-19 pandemic. Hence, these operations reduce the interest rate costs companies face when issuing new bonds and they make it easier for companies to float new issues on the primary market. The very same logic applies to bank-issued covered bonds. Given the "benchmark" status of government bonds, sovereign bond purchasing programs in turn reduce the interest rate level and the financing costs for all economic sectors and for numerous financial instruments, including risk capital, via a reduction in government bond yields over the entire range of maturities. Thus, as a result of the related asset purchases, many areas of the economy benefit from more favorable financing conditions in the capital markets.

Small and medium-sized enterprises (SMEs) and households, however, rarely have access to capital markets and depend on bank credit instead. Frequently, their only source of external finance are bank loans, and the conditions at which these are provided are crucial for the implementation of consumption and investment projects. Consequently, were the COVID-19 crisis to impair the banking sector's capacity to provide adequate funding to SMEs and households, euro area economic growth would suffer, and the inflation outlook would be dampened even further.

The second part of the Eurosystem's monetary policy response to the COVID-19 pandemic is, therefore, designed to strengthen the supply of bank loans to the real economy by providing ample sources of refinancing at lower interest rates and longer maturities than before the COVID-19 shock. In addition to its regular refinancing operations, the Eurosystem started to offer banks two new refinancing programs – pandemic emergency longer-term refinancing operations (PELTROs) and a modified version of the third generation of targeted longer-term refinancing operations (TLTRO III) – at interest rates that are below the rate on its main refinancing operation (currently 0%) and at maturities of between one and three years. Both programs are carried out through a fixed-rate tender procedure with full allotment, which means that banks' demand is met in full (if they comply with the eligibility requirements). The reasoning behind these measures is that

[2] *The above estimate of the combined APP and PEPP purchasing volume of EUR 2.5 trillion is based on the assumption that the APP will also be continued until March 2022.*

banks subsequently pass on their favorable refinancing conditions to the real economy. Central bank loans with longer maturities are intended to give banks more security regarding their medium-term refinancing situation and refinancing costs, so that refinancing obstacles to loan provision are removed.

Since the Eurosystem only provides collateralized loans, the third building block of its policy response to the COVID-19 pandemic are significantly eased collateral requirements to anticipate potential borrowing constraints and widen access to central bank refinancing. Accepting lower-quality collateral ensures that banks have more assets they can mobilize as collateral with the Eurosystem so they can participate in the liquidity-providing operations and continue to provide funding to the euro area economy. To increase the pool of eligible assets, the Eurosystem reduced the applied haircuts and relaxed the conditions at which credit claims can be accepted as collateral. Moreover, the Eurosystem's monetary policy response includes a rating freeze. Hence, rating downgrades that are attributable to the economic fallout of the COVID-19 pandemic alone and that would normally entail a deterioration of asset ratings below minimum credit quality requirements, will not cause marketable assets to become ineligible as collateral in Eurosystem operations. This measure reduces potential procyclical dynamics in credit markets and ensures the continued availability of collateral.

Finally, prudential authorities across the euro area have relaxed capital requirements and have granted banks more operational flexibility to maintain the flow of credit to the economy.[3] Moreover, fiscal policy provided loan guarantees and debt moratoria.

The Eurosystem's policy response to the COVID-19 shock must be regarded as an encompassing package whose individual measures reinforce each other in their aim of combating the financial fallout of the COVID-19 pandemic, thereby supporting the economy and bringing inflation back to target. As a corollary, the monetary policy measures should be discussed and calibrated jointly (see Altavilla et al., 2020a; Rostagno et al., 2019). Recent impact assessments of individual policy measures, however, have proven helpful in evaluating the aggregate effects of unconventional monetary policy measures on economic growth and inflation developments over the last decade (see e.g. Altavilla et al., 2019; Boeckx et al., 2020; Eser et al., 2019; Heider et al., 2019).

Building on the empirical literature that has analyzed the effect of central bank lending on banks' credit supply before the COVID-19 pandemic (e.g. Afonso and Sousa-Leite, 2020; Andreeva and Garcia-Posada, 2020; Bats and Hudepohl, 2019; Esposito et al., 2020; Laine, 2019)[4], we focus on one important part of the above-mentioned monetary policy responses to the COVID-19 crisis: the Eurosystem's TLTROs. We provide a pilot study analyzing the effects of TLTROs on Austrian banks' loan supply since the outbreak of the COVID-19 pandemic. Our empirical strategy is based on bank-level (micro)data, which we use to identify the causal effect of TLTROs on banks' credit supply. We face two endogeneity concerns in this endeavor, namely the self-selection of banks into TLTROs and the

[3] *For a detailed description of all macroprudential and supervisory measures in response to the COVID-19 pandemic in the euro area, see Altavilla et al. (2020a).*

[4] *Alves et al. (2016), Andrade et al. (2019), Carpinelli and Crosignani (2017) as well as Garcia-Posada and Marchetti (2015) provide empirical evidence on the effect of LTROs – the untargeted predecessors of TLTROs – on credit supply in the euro area.*

difficulty of distinguishing credit supply from credit demand responses. First, as TLTROs do not represent a randomly assigned treatment, banks with certain characteristics (e.g. banks that plan to provide credit to the real economy anyway) may be more likely to participate than others. If left unaddressed, this selection of banks into TLTROs would be likely to result in biased estimators. Following Afonso and Sousa-Leite (2020), Andreeva and Garcia-Posada (2020), Benetton and Fantino (2018) as well as Esposito et al. (2020), we draw on an instrumental variable strategy to deal with these concerns. Second, it is notoriously difficult to distinguish between credit demand and credit supply forces at the bank level (see e.g. Andrade et al., 2019; Carpinelli and Crosignani, 2017; Khwaja and Mian, 2008; Schnabl, 2012) as we only observe equilibrium outcomes in credit markets. The COVID-19 shock that triggered the provision of TLTROs III also affected credit demand (e.g. by increasing demand for loans by affected customers). To estimate unbiased credit supply elasticities to TLTRO uptake, we thus must credibly disentangle credit demand from credit supply forces. For this purpose, we control for a bank-specific covariate that takes into account the composition of each bank's customer base just before the outbreak of the COVID-19 pandemic and combines this information with data on how hard each sector in the customer base was hit by the COVID-19 shock. Together, these two strategies should help us identify the plausibly causal effects of TLTRO uptake on Austrian banks' supply of new loans.

In this pilot study, we find evidence for an unambiguously positive effect of TLTRO uptake on loan supply for the period from July to September 2020. The credit supply elasticities estimated for Austrian banks range from 0.26 to 1.00, depending on the respective econometric specification and on whether we allow for anticipation effects in credit supply, whether we restrict our attention to eligible loans only or whether we look at all categories of new loans supplied. Hence, while the positive sign of the estimated elasticity seems robust, we fully acknowledge that the wide range of estimates points to considerable uncertainty about the magnitude of this positive effect. Moreover, we would like to caution against over-interpreting the size of the estimated elasticities for two reasons. First, while some studies find elasticities significantly higher than 0.26, the specific economic background of our study (i.e. a pandemic crisis, and our restricted sample) may not be directly comparable to the contexts of previous work. Second, it is difficult to gauge how bank credit would have evolved without TLTRO support.

We contribute to the literature in two ways. First, our study extends previous efforts to evaluate the impact of unconventional monetary policies in response to the COVID-19 crisis. It provides a first, almost real-time analysis of the Eurosystem's monetary policy response to the pandemic. Although our estimates are preliminary and subject to many caveats, we still hope that our study will prove useful for the further calibration and fine-tuning of current measures as the Eurosystem continues to fight the economic fallout of the COVID-19 crisis. Second, building on the work of Puhr and Schneider (2020), we create a COVID-19 shock indicator for Austrian banks' credit demand that carefully traces how hard each individual customer base was hit by the pandemic and the related containment measures.

The remainder of this study is structured as follows. Section 1 explores the specific modalities of TLTROs and studies how they were adapted to meet the extraordinary pressures of the current crisis. We also report the main aggregate facts documenting the uptake of TLTROs by the Austrian banking sector. Section 2

provides a discussion of the empirical challenges faced when estimating the credit supply response to banks' TLTRO borrowing. In section 3, we explain our empirical strategy and sources in more detail. In section 4, we present our estimation results for the impact of TLTRO uptake on bank-level credit. Finally, section 5 concludes.

1 Targeted longer-term refinancing operations (TLTROs)

Banking sector credit intermediation is central for investment in the euro area in general and in Austria in particular, especially for SMEs and households with no other sources of finance. To stimulate the supply of loans and thus to provide the real economy, and consequently inflation, with a positive impetus, the Eurosystem launched TLTROs already back in September 2014. In contrast to other refinancing operations, this funding-for-lending scheme contains incentives for banks to grant loans to the private sector.

In September 2019, the Eurosystem launched the third generation of TLTROs (TLTRO III). This program consists of ten operations (TLTRO III.1 to TLTRO III.10) conducted at a quarterly frequency between September 2019 and December 2021. Each operation comes with a maturity of three years. Although TLTRO III already existed before the COVID-19 crisis, its conditions were adjusted in the light of the new challenges. Consequently, the first two operations before the COVID-19 shock (TLTRO III.1 in September 2019 and TLTRO III.2 in December 2019) were offered on different terms than the subsequent five operations.[5,6]

TLTROs are targeted operations, because the amount that banks can borrow is linked to the size of their existing portfolio of loan to the private sector. Banks heavily engaged in private sector lending can thus borrow a relatively higher amount (compared to the size of their balance sheet). Since TLTRO III.3 of March 2020, banks have been able to borrow up to 50% of the outstanding amount of their loans to nonfinancial corporations and households as of February 28, 2019 (including loans to nonprofit institutions serving households and excluding loans to households for house purchase).[7] This so-called borrowing allowance is reduced accordingly if a bank has already borrowed under TLTRO II and TLTRO III beforehand. Put differently, participating banks' TLTRO borrowing cannot exceed 50% of their eligible loan portfolio at any moment during the lifespan of the operations in question. In addition, TLTRO loans are collateralized, like any other central bank loan. Hence, the maximum amount a participant can borrow is not just restricted by the remainder of the borrowing allowance, but also by the eligible collateral available to the respective bank.

Designed as a funding-for-lending scheme, TLTROs are not only targeted (as explained above), but also have a built-in incentive for banks to provide loans to the private sector. Under TLTRO III, the interest rate charged by the Eurosystem is

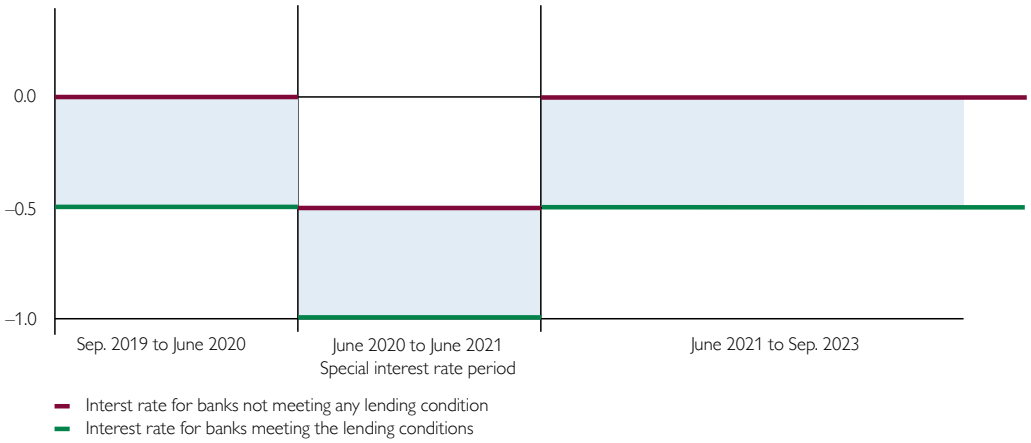
[5] *In December 2020, the Eurosystem once again recalibrated the setup of the TLTROs III. In this study, however, we focus on the immediate reaction of bank lending to the decisions of spring 2020 and therefore describe the conditions that applied to TLTRO III at that point in time.*

[6] *In addition to changing TLTRO III conditions due to the COVID-19 pandemic, in March 2020 the Eurosystem introduced longer-term refinancing operations (LTROs) to provide immediate liquidity support to the financial system also for the period between TLTROs. The LTROs provided liquidity at the deposit facility rate to bridge the period until the TLTRO III.4 in June 2020.*

[7] *The Eurosystem excludes loans for house purchase from the amount of outstanding loans to avoid contributing to an overheating of real estate markets and to forestall potential house price bubbles.*

Figure 1

Range of interest rates applied to all TLTROs III



Source: OeNB.

linked to each participating bank's lending performance. If a bank provides more loans to nonfinancial corporations and households (except loans to households for house purchase) than a predefined benchmark amount, the interest rate on its TLTRO III borrowings becomes more attractive. If a bank's eligible loan portfolio beats the benchmark by at least 1.15% on March 31, 2021[8], it will achieve the maximum discount on the interest rate and will be "charged" the average interest rate on the deposit facility (DF rate) over the lifespan of the respective TLTRO III (currently –0.5%). In other words, given the current conditions, a bank that effectively obtains the maximum discount receives (rather than being charged) an interest rate of 0.5% for borrowing central bank money. If the eligible loan portfolio of the respective bank is lower than the benchmark, the applied interest rate will be the average interest rate in the main refinancing operation (MRO rate) over the lifespan of the respective TLTRO III (currently 0%). Finally, if a participant's loan book beats the benchmark by less than 1.15%, the interest rate to be applied will be graduated linearly between the average MRO rate and the average DF rate, depending on the percentage by which the participant exceeds the benchmark amount.

To take into account the particularly difficult circumstances prevailing during the COVID-19 crisis, a so-called special interest rate period was introduced for the time between June 24, 2020, and June 23, 2021. In this one-year period, the interest rate can be as low as the DF rate minus 50 basis points (currently –1%) if the participating bank keeps its eligible loan portfolio at a constant level between March 1, 2020, and March 31, 2021. If this condition is met, the maximum discount on the interest rate will also be applied for the rest of the lifespan of the respective TLTRO (currently –0.5%). Even for banks which are not able to meet this condition during the special reference period, the interest rate in the special interest rate period will still be lowered to the average MRO rate minus 50 basis points (see figure 1). Finally, while the initial maturity of three years was maintained even after the COVID-19 shock, an early repayment option was introduced. Any amount borrowed under TLTROs III can be repaid 12 months after the settlement of each operation, starting in September 2021.

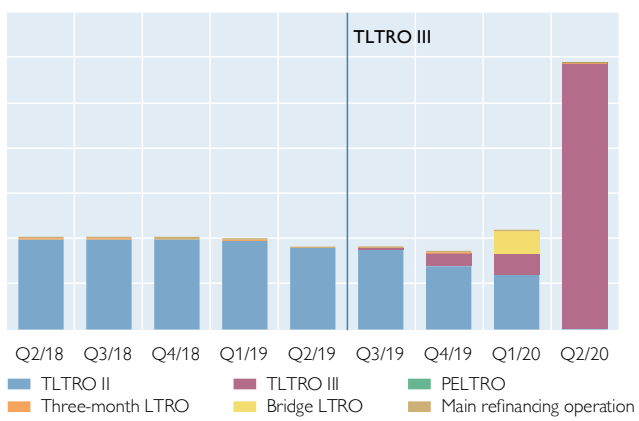
[8] *The second reference period runs from April 1, 2019, to March 31, 2021.*

In chart 1, we summarize the total liquidity demand of Austrian banks since Q2/2018, including both standard tender operations and the recent crisis measures. Focusing on the most recent refinancing rounds, 35 Austrian banks participated in TLTRO III.3 and TLTRO III.4, borrowing nearly EUR 55.5 billion in both operations.[9] Part of this uptake was substituting liquidity stemming from TLTRO II, as banks rolled over old central bank loans into new loans, extending the maturity for another three years. Hence, around EUR 40 billion represented additional net liquidity demand. Since the TLTRO III.4 allotment, more than 99% of the central bank liquidity held by Austrian banks have stemmed from TLTRO III.

Chart 1

Liquidity demand by Austrian banks

EUR billion (stocks at end of quarter)



Source: OeNB.

2 Identification challenges

Banks' TLTRO uptake could affect both the pricing and the quantity of credit. Regarding pricing effects, TLTROs can dampen banks' external funding costs in two ways: first, directly, by reducing the borrowing costs on funds supplied by the Eurosystem; and second, indirectly, by creating general downward pressure on the costs for funds obtained from other creditors (Rostagno et al., 2019; Andreeva and Garcia-Posada, 2020). Banks may pass on these lower refinancing costs when granting new loans and/or rolling over outstanding loans at lower interest rates (for empirical evidence, see Altavilla et al., 2020b; Benetton and Fantino, 2018; De Haan et al., 2015; van Dijk and Dubovik, 2018). Ceteris paribus, lower bank retail rates can result in an increase in loan demand (Angeloni et al., 2003).

Turning to the quantity effects on bank-level credit (i.e. the supply effect), TLTROs increase the availability and stability of funding for banks and reduce their rollover risk. As they lengthen the maturity of bank liabilities, they reduce uncertainty about the financing conditions over a longer period. Hence, banks have more means and more confidence to support their asset-side activities, i.e. providing loans. The so-called *liquidity channel* of monetary policy transmission (BCBS, 2011) highlights the relationship between higher available funding (and lower funding risk) on the one hand and higher credit supply on the other.[10]

Furthermore, TLTROs lead to a change in the composition (and size of) banks' balance sheets. If the resulting balance sheet change affects banks' external finance premiums, the bank lending channel (Bernanke, 2007) will kick in. It might trigger an additional and independent shift in the supply of bank loans because banks obtain refinancing from other sources than the central bank more easily and probably at a cheaper rate.

[9] *Demand, however, was not equally distributed. Banks demanded EUR 1.7 billion under TLTRO III.3 and EUR 53.8 billion under TLTRO III.4.*

[10] *For empirical evidence of the liquidity channel, see Jasova et al. (2020).*

An additional channel might work through the combination of TLTROs and the significantly eased collateral requirements. The mix may change banks' risk tolerance and hence the degree of risk they are willing to accept in their portfolios.[11] Consequently, the risk-taking channel (Borio and Zhu, 2007) could also be a lever through which TLTROs might affect banks' credit supply.

Finally, the favorable interest rates at which TLTROs III are offered reduce banks' refinancing costs and strengthen bank equity. Therefore, TLTRO uptake may contribute to an increase in the amount of new loans via the *capital channel* of bank lending (Stein, 1998; van den Heuvel, 2002). The "tiering" system of reserves – which provides banks with the opportunity to deposit a certain amount of their central bank reserves with the Eurosystem at a 0% interest rate – reinforces this channel. The fact that banks can take up sums in TLTROs that are large relative to their outstanding loan portfolios suggests that the credit supply effects of TLTRO participation (taking all above-mentioned channels together) might be sizable.[12]

In this study, we focus on the quantity impact of TLTRO uptakes: We propose an evaluation of the bank-level elasticity of new loans (measured in EUR) in reaction to TLTRO uptake. For this purpose, we concentrate on the TLTRO III.4 uptake (on June 24, 2020) by Austrian banks. In our baseline model, we estimate the elasticity of the TLTRO III.4 uptake with regard to the supply of new loans aggregated at the bank level in the three months following the tender (July, August and September 2020).

In evaluating the credit supply effect of the TLTRO III.4 uptake for Austrian banks, our study faces a series of empirical challenges which complicate the identification of reliable causal effects. First, given our focus on Austria, rather than the euro area, our estimation is based on a small sample of banks. Thus, the advantage of having access to precise monthly bank-level data on new loans and the exact TLTRO uptake for Austrian banks comes at the price of sample size. At the time of writing, only 55 Austrian banks were eligible to participate in Eurosystem tender operations. 14 out of these 55 banks drop from our estimation sample because they do not report to the OeNB's internal monthly monetary statistics on new loans. Hence, we obtain an effective estimation sample containing 41 banks.[13]

Our study only sheds light on the direct effects of TLTRO III.4 participation on the supply of new loans. Part of the total effect of TLTROs on the supply of new loans, however, may materialize due to the tenders' dampening impact on aggregate market interest rates. Hence, banks which did not directly participate in TLTROs could have equally benefited from lower refinancing costs in the open market following TLTROs. As a corollary, nonparticipating banks may have also increased their credit supply to the real economy in reaction to TLTROs (see Andreeva and Garcia-Posada, 2020). Overall, our analysis may therefore underestimate the total credit supply impact of TLTROs.

Second, endogeneity concerns loom large when it comes to estimating the credit supply response to monetary policy measures, particularly so in the case of

[11] *The empirical results of Andrade et al. (2019) suggest that "[…] firms belonging to the newly eligible credit category indeed benefited from a stronger transmission of the LTRO liquidity […]".*

[12] *For empirical evidence on the quantity effect of TLTROs before the COVID-19 pandemic, see Afonso and Sousa-Leite (2020), Andreeva and Garcia-Posada (2020), Bats and Hudepohl (2019) and Laine (2019).*

[13] *Only nine banks out of the remaining group of 41 banks did not participate in the TLTRO III.4. Six out of these nine banks have never participated in any TLTRO.*

TLTROs. As described in detail in Andrade et al. (2019), two main worries stand out in this regard. On the one hand, banks choose to ask for liquidity in TLTROs. Even conditional on participation the amount, an individual bank borrowed from the Eurosystem in TLTRO III.4 clearly cannot be viewed as an exogenous continuous treatment variable: The uptake is likely a function of several observable and unobservable bank-level characteristics. On the other hand, it is notoriously difficult to distinguish credit demand from credit supply forces at the bank level (see e.g. Andrade et al., 2019; Carpinelli and Crosignani, 2017; Khwaja and Mian, 2008; Schnabl, 2012). Credit demand at the bank level can have different impacts on the amount of new loans individual institutions grant to their customers. Hence, chances are high that TLTRO uptake is endogenous to (expected) credit demand. Overall, endogeneity concerns would likely bias the treatment effect into an, a priori, unclear direction. For example, if credit demand and TLTRO uptake are positively correlated at the bank level, we might spuriously attribute some of the demand effects to our treatment variable and overestimate the impact of tender participation. In contrast, some banks may simply have an incentive to borrow more in terms of TLTROs to replace relatively more expensive funding sources by cheaper ones. This might hold true especially for banks with a large amount of retail deposit funding if these institutions cannot fully pass on negative interest rates to their customers (see e.g. Heider et al., 2020). Since banks that experience lower profitability due to the squeeze in their interest rate margins might grant fewer new loans, simple OLS estimates may be biased downward. Including controls related to banks' capital position can alleviate but may not fully capture this downward bias.

Governmental loan guarantees and moratoria, which were put in place in reaction to the economic fallout of the COVID-19 pandemic in spring 2020, represent an additional endogeneity concern. Loan guarantees and/or moratoria may be correlated with both TLTRO uptake and the supply of new loans at the bank level. In this case, leaving these two covariates out of our estimation equation might trigger omitted variable bias. For example, without an adequate empirical strategy to address this concern, we might spuriously attribute part of the positive effect of loan guarantees to TLTRO uptake.

Third, on top of selection bias and the difficulty of purging the loan supply response from developments in credit demand, three additional challenges pose a threat to causal effect identification. All three concerns fit under the umbrella of "measurement error" in the outcome variable of interest and are likely to trigger a downward bias in the estimated treatment effect, resulting in an overly and incorrectly low credit supply elasticity of TLTRO uptake at the bank level. For one, banks might have anticipated their uptake in the June 2020 TLTRO round as the favorable conditions governing TLTRO III.4 had been known several weeks in advance.[14] As a corollary, the amount of new loans granted by Austrian banks in the three months following TLTRO III.4 uptake may only imperfectly capture the actual loan supply that might be tied to TLTRO III.4 borrowing if the size of anticipation effects were fully known.

For another, significant distortions in the elasticity of bank-level credit supply to TLTRO uptakes may derive from delaying effects, i.e. the reverse phenomenon of anticipatory movements in the supply of new loans. For example, the findings of

[14] *Depending on the specific innovations in question, the relevant reference date is either March 12, 2020 or April 30, 2020.*

Gibson et al. (2020) suggest that central bank funding affects bank lending not only shortly after a TLTRO uptake, but over a longer horizon. Hence, banks which participated in TLTRO III.4 may not have (fully) tapped into their additional, TLTRO-induced funding because they plan or expect to grant new loans only later in the year (in our case, after September 2020). Unfortunately, time alone does not solve this measurement problem. Since the June 2020 round, additional TLTRO III tenders took place in September and December 2020 and will continue to take place until 2021. Therefore, over time, it becomes more difficult to disentangle the effects of any single TLTRO round on the supply of new loans.

Finally, some Austrian banks participate in the TLTRO as group bidders. Group bidders constitute financial institutions that bid in Eurosystem tenders on behalf of several other institutions (plus themselves). Group bidders subsequently allocate their TLTRO uptake among the group members, according to the members' needs (this allocation is likely, but not necessarily, determined prior to the actual uptake). While we are able to identify group bidders, we cannot allocate their uptake to the individual financial institutions within the group that are the actual end users of the funds. Thus, we might considerably underestimate the credit supply elasticity of TLTRO uptake because we match group bidders' uptake only to the new loans granted by the group's single bidding institution.[15]

It is important to note that these three measurement challenges do not per se represent substantive explanations for a loan supply elasticity smaller than one. Rather, the assumption is that, if these three effects were not present, we would be in a position to more accurately estimate the treatment effect of TLTRO uptake (ceteris paribus), whatever its true size. A substantive explanation, in contrast, would provide plausible reasons for an estimated elasticity persistently smaller than one even after the three measurement challenges discussed above are fully taken into account. We will come back to this point in more detail in section 4, where we discuss our preliminary estimation results.

3 Empirical strategy and data

We pursue a three-pronged empirical strategy to address the challenges outlined in the previous section. First, at the heart of our identification strategy lies an instrumental variable (IV) approach as pioneered by Benetton and Fantino (2018) and applied by Afonso and Sousa-Leite (2020), Andreeva and Garcia-Posada (2020) as well as in Esposito et al. (2020). It is designed to address the potential bias in our treatment effect deriving from the endogeneity of TLTRO uptakes at the bank level. Second, we also control for a series of bank-level balance sheet and financial covariates that could be relevant predictors of banks' TLTRO uptake. Third, on the basis of sector-level loan portfolio decompositions and sector-specific

[15] *To address this potential mismatch, one could aggregate the groups' supply of new loans and substitute this amount for the sum granted by the single bidding institution. Extending this strategy to all control variables would boil down to creating a "synthetic" bank reflecting the entire bidding group. For this approach to work, however, the allocation of the borrowing uptake among the group members would have to be known – in particular, we would have to know which group members, if any, did not receive or claim a part of the uptake. Otherwise, the synthetic bank's total supply of new loans may be incorrectly computed: If a specific bank from a bidding group did not receive or claim any of the TLTRO funds, its credit supply should not form part of the synthetic bank's sum of new loans. Without this information, the synthetization strategy would not mitigate, but most likely reverse the direction of the bias in our treatment coefficient.*

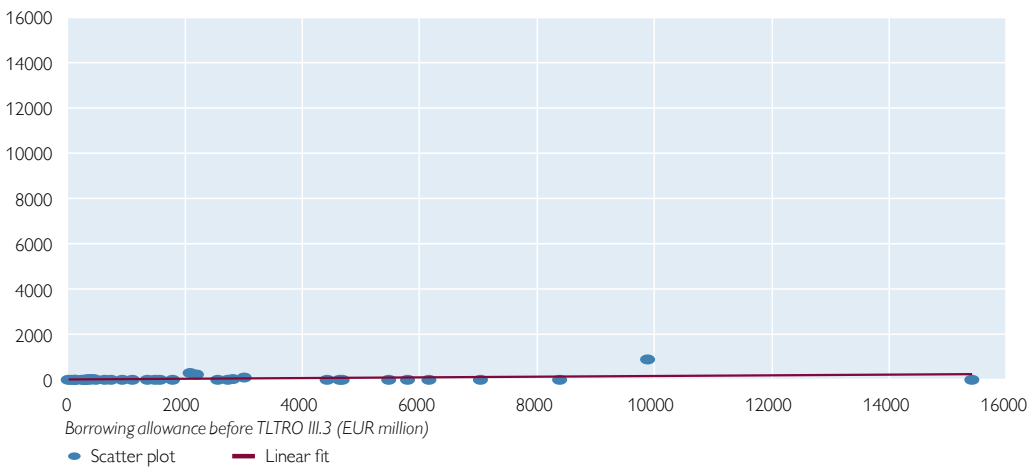
COVID-19 shocks, we create a bank-level control variable for credit demand reflecting each individual bank's business model and/or client base.

To address endogeneity concerns, we instrument TLTRO III.4 uptake at the bank level with the remainder of a given bank's TLTRO borrowing allowance as measured just before TLTRO III.4 uptake.[16] The rationale behind this instrumental variable strategy is as follows. First, the borrowing allowance itself is arguably exogenous with regard to the bank-level supply of credit since June 2020 because it is computed as a deterministic function of banks' eligible lending portfolio at the end of February 2019. Second, the extent to which banks made use of their borrowing allowance prior to the outbreak of the COVID-19 crisis is orthogonal to the shock that arrived in February 2020. Third, while available data show that the remainder of the bank-specific borrowing allowance is not a good predictor of banks' TLTRO uptake for any of the previous bidding rounds, IV relevance should be high for TLTRO III.4. The borrowing allowance (BA) should have become relatively more binding in peak crisis times: The demand for central bank refinancing probably increased over the months following the lockdowns and the borrowing conditions for TLTRO III.4 were even more favorable than those for previous rounds. To illustrate these points, in charts 2 and 3 we compare the correlation between bank-level TLTRO uptake and the bank-specific BA for TLTRO III.4 to the correlation observed between the very same covariates for TLTRO III.3. Whereas we find no evidence of a link between the BA and TLTRO uptake for the earlier round, the correlation is strong and positive for the June 2020 operation. Furthermore, the positive correlation shown in chart 3 is robust to excluding the potentially influential observation in the right upper corner of the chart (see "linear fit excluding potentially influential observation"). This finding thus bodes well for IV relevance and the strength of our first stage.

Our main identification assumption is that the following exclusion restriction holds: Conditional on our control variables, the remainder of the BA just before

Chart 2

First-stage relevance: bank-level TLTRO borrowing allowance and uptake (TLTRO III.3)

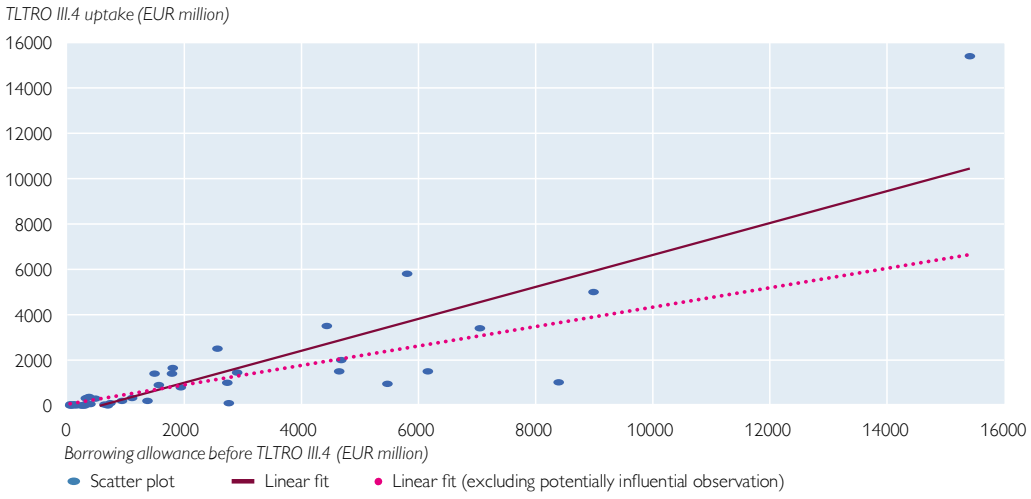


Source: OeNB, authors' calculations.

[16] *For a definition of banks' TLTRO borrowing allowance, and changes to its modalities over time, see section 1.*

Chart 3

First-stage relevance: bank-level TLTRO borrowing allowance and uptake (TLTRO III.4)



Source: OeNB, authors' calculations.

TLTRO III.4 should have only affected the supply of new loans via the actual bank-specific TLTRO uptake of June 2020. To ascertain conditional IV independence, we control for the following balance sheet and financial variables at the bank level: banks' total assets and tier 1 capital ratio, a bank-specific credit demand proxy (see next paragraph), a group bidder dummy indicating whether a bank in the sample bids on behalf of a group of financial institutions, and a dummy for collateral scarcity, flagging bidding banks which were close to exhausting their collateral deposited with the Oesterreichische Nationalbank (OeNB).[17] In light of recent contributions (Sugo and Vergote, 2020), we would ideally like to control for more detailed information on collateral holdings at the bank level, but for now data availability and confidentiality issues limit our set of variables.

We generally plan to extend our set of control variables as we move our analysis beyond the pilot study stage. At this point, however, our small sample size would seem to call for a parsimonious specification anyway. We acknowledge all the potential caveats attached to this parsimonious set of control variables, particularly in terms of omitted variable bias.[18]

We complement these balance sheet and financial variables with a bank-specific continuous variable that reflects the degree of exposure of a given bank's clients to the COVID-19 shock. We use this variable to proxy for potential credit demand facing the bank since the shock hit. Our bank-specific credit demand variable is computed as follows. We first decompose every bank's portfolio of loans to non-financial corporations and households (including nonprofit institutions serving households) according to the clients' economic sectors at the NACE 2 level. We

[17] *Banks can raise the amount of deposited collateral at any time. Hence, as long as a bank has eligible collateral for Eurosystem operations, the prepledged amount does not constitute a true borrowing constraint. Still, banks might regard the amount of prepledged collateral as fixed over the short term, in which case they might act as if reaching a borrowing threshold when having exhausted their prepledged collateral deposits.*

[18] *In particular, we would like to point out that banks specialized in lending can be expected to both have a larger BA and lend more in July, August and September 2020. Although we control for bank size and customer base-related demand effects, residual omitted variable bias still remains a potential concern. We thank Olivier Vergote for flagging this aspect.*

chose the December 31, 2019 call date for the loan portfolio decomposition to take a snapshot of banks' usual client base prior to the COVID-19 shock. We then match the aggregated loan amounts at the NACE 2 level to the mean, median, maximum and minimum monthly deviation (between March and June 2020) of the value added from pre-crisis trends (deviations in %) of each NACE 2 sector (see below for our data sources). Based on NACE 2-level data on the loans extended by each bank and the corresponding NACE 2 shocks (i.e. deviations), we proceed to compute a weighted bank-specific demand shock (DS_i) for each bank $_i$:

$$DS_i = \sum_{n=1}^{q} NACE2\ shock_n \times \frac{NACE2\ loan\ amount_{n,i}}{total\ loans\ to\ NFC\ and\ HH_i}$$

where n runs from 1 to q and gives the number of sectors we take into account. An important caveat concerning this variable is that our loan data do not assign NACE codes to loans granted to non-self-employed households. The share of loans falling into this category varies substantially from bank to bank in our sample (between 1% and 95%).

As we do not have any information on the employment background (in particular, on the respective sector of employment) of the borrowing non-self-employed households, the implicit assumption we make is that their sectoral distribution at the bank level is, on average, identical to the distribution of loans for which we have the corresponding NACE 2 classification. Depending on how accurate this assumption is, we might substantially over- or underestimate the bank-specific credit demand shock triggered by the COVID-19 crisis.[19] We report the summary statistics for all our left-hand and right-hand side variables in table 1.

Table 1

Summary Statistics

Variable name	Number of observations	Mean	Median	Standard deviation	Minimum	Maximum
New ENL, July to September 2020 (EUR million)	41	309.993	150.162	461.647	0	2444.809
New total loans, July to September 2020 (EUR million)	41	397.279	207.93	582.459	0	3014.533
New ENL, March to September 2020 (EUR million)	41	876.732	370.347	1586.084	0.039	9250.786
TLTRO III.4 uptake (EUR million)	41	1309.584	330	2635.708	0	15400
TLTRO III.3 uptake (EUR million)	41	41.951	0	150.607	0	900
Borrowing allowance pre-TLTRO III.4 (EUR million, conservative)	35	2816.63	1565.05	3327.25	52.15	15415.26
Borrowing allowance pre-TLTRO III.4 (EUR million, complemented)	41	2435.695	1107.9	3207.044	47.702	15415.26
Total assets (EUR million)	41	14980.139	7026.864	21959.722	457.78	98021.933
Group bidder dummy	41	0.22	0	0.419	0	1
Collateral scarcity dummy	41	0.195	0	0.401	0	1
Tier 1 capital ratio (unweighted, percentage points)	41	0.088	0.077	0.054	0.04	0.371
Mean demand shock (%)	41	–14.872	–13.252	5.617	–34.326	–7.695
Median demand shock (%)	41	–13.795	–12.246	5.497	–33.261	–6.604
Maximum demand shock (%)	41	–21.774	–20.084	7.487	–45.329	–11.918
Minimum demand shock (%)	41	–10.123	–9.022	4.096	–25.454	–4.749

Source: Authors' calculations.

Note: ENL means "eligible net lending," i.e. banks' loans to nonfinancial corporations, to nonprofit institutions serving households and to households (excluding loans for house purchase). The conservative sample for the borrowing allowance includes all banks that participated in at least one TLTRO. These banks self-reported the data relevant for the computation of the borrowing allowance in the corresponding TLTRO reporting template. The complemented sample for the borrowing allowance includes the conservative sample plus an additional six banks which, albeit eligible, never participated in TLTROs and whose hypothetical borrowing allowance was reconstructed using OeNB proprietary data.

[19] *Because of confidentiality restrictions, we cannot share the size of the individual bank-level demand shocks.*

To compile and compute the variables required for our estimations, we draw on several data sources. Our TLTRO-specific control variables are based on OeNB proprietary data. We obtain balance sheet data, ratios and detailed data on banks' loan portfolios (including the monthly supply of new loans) from the OeNB's internal monthly monetary statistics. Finally, the NACE 2 sector-level COVID-19 shock we use to construct our credit demand proxy is based on another contribution in this issue of Monetary Policy & the Economy (Puhr and Schneider, 2020).

For the first stage of our two-stage least squares (2SLS) instrumental variable strategy, we estimate the following model:

$$\text{Model 1: } T_i = \tau + \delta IV_i + \Gamma \boldsymbol{E}_i + e_i$$

where T_i represents the bank-level uptake from TLTRO III.4; τ is a constant; IV_i stands for the instrumental variable, i.e. the remainder of the BA prior to TLTRO III.4; $\boldsymbol{E}_i$ is a vector of control variables containing all the covariates mentioned above; and e_i is a standard error term. For the second stage, we use the predicted value of T_i, $\hat{T}_i$, derived from model 1 as our main independent variable of interest:

$$\text{Model 2: } Y_i = \tau + \beta \widehat{T}_i + \Pi \boldsymbol{E}_i + u_i$$

where Y_i represents our main outcome of interest, the total bank-level supply of new loans to nonfinancial corporations and households (including nonprofit institutions serving households but excluding loans for house purchase) in July, August and September 2020; $\hat{T}_i$ is the instrumented bank-level uptake from TLTRO III.4; $\boldsymbol{E}_i$ remains as defined in model 1; and u_i is again a standard error term.

Apart from our main outcome variable (i.e. new loans to nonfinancial corporations and households including non-profit institutions serving households but excluding loans for house purchase in July, August and September 2020), we also run our 2SLS regressions with two alternative outcome variables for the supply of new loans at the bank level. First, we re-estimate model 2 for the total sum of new loans to nonfinancial corporations and households in July, August and September 2020. We draw on this wider definition of the supply of new loans to obtain some initial evidence regarding the questions of whether banks use TLTRO funds mainly to expand their eligible net lending or whether they also draw on these funds to grant loans beyond this category.

Second, we also run model 2 by extending backward the time horizon of our main outcome variable of interest. More precisely, we re-estimate model 2 by drawing on the supply of new loans to nonfinancial corporations and households (including non-profit institutions serving households but excluding loans for house purchase) for the entire period between March and September 2020. Naturally, this third specification is econometrically problematic as we use a dependent variable that is partly determined by developments prior to our treatment of interest, the bank-level uptake from TLTRO III.4. Our main rationale for still estimating and reporting the results of this specification is that we regard them us an upper

bound for our treatment effects.[20] Whereas the treatment coefficient from the July, August and September 2020 specification likely represents a lower-bound estimate of the true underlying credit supply elasticity, drawing on the total supply of new loans between March and September 2020 provides a proxy for an upper bound taking into account potential anticipation effects. Of course, by assuming that all new loans granted in the months prior to TLTRO III.4 uptake constitute loans given in anticipation of the June 2020 uptake, the March to September 2020 specification probably provides a very crude upper-bound estimate of the treatment effect.

4 Preliminary econometric results

All coefficients reported in this section reflect the estimation results for our preferred specification, using the median weighted bank-specific demand shock.[21] Before discussing our 2SLS results below, we report basic OLS regression results in table 2 to convey a first impression of the association between banks' TLTRO uptake and the supply of new loans in Austria. The naïve OLS regressions suggest a statistically highly significant positive elasticity of credit supply in response to TLTRO uptake. The estimates range between 0.15 and 0.58, depending on the outcome variable used (see columns 1 to 3 of table 2). Hence, the OLS results associate a EUR 1 rise in uptake with a EUR 0.15 to EUR 0.58 rise in additional new loans. Moreover, table 2 shows that our dummy for collateral scarcity may be linked to a lower supply of new loans (bearing statistical significance in two of the three specifications). A more pronounced bank-level demand shock is also consistently negatively associated with the supply of new loans (however, statistically significance is reached in only one of the specifications).[22] A bank experiencing a 1% higher (negative) median shock is associated with an approximately EUR 7.8 million to EUR 18.2 million lower credit supply. Other control variables contained in $\boldsymbol{E}_i$ do not emerge as significant in any of the three specifications in table 2.[23]

[20] *Many customers tapped into pre-existing credit lines with their banks during the early months of the COVID-19 pandemic. Hence, TLTRO III.4 uptake could replace and complement funding sources that were used to grant loans during this early period. Furthermore, it should be noted that loans granted during that period also ended up counting toward achieving the benchmark targets (see section 1).*

[21] *Controlling for the mean, maximum or minimum shock variable instead does not qualitatively change our results. These additional regression results are available from the authors on demand.*

[22] *By construction, the weighted bank-specific demand shock is negative for all banks (i.e. the NACE 2-level deviations bear a negative sign).*

[23] *Given our small sample and the relatively large number of partly collinear controls, we would like to caution against overinterpreting the coefficients on* $\boldsymbol{E}_i$ *in the current version of this study.*

Table 2

OLS regression results

Variable	(1) New ENL (July to September 2020, EUR million)	(2) All new loans (July to September 2020, EUR million)	(3) New ENL (March to September 2020, EUR million)
TLTRO III.4 uptake (EUR million)	0.145***	0.197***	0.578***
	(0.027)	(0.034)	(0.084)
Total assets (EUR million)	0.003	0.001	0.006
	(0.003)	(0.004)	(0.009)
Group bidder dummy	84.438	113.479	–151.821
	(83.251)	(106.510)	(258.850)
Collateral scarcity dummy	–219.319**	–203.625	–865.474**
	(103.036)	(131.823)	(320.369)
Tier 1 ratio (unweighted, percentage points)	–150.536	–510.392	405.890
	(649.783)	(831.324)	(2020.361)
Median demand shock (%)	7.836	13.260*	18.186
	(6.056)	(7.748)	(18.829)
Constant	219.648*	368.383**	452.173
	(109.720)	(140.374)	(341.151)
Observations	41	41	41
R-squared	0.83	0.83	0.86

Source: Authors' calculations.

*Note: ENL means "eligible net lending," i.e. banks' loans to nonfinancial corporations, to nonprofit institutions serving households and to households (excluding loans for house purchase). "All new loans" mean banks' loans to nonfinancial corporations, to nonprofit institutions serving households and to households (including loans for house purchase). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Although the results displayed in table 2 suggest a strong relationship between TLTRO uptake and the supply of new loans in Austria, the estimation results are subject to a long list of caveats explained in section 2. Hence, to be in a position to attach a more causal interpretation to our findings in table 2, we move beyond simple OLS regressions by turning to our instrumental variable strategy. Table 3 shows the results of our first-stage regressions, for which we report two specifications. First, we rely only on a limited sample of 35 banks ("conservative sample"), which includes all those institutions that participated in TLTROs at least once. These banks self-reported the relevant data for BA computation in the Eurosystem' TLTRO reporting template. Second, we also estimate the first-stage drawing on a "complemented sample" including 41 banks (the conservative sample plus an additional six banks which, albeit eligible, never participated in TLTROs). Since the six additional banks never participated in a TLTRO, they did not report BA data via the Eurosystem template. Therefore, we reconstructed their hypothetical BA using OeNB proprietary data, following the rules of the Eurosystem template as closely as possible.

The first-stage results for the two samples are very similar. We report the corresponding coefficients in columns 1 and 2 of table 3. The most important insight from table 3 is that our first stage works well, despite the small samples we have at our disposal. The F-statistics for the exclusion of our instrument amount to 12.92 and 15.71, for the conservative and complemented samples respectively. Moreover, given the high R-squared of 0.85 and 0.86, the first-stage regressions appear to capture a large fraction of the variation in banks' TLTRO III.4 uptake. The coefficients attached to our instrumental variable are 0.55 and 0.54, respectively. This suggests that – conditional on $\boldsymbol{E}_i$ – a EUR 1 rise in the remaining BA is associated with an about EUR 0.55 rise in TLTRO III.4 uptake at the bank level. Since the

Table 3

First-stage regression results

Variable	(1) TLTRO III.4 uptake (EUR million) (conservative sample)	(2) TLTRO III.4 uptake (EUR million) (complemented sample)
Borrowing allowance pre-TLTRO III.4 (EUR million)	0.551***	0.540***
	(0.153)	(0.136)
Total assets (EUR million)	0.030	0.030*
	(0.020)	(0.018)
Group bidder dummy	–1377.363**	–1381.937**
	(576.586)	(523.560)
Collateral scarcity dummy	1600.632***	1589.831***
	(538.647)	(489.114)
Tier 1 ratio (unweighted, percentage points)	–3037.478	–3218.885
	(3834.268)	(3392.217)
Median demand shock (%)	–22.355	–24.631
	(39.285)	(31.861)
Constant	–554.561	–525.658
	(710.957)	(591.574)
Observations	35	41
R-squared	0.85	0.86
F-statistic for exclusion of instrument	12.92	15.71

Source: Authors' calculations.

*Note: The conservative sample includes all banks that participated in at least one TLTRO. These banks self-reported the data relevant for the computation of the borrowing allowance in the corresponding TLTRO reporting template. The complemented sample includes the conservative sample plus an additional six banks which, albeit eligible, never participated in TLTROs and whose hypothetical borrowing allowance was reconstructed using OeNB proprietary data. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

weighted bank-specific demand shock is negative for all banks (i.e. the NACE 2-level deviations bear a negative sign), a bank experiencing a 1% higher (negative) median shock is associated with an approximately EUR 22 million to EUR 25 million higher uptake in the TLTRO III.4 round. Given a mean uptake of EUR 1,300 million and a mean median shock of about 14%, this coefficient appears to exhibit a plausible order of magnitude.

We summarize our second-stage results in table 4. The main take-away from table 4 is that – in line with contributions by Afonso and Sousa-Leite (2020) and Andrade et al. (2019) – the bank-level uptake during the TLTRO III.4 round has a positive, statistically highly significant effect on the supply of new loans. This conclusion holds for the two first-stage samples and all three outcome variable specifications discussed above. The estimated credit supply elasticity, however, varies substantially depending on the specification considered. When drawing on our conservative sample baseline outcome specification (July, August and September 2020, excluding loans for house purchase), we obtain an elasticity of 0.26. In other words, our 2SLS estimation yields a lower-bound treatment effect that associates a EUR 1 rise in uptake with a EUR 0.26 rise in additional new loans (see column 1 of table 4). Our upper-bound estimate for the credit supply elasticity of TLTRO III.4 uptakes based on the backward extension of the time horizon for new loans amounts to 0.99 (see column 5 of table 4) for the conservative first stage sample.[24]

[24] *While this point estimate is large, we would like to emphasize again that we consider it an upper bound rather than a realistic estimate of the true underlying treatment effect.*

Table 4

Second-stage regression results

Variable	New ENL (July to September 2020, EUR million)	New ENL (July to September 2020, EUR million)	All new loans (July to September 2020, EUR million)	All new loans (July to September 2020, EUR million)	New ENL (March to September 2020, EUR million)	New ENL (March to September 2020, EUR million)
	(1)	(2)	(3)	(4)	(5)	(6)
TLTRO III.4 uptake (EUR million)	0.259***	0.268***	0.315***	0.320***	0.985***	1.00***
	(0.058)	(0.055)	(0.070)	(0.065)	(0.191)	(0.179)
Observations	35	41	35	41	35	41
R-squared	0.73	0.73	0.76	0.76	0.76	0.76
Ei control vector	√	√	√	√	√	√

Source: Authors' calculations.

*Note: ENL means "eligible net lending," i.e. banks' loans to nonfinancial corporations, to nonprofit institutions serving households and to households (excluding loans for house purchase). "All new loans" mean banks' loans to nonfinancial corporations, to nonprofit institutions serving households and to households (including loans for house purchase). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

When drawing on the complemented first stage sample, the estimated elasticities are slightly higher (0.27 and 1.00 in columns 2 and 6 of table 4, respectively). Finally, the treatment coefficient for the July, August and September 2020 specifications including loans for house purchase (columns 3 and 4 of table 4) is estimated at EUR 0.32 for each additional EUR 1 taken up in the TLTRO III.4 round. Overall, our 2SLS estimates would thus suggest that a naïve OLS approach tends to underestimate the credit supply elasticity of the TLTRO III.4 uptake. As discussed above, the downward bias in simple OLS regressions may be driven by banks which draw on TLTROs in a particularly extensive manner to replace more expensive funding sources, while on average granting fewer new loans due to profitability concerns or impaired balance sheets.

Our results corroborate the findings of the latest euro area bank lending survey (ECB, 2020). A net percentage of 47% of euro area banks participating in the survey indicate that TLTRO III had a positive impact on their credit supply to firms in the past six months. In the April 2020 survey, the net percentage was only 11%. Hence, TLTRO III.4 noticeably changed loan supply dynamics. Moreover, banks said they expected an equally strong positive impact of TLTRO III on lending volumes also in the next six months.

Whereas the TLTRO III.4 uptake appears to have had an unambiguously positive impact on the supply of new loans by participating banks, we cannot give a precise point estimate for this positive effect. The range provided by our estimated lower-bound and upper-bound elasticity is considerable and reflects the myriad of caveats and assumptions of our pilot study. Thus, it is important to emphasize, once again, which conclusions cannot be drawn from our results.

First, based on our estimates we cannot conclude that banks effectively use only a small fraction of the funds taken up to grant new loans, while the remainder is "lying idle." According to this narrative, banks are simply parking tender liquidity on their current accounts with the central bank. This conclusion would commit the fallacy of omitting potential anticipation and delaying effects. Moreover, it would fully discount those potential positive effects of TLTROs on aggregate interest rates which we are likely to neglect in this study given our focus on the effect of direct participation. Although we attempt to gauge the bias induced by an

anticipatory supply of new loans, the current level of uncertainty makes it hard to evaluate the future role of delaying effects. Yet, since banks might still increase their credit supply considerably in the months to come, we are inclined to interpret our lower-bound estimates as conservative because, by definition, they only capture the short-run effects of banks' TLTRO III.4 participation.

Second, our results do not necessarily imply that TLTROs have sizable indirect effects by exercising general downward pressure on the costs of funds obtained from other creditors. Although the presence of indirect effects could explain a high credit supply elasticity close to 1, we are not confident enough in our upper-bound estimate to interpret the results as convincing evidence for the existence of a prominent "external cost" channel.

Having said this, while we are confident about the positive sign associated to our treatment coefficient, we think that at present no cogent, definite statement regarding the "true" size of the underlying credit supply elasticity of TLTRO III.4 uptakes is possible. On the one hand, the true treatment coefficient may be considerably lower than 1. In this case, banks might effectively be parking a fraction of their TLTRO funding for purposes other than granting new loans. It should be noted, however, that banks that "park" the liquidity obtained from TLTRO funding on their current accounts with the central bank are not necessarily free from liquidity constraints thwarting an expansion of their loan supply.[25] Cautionary or regulatory motives may explain why banks temporarily "park" central bank funding. These motives, however, may apply equally to banks experiencing liquidity constraints and to banks which are not liquidity constrained. On the other hand, via increased pressure on participating banks' market funding costs that boosts the loan supply of nonparticipating banks, banks' TLTRO III.4 uptake could also exhibit a true underlying credit supply elasticity close to 1.

5 Conclusions

The Eurosystems's monetary policy response to the COVID-19 crisis contained both extensions and enlargements of existing unconventional monetary policy measures. In addition, the Eurosystem also introduced new measures to meet the extraordinary challenge posed by the economic fallout of the COVID-19 pandemic. In this paper, we provide a pilot study to analyze the credit supply effects of one important part of this rescue package: the Eurosystem's targeted longer-term refinancing operations (TLTRO). We draw on Austrian bank-level data and exploit a two-stage instrumental variable (2SLS) strategy to approximate the causal effects of the June 2020 TLTRO uptake on banks' supply of new loans. We find evidence for an unambiguously positive effect of TLTRO participation on loan supply in Austria. Yet, the precise point estimate resulting from our 2SLS strategy is subject to many caveats as we cannot fully incorporate potential anticipation and delay effects. Moreover, on the basis of our current sample and data, we are not able to capture the potentially positive credit supply effects that derive from TLTROs' impact on aggregate market interest rates.

[25] *Banks' supply of new loans may be hampered by liquidity constraints, i.e. a relative lack of free resources to lend out to their customers (asset-side constraints) and/or a relative lack of stable funding for new loans (funding-side constraints).*

We hope to be able to scale the present study and replicate it at the euro area level, including a longer time horizon following the June 2020 TLTRO uptake, to be able to better address some of these empirical challenges in the future.[26] Furthermore, not least since the ECB's monetary policy decisions of December 2020 entailed a recalibration of TLTRO conditions, including an enlargement of banks' borrowing allowance to 55% of the stock of their eligible loans, more research is warranted to evaluate the effects of TLTROs on an ongoing basis. Another interesting but challenging avenue for further research would consist in quantifying the indirect effect of TLTROs on the credit supply of nonparticipating banks. For this purpose, it would be necessary to disentangle the impact of TLTROs from the effects of other unconventional monetary policy tools (e.g. the corporate sector purchase programme) on aggregate funding conditions. Finally, it would be worthwhile investigating how firms and households, which benefit from the increased supply of new loans following TLTRO, invest these additional funds. While these analyses are beyond the scope of the present study, we hope our contribution will motivate researchers in academia and at central banks to investigate these questions in more detail.

References

Afonso, A. and J. Sousa-Leite. 2020. The transmission of unconventional monetary policy to bank credit supply: Evidence from the TLTRO. In: The Manchester School 88(S1). 151–171.

Altavilla, C.,Brugnoli, L., Gürkaynak, R., Motto, R. and G. Ragusa. 2019. Measuring euro area monetary policy. In: Journal of Monetary Economics 108. 162–179.

Altavilla, C., Barbiero, F., Boucinha, M. and L. Burlon. 2020a. The great lockdown: pandemic response policies and bank lending conditions. ECB Working Paper 2465. September 2020.

Altavilla, C., Canova, F. and M. Ciccarelli. 2020b. Mending the broken link: Heterogeneous bank lending rates and monetary policy pass-through. In: Journal of Monetary Economics 110. 81–98.

Alves, N., Bonfim, D. and C. Soares. 2016. Surviving the perfect storm: the role of the lender of last resort. Banco de Portugal Working Paper 17. September 2016.

Andrade, P., Cahn, C., Fraisse, H. and J. Mésonnier. 2019. Can the provision of long-term liquidity help to avoid a credit crunch? Evidence from the Eurosystem's TLTRO. In: Journal of the European Economic Association 17(4). 1070–1106.

Andreeva, D. and M. Garcia-Posada. 2020. The impact of the ECB's Targeted Long-Term Refinancing Operations on banks' lending policies: the role of competition. In: Journal of Banking and Finance, forthcoming.

Angeloni, I., Kashyap, A. and B. Mojon (eds.). 2003. Monetary Transmission in the euro area. Cambridge University Press.

Bats, J. and T. Hudepohl. 2019. Impact of targeted credit easing by the ECB: bank-level evidence. DeNederlandsche Bank Working Paper 631. April 2019.

BCBS. 2011. The transmission channels between the financial and real sectors: a critical survey of the literature. Basel Committee on Banking Supervision Working Paper 18. February 2011.

Benetton, M. and D. Fantino. 2018. Competition and the pass-through of unconventional monetary policy: evidence from TLTROs. Banca d'Italia Working Paper 1187, September 2018.

[26] *Additional extensions worth considering are the explicit inclusion of TLTRO III.3 and LTRO uptakes in our analysis. We would like to thank Olivier Vergote for suggesting these extensions.*

Bernanke, B. 2007. The Financial Accelerator and the Credit Channel. Speech given at The Credit Channel of Monetary Policy in the Twenty-first Century Conference, Federal Reserve Bank of Atlanta. June 2007.

Boeck, J., Perea, M. and G. Peersman. 2020. The transmission mechanism of credit support policies in the euro area. In: European Economic Review 124. May 2020.

Borio, C. and H. Zhu. 2012. Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism? In: Journal of Financial Stability 8(4). 236–251.

Carpinelli, L. and M. Crosignani. 2017. The effect of central bank liquidity injections on bank credit supply. In: Finance and Economics Discussion Series 2017-038. Board of Governors of the Federal Reserve System. March 2017.

De Haan, L., van den End, J. and P. Vermeulen. 2015. Lenders on the storm of wholesale funding shocks: Saved by the central bank? DeNederlandsche Bank Working Paper 456. January 2015.

ECB. 2020. Euro area bank lending survey. October 2020. https://www.ecb.europa.eu/stats/ecb_surveys/bank_lending_survey/html/ecb.blssurvey-2020q4~e89c77d212.en.html

Eser, F., Lemke, W., Nyholm, K., Radde, S. and A. Vladu. 2019. Tracing the impact of the ECB's asst purchase programme on the yield curve. ECB Working Paper 2293. July 2019.

Esposito, L., Fantino, D. and Y. Sung. 2020. The impact of TLTRO2 on the Italian credit market: some econometric evidence. Banca d'Italia Working Paper 1264, February 2020.

Eurosystem staff. 2020. Eurosystem staff macroeconomic projections for the euro area. December 2020. https://www.ecb.europa.eu/pub/projections/html/ecb.projections202012_eurosystemstaff~bf8254a10a.en.html

Fenz, G. and M. Schneider. 2020. Second wave of COVID-19 pandemic delays economic recovery. In: OeNB. Monetary Policy & the Economy Q4/20 – Q1/21.

Garcia-Posada, M. and M. Marchetti. 2015. The Bank Lending Channel of Unconventional Monetary Policy: the Impact of the VLTROS on Credit Supply in Spain. Banco de Espana Working Paper 1512. February 2016.

Gibson, H., Hall, S., Petroulas, P. and G. Tavlas. 2020. On the effects of the ECB's funding policies on bank lending. In: Journal of International Money and Finance 102.

Heider, F., Saidi, F. and G. Schepens. 2019. Life below Zero: Bank Lending under Negative Policy Rates. In: Review of Financial Studies 32(10). 3728–3761.

Heider, F., Saidi, F. and G. Schepens. 2020. Banks and negative interest rates. In: Annual Review of Financial Economics (forthcoming).

Jasova, M., Mendicino, M. and D. Supera. (2018). Rollover Risk and Bank Lending Behavior: Evidence from Unconventional Central Bank Liquidity. 2018 Meeting Papers 500, Society for Economic Dynamics.

Khwaja, I. and A. Mian. 2008. Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market. In: American Economic Review 98(4). 1413–1442.

Laine, O. 2019. The effect of TLTRO-II on bank lending. Bank of Finland Research Discussion Papers 7. April 2019.

Puhr, C. and M. Schneider. 2020 Have mitigating measures helped prevent insolvencies in Austria amid the the COVID-19 pandemic? In: OeNB. Monetary Policy & the Economy Q4/20 – Q1/21.

Rostagno, M., Altavilla, C., Carboni, G., Lemke, W., Motto, R. Saint Guilhem, A. and J. Yiangou. 2019. A Tale of Two Decades: the ECB's Monetary Policy at 20. ECB Working Paper 2346. December 2019.

Schnabl, P. 2012. The International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market. In: The Journal of Finance 67(3). 897–932.

Stein, J. 1998. An adverse-selection model of bank asset and liability management with implications for the transmission of monetary policy. In: RAND Journal of Economics 29(3). 466–486.

Sugo, T. and O. Vergote. 2020. Who takes the ECB's targeted funding? ECB Working Paper 2439. July 2020.

Van den Heuvel, S. 2002. Does bank capital matter for monetary transmission? In: Federal Reserve Bank of New York Economic Policy Review 8(1). 259–265.

Van Dijk, M. and A. Dubovik. 2018. Effects of Unconventional Monetary Policy on European Corporate Credit. CPB Netherlands Bureau for Economic Policy Analysis Discussion Paper 372. January 2018.

Unprecedented fiscal (re)actions to ease the impact of the COVID-19 pandemic in Austria

Doris Prammer[1]
Refereed by: Paul Eckerstorfer, Parliamentary Budget Office

Austria's public finances – both, automatic stabilizers and discretionary measures – have played a major role in easing the impact of the COVID-19 pandemic on the Austrian economy. During the two lockdowns in spring and November/December 2020, discretionary fiscal measures were mainly aimed at supporting the health care system and mitigating the effects of the lockdowns. Measures adopted after the first lockdown provided classic stimuli to boost economic activity. Initiatives to promote private and public investments followed, which, ideally, support the transition to new technologies and ways of working and thus increase the Austrian economy's long-term growth potential. Given the high uncertainty surrounding the economic outlook, the measures taken to contain COVID-19 might, however, be less effective than during normal times. Moreover, policy measures must be unwound with caution to avoid that crisis legacy issues, such as tax deferrals or accumulated debt once the moratoria are lifted, hamper the economic recovery. At the same time, the measures should be carefully designed and targeted to avoid overcompensation of private companies at the cost of society. While the unprecedented fiscal measures and automatic stabilizers built into the budget have left their mark on Austria's public finances, their sustainability is currently not at risk. Nevertheless, as low interest rates might not stay around forever, the high debt ratio should be reduced in the medium-term in a socially and environmentally sustainable way.

JEL classification: H12, H60, H84
Keywords: fiscal policy, automatic stabilizers, discretionary fiscal measures, COVID-19 pandemic

Austria's public finances have played a major role in dampening the impact of the COVID-19 pandemic on the economy. Like in other countries, the fiscal measures adopted by the government have supported the domestic health care system, have mitigated the economic damage caused by the lockdowns and have provided economic stimuli. In fact, the fiscal measures adopted during the two lockdowns in spring and in November/December 2020 were aimed at cushioning the intended temporary reduction in (economic) activity and at ensuring that the health care system remains fully operational. Moreover, compensating businesses and households for income losses suffered because of the containment measures has helped maintain the economy's growth potential, which would have otherwise been lost if viable firms and jobs had been permanently destroyed. The fiscal measures adopted since the first lockdown mostly are "standard" stimulus measures to swiftly restart the economy by encouraging (private and public) consumption and investment. In addition to these measures, automatic stabilizers have cushioned parts of the economic downturn. Automatic stabilizers are built into the revenue and expenditure system and reduce fluctuations in economic activity without the

[1] *Oesterreichische Nationalbank, Economic Analysis Division, doris.prammer@oenb.at.* *Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the Oesterreichische Nationalbank or the Eurosystem. The author would like to thank Alena Bachleitner, Ernest Gnan and Kurt Mlekusch for their helpful comments and valuable suggestions.*

need for active government action. As a case in point, the existing unemployment insurance scheme helps stabilize income.

These unprecedented fiscal (re)actions – both discretionary and automatic – have left their mark on public finances. As is the case for other EU Member States, Austria is likely to see the largest budget deficit since 1995 in 2020, after considerable budget surpluses in 2018 and 2019. The deficit is expected to amount to 9.2% of GDP,[2] which is almost twice the level observed during the great economic and financial crisis of 2008/2009. The exact size of the fiscal burden depends on how the COVID-19 pandemic develops, the extent to which government assistance is taken up and whether additional measures are adopted. Nevertheless, the sustainability of Austria's public finances should not be permanently compromised, as Austria went into the crisis with a sound fiscal position. Moreover, the mostly temporary nature of the measures and the assumed rebound in economic activity are expected to reduce high deficit and debt levels in the years ahead.

This study is organized as follows: Section 1 discusses the automatic stabilizers built into government budgets. Section 2 provides a summary of the most important discretionary fiscal measures taken in Austria in response to the COVID-19 crisis and discusses their effectiveness. Section 3 assesses the impact of these measures on public finances and their sustainability. Finally, section 4 concludes.

1 Automatic response of fiscal policy

Automatic stabilizers are mechanisms built into general budgets that cushion the impact of an economic downturn during a recession or prevent the economy from overheating during a boom, without any government intervention. At the same time, they deteriorate the budget balance during a recession and improve it during a boom. They generally act (i) in a timely manner, as they respond automatically without delay; (ii) in a targeted manner, as they support the target groups specified in the budget; and (iii) in a temporary manner, as they automatically kick in when economic conditions deteriorate and taper off as they improve.

The economic literature generally distinguishes between two types of automatic stabilizers (see ECB, 2020a). The first set of automatic stabilizers are those components of the budget that react to the business cycle; hence, they are often referred to as the cyclical components of the budget balance. These cyclical revenue and expenditure items mirror the fluctuations of their macroeconomic base variables. For example, unemployment expenditure increases as the number of unemployed persons rises. Some cyclical components react even more strongly than their macroeconomic bases, which is, for example, the case for wage taxes. Due to the progressivity of the income tax system, an increase in income – which is usually the case during a boom – implies a more than proportional tax increase, as individuals face higher tax rates in higher tax brackets. Thus, the cyclical components cushion the volatility of disposable income and reduce output volatility. The second set of automatic stabilizers comprises (mostly) those expenditure items that remain stable despite a changing economic environment. If governments keep their expenditure, such as wages or investment expenditure, constant, they will, at the same time, stabilize output over the business cycle. The economic literature (see e.g. Fatás and Mihov, 2001; Pisani-Ferry et al., 2008) generally associates

[2] *See the OeNB December 2020 economic outlook for Austria in this issue.*

larger governments[3] with higher output stabilization in OECD countries – albeit with sometimes decreasing returns and only up to a certain threshold.

It should be noted, however, that the stabilizing properties of government budgets come at the cost of deteriorating the general government budget balance during a downturn; in other words, the budget balance fluctuates with the business cycle. The size of these budgetary fluctuations is estimated by international organizations, such as the OECD and the European Commission, as well as the European System of Central Banks (ESCB), as this information is widely used for fiscal surveillance. Even though the OECD, the European Commission and the ESCB use the same theoretical measurement concept of semi-elasticities, the results for the euro area range from 0.48 (ESCB's estimate) to 0.56 (European Commission's estimate), with the OECD's estimate lying in-between (at 0.54).[4] Intuitively, these numbers indicate by how many percentage points the budget balance-to-GDP ratio deteriorates (improves) given a 1% decrease (increase) in GDP.[5] With an estimate of 0.57 (see Bouabdallah et al., forthcoming), Austria is one of the Member States with the highest automatic reaction of the budget balance to the business cycle. The large cyclical reaction is the result of (i) a larger government size including more generous social benefits; and (ii) a more progressive direct tax system compared to that of other EU Member States. In 2020, automatic stabilizers are estimated to account for almost half of the budget balance deterioration observed in Austria.[6]

While the size of automatic stabilizers is subject to some uncertainty, the uncertainty surrounding their effectiveness in smoothing output is even higher. Their effectiveness is not only determined by the exact composition of expenditure and revenue (e.g. higher social security transfers or a higher share of (progressive) direct taxation imply higher stabilization) but also by the nature of the initial shock (e.g. export versus internal demand/supply shock) as well as the reaction of economic agents. Based on model simulations for the euro area, the ECB (2020a) estimates that automatic fiscal stabilizers cushion around 10% to 30% of a standard GDP shock.

The COVID-19 pandemic might have changed the size of automatic stabilizers and might have made them less effective. The size of automatic stabilizers changes if tax and benefits systems are reformed or the structure of the economy changes. In Austria, numerous discretionary measures adopted since the beginning of COVID-19 (see section 2.2) have (temporarily) changed the tax and benefits system. Moreover, the lockdowns have particularly affected Austria's economic structure: Online trading, which generally has a low wage sum and might not be liable to taxation in Austria, has gained importance, while tourism has lost importance. Also, unlike in other recessions, typically stable government revenue of state entities (such as entry fees for museums) has declined during the COVID-19 recession. The automatic stabilizers might have been less effective, as the uncer-

[3] *Government size is generally measured as the ratio of government expenditure to GDP.*

[4] *For a comparison with other concepts, see ECB (2020a). For details on the estimation methods and the estimates, see Mourre et al. (2019), Price et al. (2014) as well as Bouabdallah et al. (forthcoming).*

[5] *More technically, the cyclical change in the budget balance is given by the product of the semi-elasticity times the output gap. Hence, the change in the budget balance reflects the change in the output gap.*

[6] *These estimates are, however, based on the pre-crisis calibration of the effects.*

tainty is currently much higher than in a "normal" recession. The fear of contracting coronavirus when e.g. eating in a restaurant or going shopping as well as the uncertainty about future economic developments have led to larger parts of disposable income, which was supported by automatic stabilizers (and discretionary action), being saved rather than spent on consumption. Moreover, the COVID-19 pandemic was initially a simultaneous demand and supply shock; historically, however, automatic stabilizers have been generally designed to smoothen demand shocks. Given the special nature of the COVID-19 shock, the ECB (2020a) estimates the output smoothing effect of automatic stabilizers to be as much as 25% lower than in normal times.

2 Unprecedented discretionary response of Austrian fiscal policy

2.1 Overview and objectives of the measures

As the COVID-19 shock has not only been different but also faster and deeper than that of the great economic and financial crisis, countries had to resort to unprecedented discretionary action to stabilize their economies.[7] In the early stages of the COVID-19 crisis and during the second lockdown in November and December 2020, many of the discretionary fiscal measures adopted in Austria were primarily meant to mitigate the health crisis and the damage caused by the intended temporary reduction in (economic) activity. In fact, these measures aimed at ensuring that the health care system[8] remains fully operational and at supporting businesses and households. Compensating businesses and households for income losses suffered because of the containment measures helps underpin the economy's production capacity. The latter would be lost if viable firms and jobs were permanently destroyed. From summer 2020 onward, the focus of the policy response has gradually shifted toward "standard" stimulus measures to restart the economy and improve its resilience to future challenges, before the second lockdown kicked in in November 2020. Similar fiscal measures were taken all over Europe and even worldwide (see IMF 2020; OECD 2020; Bruegel, 2020 and Deutsche Bundesbank, 2020).

As stated earlier, various measures were taken to ease the pressure on Austria's health care system at the beginning of the COVID-19 pandemic. The measures with an impact on public finances include additional expenditure on personal protective equipment, additional testing devices and medical equipment (most of which was ordered via the Austrian Red Cross), campaigns to inform the general public, including the launch of the COVID-19 emergency hotline, and the promotion of R&D expenditure on the development of a vaccine or drug. Moreover, additional resources were allocated to compensating the health care sector for revenue shortfalls and regions for additional care expenditure.[9] While COVID-19-related additional costs have been relatively contained so far (amounting to less than EUR 1 billion), they are set to increase strongly with each new wave of COVID-19 and the acquisition of a vaccine.

[7] *For details on the most important measures, see section 2.2, Baumgartner et al. (2020), Budgetdienst (2020a–f), Ministry of Finance (2020) as well as the respective laws and regulations.*

[8] *Estimates of the overall health-related costs caused by the COVID-19 pandemic are not available at present.*

[9] *For further details, see table 7 in Budgetdienst (2020a).*

In the initial stage of the COVID-19 crisis and during the second lockdown in November and December (phases Ia and Ib in table 1), important measures were also enacted to protect jobs and support households and families. The use of short-term work – which, in Austria, was a well-established policy tool in certain industries already before the COVID-19 crisis – was generously extended. Subsidies for short-term work not only helped save jobs and ensure that production could be restarted quickly after the end of the lockdown, but also cushioned negative social effects, protecting many employees from large income losses due to unemployment. Likewise, transfers from the hardship fund to micro businesses and self-employed persons and a special fund for artists provided compensation for income losses and can be considered "unemployment benefits" for the self-employed. Furthermore, assistance to long-term unemployed persons, which had previously amounted to 92% of unemployment benefits, was raised to the level of unemployment benefits. Families in need were supported via the family hardship fund and the fund for school event cancellation fees. Moreover, moratoria were introduced for rent payments as well as mortgage and non-mortgage loan repayments.

Support measures for businesses carry the most weight in quantitative terms. This is particularly true if short-term work schemes and transfers from the hardship funds are counted toward support for firms and not for households.[10] Non-profit organizations (NPOs) were supported via a separate fund to enable them to keep up their activities. Additional measures were designed to support businesses through liquidity-enhancing measures, such as deferrals of tax payments and social security contributions, tax debt moratoria and the reduction of tax prepayments. Furthermore, businesses that were healthy before the crisis could apply for a subsidy to cover fixed costs. In addition to the fixed cost grant, firms could take advantage of guarantees for bank loans to strengthen their liquidity position. Moreover, several moratoria were introduced for businesses. During the second lockdown starting in November 2020, businesses that were closed down by law were entitled to payments of up to 80% of the turnover generated during the same period last year.

The fiscal measures adopted since the summer (phases II and III in table 1) extended, on the one hand, existing programs and focused, on the other hand, on "classic" stimulus measures to encourage (private and public) consumption and investment. Cutting income taxes and raising the negative income tax rate increased disposable household income, as did two one-off payments to unemployed people and a one-off child benefit payment. These measures were meant to stimulate consumer demand, in particular from liquidity-constrained households. At the same time, the funds earmarked for active labor market policies were increased. The focus was put on upskilling and reskilling to meet the requirements of a digitalized and knowledge-intensive economy. Investment activity was encouraged by helping businesses avoid liquidity shortages (carryback of 2020 losses to profit earned in the previous year(s), cuts in VAT in the hospitality sector, publications and culture) and by giving them investment incentives (higher short-term tax credits based on accelerated depreciation, investment premium).

[10] *ESA 2010 accounting conventions seem to allow for recording short-term work benefits either as transfers to households or as subsidies to firms. In Austria, they are recorded as subsidies to firms, while transfers from the hardship funds are recorded as social benefits to households.*

Furthermore, the government has announced a number of (investment) measures aimed at increasing the medium- to long-term growth potential and fostering the greening of the economy (phase III). Financial support for regional and local authorities suffering considerable income losses as a result of the COVID-19 containment measures takes inter alia the form of higher federal funding for regional and local projects and investments.

To counter the impact of the COVID-19 pandemic, unprecedented measures were also introduced at the EU level, most importantly the SURE (temporary Support to mitigate Unemployment Risks in an Emergency) and the NextGenerationEU (NGEU) instruments. Under the SURE instrument, financial assistance is provided in the form of loans to Member States (amounting to EUR 100 billion) to fight the negative economic and social consequences of the coronavirus outbreak on their territory. The NGEU, the second temporary recovery instrument (amounting to EUR 750 billion) provides swift loans (of up to EUR 360 billion) and grants (of up to EUR 390 billion) to Member States to support national fiscal measures with a focus on strengthening recovery and resilience (European Council, 2020). The total envelope should be disbursed by 2026 and will initially be financed through the issuance of EU debt which will later be paid back by the receiving Member States (loans) or future EU budgets (grants), respectively. Austria may be allocated grants of approximately EUR 3 billion or 0.8% of GDP (European Commission, 2020).[11]

2.2 The measures in detail

This section provides a more detailed description of the most important measures in quantitative and economic terms. The quantifications indicated in table 1 are based on established maximum spending amounts, as originally provided for in government budgets, or on estimates, as set out in legislative proposals. However, they do not necessarily correspond to the "most likely" fiscal projections or maximum amounts according to EU state aid provisions. Moreover, the amounts of some measures (e.g. short-term work in 2021) can easily be increased by way of a decree, while the amount of tax deferrals shown in table 1 only reflects the indicative announcement made by the government without the need for budgetary provisions. Some measures, in particular investment measures, have been scheduled for a period of several years; in these cases, the table shows the total amount of expenditure budgeted over time.

[11] *This amount is derived from European Commission (2020). However, these allocations are based on EU grants amounting to EUR 500 billion, which corresponds to the amount specified in an early European Commission proposal for the NGEU. According to the European Commission (2020), grants allocated to Austria under the Recovery and Resilience Facility (the centerpiece of NGEU) come to EUR 2,995 million and the funds under ReactEU to EUR 207 million. Grants under the Rural Development and Just Transition funds have not yet been allocated. As Austria's gross national income (GNI) share amounts to 3% of the EU's GNI, its share in the financing of the grants comes to approximately EUR 11 billion, to be paid for by future GNI contributions to the EU budget.*

Table 1

Largest fiscal measures to strenghten Austria's resilience and support recovery

	Economic phase	Receiving sector according to ESA 2010	2020	2021	2022 or not attrib-utable to years	Payout (cut off December 15th 2020)	Impact on	
							Maastricht deficit	Maastricht debt
	EUR million							
1 Expenditures								
Short-term work (max.)	Phase Ia, Ib & II	C	12,000	1,500		5,168	yes	yes
Corona labor foundation	Phase III	C/HH		700		n.a.	yes	yes
Hardship fund; fund for artists (max.)	Phase I & II	HH	2,000 (90)			709 (24)	yes	yes
Fixed cost grant to businesses that lost sales (max.)	Phase Ia, Ib & II	C	12,000			316	yes	yes
Payments to Austrian Airlines	Phase II	C	150			150	n. a.	yes
Net turnover compensation	Phase Ib	C	3,000			1,422	yes	yes
Funds for NPOs (including sports leagues)	Phase I&II	HH	700	285		172	yes	yes
Investment premium for new investments (7% or 14%)	Phase II	C			2,000	5	yes	yes
Family hardship fund	Phase I	HH	130	70		89	yes	yes
Alignment of long-term unemployment benefits with unemployment benefits	Phase I	HH	90			n.a.	yes	yes
One-off payments of unemployment benefits (spring: EUR 450/person; winter: EUR 150–450/person)	Phase II & Ib	HH	198 + 200			181 + 183	yes	yes
One-off child benefit (EUR 360/child)	Phase II	HH	708			665	yes	yes
2 Revenues								
Cut of personal income taxes in the lowest tax bracket to 20% (before 25%)	Phase II	HH	–1,375	–1,725		automatic	yes	yes
Increase of negative income tax (i.e. reim-bursement of social security contributions)	Phase II	HH		–100		automatic	yes	yes
Cut of VAT to 5% for hospitality sector, publications and culture	Phase II	C	–900	–1,250		automatic	yes	yes
Carryback of 2020 losses to 2019/2018	Phase II	C/HH	–2,000	–2,000		automatic	yes, self–reversing	yes, self–reversing
Degressive depreciation for investment and faster depreciation for immovable property	Phase II	C		–280		automatic	yes, self–reversing	yes, self–reversing
3 Announced public sector investment programs								
Local government investment program (2020–2024)	Phase II & III	HH/C			2,000	155	yes	yes
Master plan for digitalization of education (2021–2024)	Pahse III	HH			235	n.a.	yes	yes
Scaling up of renewable energy (2020–2022)	Phase III	HH/C			260	n.a.	yes	yes
Renovation initiative (2020–2022)	Phase III	HH/C			750	n.a.	yes	yes
Ecological investment (incl. single public transport travel pass for Austria)	Phase III	HH		507	740	n.a.	yes	yes
School development plans (2020–2030)	Phase III	HH/C			2,400	n.a.	yes	yes
Climate-friendly investment (2020–2022)	Phase III	HH/C		100	300	n.a.	yes	yes
Start-up initiative (2020–2022)	Phase III	C			450	n.a.	yes	yes
Digitalization (2020–2022)	Phase III	HH/C			100	n.a.	yes	yes
Broadband investment	Phase III	HH/C			1,000	n.a.	yes	yes
4 Guarantees								
Guarantees (max.)	Phase I	C	9,000			2,919	only if called	only if called
Guarantees from the Austrian COVID-19 funding agency COFAG (EUR 15 billion in total for guarantees and fixed cost grant & net turnover compensation)	Phase I	C	7,375			3,712	only if called	only if called
5 Tax deferrals and reduced tax prepayments (announced by Federal Ministry of Finance, but no max. amount or legal ceiling)	Phase I	C	–10,000			–6,390	partly	yes

Source: Authors' compilation based on Ministry of Finance and Budget Office information.

Note: All amounts are maximum amounts taken from the impact assessments with regard to the relevant law, from regulations, maximum budgeted amounts as indicated in the government budgets of 2020 and 2021 and announcements made by the government (public investment). HH = household sector; C = corporate sector.

Expenditures

Short-term work scheme, Corona labor foundation (Kurzarbeit, Corona-Arbeitsstiftung): Under the Austrian short-term work scheme, companies pay salary for reduced working hours only, while the remaining costs are covered by the state. The pre-pandemic short-term work scheme was adjusted to meet the needs during the COVID-19 crisis. From March 2020 onward, work time could be cut by as much as 90% during the short-term work period (work time could, temporarily, also be set to zero), with employees receiving 80%, 85% or 90% of their previous net earnings, depending on their original salary (the higher the original salary, the lower the income replacement rate). In October, the short-term work scheme was extended by another six months (until March 31, 2021), with the cut in working hours being limited to 70%. Employees working reduced hours are encouraged to attend education and training activities. During the second lockdown in November/December, initial regulations for short-term work were reinstalled, allowing for a reduction in working hours by up to 100% in a given month (indicated as phase Ib in table 1). Overall, a total of EUR 12 billion was budgeted for short-term work payments in 2020. The amount requested and approved until November 15, 2020, amounted to EUR 8 billion, of which EUR 5.2 billion have been paid out so far (Budgetdienst, 2020i). The difference between the amount requested by and the amount disbursed to companies is largely due to the fact that companies requested higher amounts than actually needed, i.e. the reduction in working hours has proved to be lower than anticipated. The Corona labor foundation provides additional means for active labor market policies, focusing, in particular, on the upskilling and reskilling for jobs in the areas of long-term care, education, environment and digitalization. Free time due to short-term work arrangements should be spent on training. Unemployed persons who participated in training activities for at least four months were entitled to a retraining benefit payment in addition to unemployment benefits.

Hardship fund (Härtefallfonds): Transfers from the hardship fund to severely affected micro businesses (including private landlords and farmers) and self-employed persons are intended to compensate for losses in self-employment income. These transfers can likewise be considered "unemployment benefits" for the self-employed, with the possibility of requesting subsidies for each month from March 16, 2020, to March 15, 2021. The maximum total support (income compensation and "comeback bonus") amounts to EUR 30,000. While applicants received an immediate one-off payment of a maximum of EUR 1,000 in payout phase 1, payout phase 2 grants subsidies of up to EUR 2,000 per month plus a monthly "comeback bonus" of EUR 500. The fund is administered by the Austrian Federal Economic Chamber and Agrarmarkt Austria (for private landlords and famers); its overall envelope amounts to EUR 2 billion. In addition to the hardship fund, a separate fund amounting to EUR 90 million was set up for artists. Eligibility requirements and payouts are based on applicants' registration with the artists' social security fund, without further conditionality.

Fixed cost grant to businesses that lost sales (Fixkostenzuschuss): The fixed cost grant is set up in two phases: In phase 1, companies that suffered sales losses of at least 40% due to the measures adopted to contain the spread of COVID-19 may apply for a grant. To be eligible, companies' fixed costs must have been incurred between March 16, 2020, and September 15, 2020. Within this period, companies

are free to choose one to three continuous periods over which they calculate the loss in sales and their fixed costs. The grant is scaled according to the sales losses and covers up to 75% of fixed costs up to a maximum of EUR 90 million per company (see table 2). Fixed costs that qualify for the grant include rents, insurance premia, interest for capital costs, electricity/gas bills, loss in value of perishable goods and employer's salary; however, depreciation of investment and credit repayments are not included. The grant is paid out in three tranches, with the first tranche payment coming to 50% of the total grant. While the first tranche is paid out based on companies' estimates of losses, the remaining tranches will only be paid out upon submission of a certificate confirming the sales losses and fixed costs by a tax accountant.

Phase 2 of the fixed cost grant extends from September 16, 2020, to June 30, 2021, and supports companies that suffered sales losses of at least 30% for a single consecutive period of one to 10 months or two consecutive periods. In accordance with European state aid provisions, the extension of the fixed cost grant regime is based on two alternative instruments of the Temporary Framework adopted by the European Commission. These may be chosen freely.

Model 1 offers aid in the form of swift direct grants of up to EUR 800,000 per company[12] and covers the fixed costs of companies facing sales losses of at least 30% (scaling was dropped). Moreover, it allows for an extended catalog of eligible fixed costs (including depreciation of investment, lease payments and frustrated expenses). Applications do not require extended documentation, which reduces the administrative burden for applicants and allows for faster payouts. Given the restricted amount of aid, this model is mainly intended to benefit small businesses. Model 2 provides support of up to EUR 3 million for uncovered fixed costs that are not covered by profit contributions (i.e. revenues minus variable costs). To be eligible, companies must have suffered sales losses of at least 30%; the aid will help them pay 70% of their fixed costs (or 90% in case of small businesses).[13] Companies may apply for the phase 1 scheme until August 31, 2021, and for the phase 2 schemes until December 31, 2021.

Table 2

Fixed cost grant to businesses

Phase 1 (March 16 to September 15, 2020) for up to 3 months		Phase 2 (September 16, 2020 to June 30, 2021) for up to 10 months			
sales loss	fixed cost grant		sales loss		fixed cost grant
%					
40–60	25 (max. EUR 30 million)	Model 1:	30–100		30–100 (max. EUR 0.8 million)
60–80	50 (max. EUR 60 million)	Model 2:	30–100		70–90 (max. EUR 3 million)
80–100	75 (max. EUR 90 million)				

Source: Ministry of Finance (directives).

[12] *European state aid provisions limit the overall amount of subsidies of model 1 to EUR 800,000 (including 100% guarantees, fixed cost grant and net turnover compensation) per company.*

[13] *In line with state aid provisions, model 2 is subject to the approval by the European Commission, which was granted in December 2020. Model 1 is not subject to approval, as it is part of an umbrella scheme that was already approved by the European Commission in April 2020. Businesses can switch from model 1 to model 2 once.*

For both the phase 1 and the phase 2 schemes, the allocated budget amounts to EUR 12 billion. The national airline company Austrian Airlines received EUR 150 million out of this fund; these transfers were based on additional regulations, however.

Net turnover compensation (Umsatzersatz): Those sectors that were instructed to close by the government during the second lockdown in November/December 2020 are entitled to compensation totaling up to 80% of their turnover based on turnover figures of November 2019. The measure is particularly aimed at those sectors that were already forced to close on November 3, 2020, such as hotels, restaurants as well as cultural and recreational facilities (including betting offices). Businesses that were only closed later (on November 17, 2020) are entitled to 80% of turnover compensation only if their revenue loss cannot be compensated for at a later point in time. This basically holds for businesses offering personal services, such as hairdressers or masseurs. For other businesses, the compensation rate comes to 20%, 40% or, at maximum, 60%, as it is assumed that they can make up for the temporary revenue loss during the lockdown with increased sales later on. While these businesses cannot apply for the fixed cost grant in parallel to the turnover compensation, there is no other conditionality, i.e. any other subsidies, such as short-term work schemes, or turnover generated from delivery/takeaway services or online sales will not need to be offset.[14] Moreover, unlike in Germany, there is no limit to the turnover achieved during the lockdown period to be eligible for turnover compensation. Requests had to be submitted by December 15, 2020; payout should be completed by end-December 2020. Extended net turnover compensation could be claimed by businesses that were still in, and had to go back into, lockdown in December (in particular hotels, restaurants, recreational as well as cultural services, and since December 26, almost all other businesses), which entitles them to compensation of 50% of their revenue loss. An overall amount of EUR 3 billion is budgeted for this measure.

Fund for NPOs including sports leagues (NPO-Unterstützungsfonds inkl. Sportligenfonds): The NPO fund gives subsidies to NPOs operating in all areas of society, such as church organizations, volunteer fire brigades and clubs in top sports leagues that suffered revenue losses due to limited activities. The NPO fund aims to help organizations continue to carry out their statutory activities by basically replacing the same costs as phase 1 of the fixed cost grant did (an additional lump-sum payment of 7% of revenues can be requested). The fund is limited to the amount of loss of income; its funding period originally extended from April 1, 2020, to December 31, 2020, but has recently been extended to March 31, 2021. The overall envelope of this fund amounts to EUR 700 million in 2020 and EUR 285 million in 2021.

Additional one-off payments of unemployment benefits, child benefit payment: In September, people who received (long-term) unemployment benefits for at least 60 days between May and August 2020 received a one-off payment of EUR 450. Moreover, a second one-off payment amounting to up to EUR 450 was disbursed in December, depending on the length of unemployment between September and end-November. Families were supported by an additional one-off child benefit

[14] *At the time of writing, compensation for businesses indirectly affected by the lockdown (e.g. businesses in the supply chain of hotels, restaurants, etc.) was also under discussion.*

payment amounting to EUR 360 per child. For these measures, an envelope of around EUR 1 billion was budgeted.

Investment premium (Investitionsprämie): The premium is provided via a grant to companies carrying out new investments in tangible and intangible depreciable fixed assets in Austria. Applications for funding may be made between September 1, 2020, and February 28, 2021; during this period, initial measures related to investments have to be carried out. New investments in climate-damaging assets, undeveloped land, financial assets, company takeovers and capitalized own services are explicitly not eligible for funding. For new investments in the areas of digitalization, greening and health/life sciences, the investment premium will be doubled from 7% to 14%. The eligible investment volume ranges from EUR 5,000 (sum total of all investments per funding application) up to a maximum of EUR 50 million. The allocated budget originally amounted to EUR 2 billion for the years up to 2024 but has recently been extended to EUR 3 billion, as the original budget had already been depleted in December 2020.[15]

Revenues

Income tax reform[16]*:* In July 2020, the income tax reform led to a cut in income tax in the lowest tax bracket (i.e. for taxable incomes from EUR 11,000 to EUR 18,000) from 25% to 20%, which implies a lower entry rate for all incomes. At the same time, to relieve employees who are not liable to tax, the negative income tax was increased by EUR 100[17], which reduced the fiscal burden for low income earners by EUR 100. While the tax cut was only enacted in July 2020, it applies retroactively for the 2020 calendar year. The budgetary impact of the wage tax cut is already materializing in 2020, while that of the income tax cut and the negative income tax will only materialize in 2021 when the income tax returns have been filed.

Temporary reduction in VAT: From July 2020 onward, VAT was reduced to 5% for hotels and restaurants as well as the publication and cultural sector. Previously, VAT for hotels came to 10%, as did VAT on food and publications, while a VAT of 20% and 13% was levied on restaurants and the cultural sector, respectively. The measure was originally scheduled to expire by the end of 2020 but was extended until the end of 2021. At the same time, a reduced VAT rate of 10% for repair services was passed.

Loss carryback: Since July 2020, losses incurred in 2020 can be offset against profits of 2019 and, under certain restrictions, against profits of 2018. A maximum of EUR 5 million in losses may be carried back. This results in a refund of taxes paid in previous years. Previously, losses could only be carried forward and thus offset against profits in subsequent years. By carrying back losses, the latter can be claimed earlier for tax purposes and even if there are no more profits in the future.

[15] *Further increases were already requested by opposition parties.*

[16] *The proposal submitted to the Austrian Council of Ministers (Vortrag an den Ministerrat) on January 30, 2020, already included plans to cut personal income taxes, albeit only from 2021 onward.*

[17] *Technically, the surcharge on the deduction on transport was increased from a maximum of EUR 300 to a maximum of EUR 400 for low income earners. Together with the corresponding increase of the maximum reimbursement of social security contributions by EUR 100, this implies that the fiscal burden was decreased by EUR 100 for low income earners.*

Degressive depreciation for investment: From July 1, 2020, onward, firms can apply the declining-balance depreciation method – as an alternative to straight-line depreciation – when handling movable assets. Up to 30% of an asset's residual book value can be depreciated, so that a higher proportion of the acquisition costs is depreciated in the first few years of the asset's useful life. Certain environmentally harmful goods, such as buildings, cars, tank and pump systems as well as aircrafts may not be depreciated using this method. For buildings a separate form of accelerated depreciation was introduced, which allows, in the first year, for three times and, in the second year, for twice the normal depreciation rate.

Tax deferrals and reduced tax prepayments: To provide immediate liquidity to firms, the government introduced tax deferrals, reduced prepayments of individual and corporate income tax and deferred interest payments for tax liabilities. The measure took effect in March 2020 and is announced to remain in effect until the end of March 2021.

Public guarantees

Several measures were adopted by the federal government to assume liability for loans granted by banks to companies. These guarantees were initially approved by the Ministry of Finance and administered by the Austria Wirtschaftsservice Gesellschaft mbH (aws), the Österreichische Hotel- und Tourismusbank (ÖHT) and the Oesterreichische Kontrollbank (OeKB). Since April 15, this role has been taken over by the newly established COFAG, the Austrian COVID-19 funding agency, which grants most of the associated guarantees on behalf of the federal government (except for export guarantees).[18] COFAG guarantees cover between 80% to 100% of the loan amount. The overall budget of COFAG was set at EUR 15 billion for fixed cost grants, other direct grants (such as subsidies for sales losses) and guarantees. The maximum budgeted amount of guarantees currently comes to EUR 7,375 billion but can be, as has already been the case, extended by way of a regulation issued by the Ministry of Finance.[19]

Public investment initiatives[20]

Local government investment program: The federal government cofinances up to 50% of the costs involved in local investment programs with a particular focus on green investment. Investment programs starting between July 2019 and end-2021 are eligible for funding; completion, and hence payout of the funds, is due by the end of 2024. As the federal budget comes to EUR 1 billion, the overall budget of the measure totals EUR 2 billion, assuming full take-up of local governments.

The *"master plan for digitalization of education"* aims at modernizing communication, knowledge transfer and teaching in Austrian schools. The procedural "8-point plan for digital learning" highlights that the means provided for this

[18] *The operational work done by COFAG is limited, as it largely remains with the aws, the ÖHT and the OeKB.*

[19] *In line with state aid provisions, this amount can be extended to up to EUR 9 billion within the existing COFAG budget of EUR 15 billion (at the expense of amounts that may be allocated to subsidy instruments). In case subsidy and guarantee payouts exceed the current COFAG budget of EUR 15 billion, the corresponding legal framework would need to be adjusted.*

[20] *While digital and green investment initiatives already featured prominently in the government program of 2020, the design, scope and timing of public investment initiatives were adjusted in the course of the COVID-19 pandemic.*

initiative should be primarily used for modernizing existing and providing new IT infrastructure (e.g. tablets for students). The *school development plan*[21] comprises school building projects that are based on educational, ecological and demographic aspects.

The budget for *restructuring/renovation investments* was increased to a total of EUR 750 million. Eligible projects have to be implemented between January 2020 and end-June 2022.

Increased funding is provided for *investments in climate-friendly innovations and industries* to help build the Austrian economy on a sustainable basis. Investments in climate-friendly innovations and industries include innovation programs that have a positive effect on the environment and the climate (e.g. research into phasing out fossil fuels). Also, this measure aims to increase Austria's participation in European research initiatives. A budget of EUR 300 million is earmarked for innovations in the field of climate protection and future technologies.

Further support for *greening investments* includes subsidies amounting to EUR 300 million for the expansion of public transport (by introducing the "1-2-3 ticket," a single public transport travel pass for Austria) and for water ecology. *Record levels of investment* are also expected in other areas of public transport, namely in railway infrastructure (especially large tunnel projects) and in other outsourced public entities (see Ministry of Finance, 2020). Another EUR 1 billion is earmarked for investments in *broadband infrastructure* until 2030. Of this amount, EUR 166 million are budgeted for 2021.

2.3 Effectiveness of the measures, incentives and possible issues in the future

The academic literature[22] has long criticized the use of discretionary fiscal policy due to its policy lags: First, it takes time until a problem is recognized (recognition lag); second, time elapses until a decision is taken on the exact action to be taken (decision-making lag); and third, implementing the decision, e.g. by way of legal acts, also takes some time (implementation lag). These long and variable policy lags are usually brought forward as the main arguments against the use of discretionary fiscal policy for stabilization purposes. However, these lags were not an issue during the COVID-19 pandemic, with the first set of financial aid already being implemented in March 2020, right at the beginning of the lockdown. Moreover, given the size of the economic downturn, discretionary measures – which generally have considerable stabilizing power via their high multipliers in downturns – were needed to stabilize the economy and correct market failures.

Effectiveness of the measures

Nevertheless, there still remains a fourth lag with respect to the effectiveness of fiscal policy, namely the effectiveness (or operational/impact) lag, which is the amount of time it takes to produce the desired results. One of the desired results of the policy measures taken to contain COVID-19 was to provide immediate liquidity to firms by either temporary provisions (tax deferrals, credit guarantees) or non-repayable grants (fixed cost grant). Judging from information provided by the Ministry of Finance (2020) and the Budget Office (see monthly reports of the

[21] *This investment initiative already existed before the COVID-19 pandemic.*

[22] *Seminal contributions were made by Ando and Brown (1963) and Taylor (2000).*

Budgetdienst (Budget Office), 2020a–e), tax deferrals were granted swiftly, as the number of filed and processed applications corresponds to that of approved applications. This is also the reason why the approved budget amount ("Payout" in table 1) is rather high compared to the original budget estimate. The number of bank guarantees provided is slowly increasing. While state guarantees support the provision of bank loans, banks are increasingly restrictive in providing company loans (see Hubmann, 2020), given that the remaining risk (up to 20%) remains with them in the current period of high economic uncertainty. What remains puzzling, however, is the low payout of the fixed cost grant to companies, which was already implemented in April 2020. Given the low number of filed applications, which – also in this case – broadly matches the number of approved and paid out applications, take-up by companies seems to be very low. This implies, in turn, that the effectiveness of this measure in providing swift liquidity to companies has been very limited. Reasons for this low take-up could include (i) the administrative burden involved; (ii) low payout entitlement in phase 1 of the fixed cost grant; and (iii) optimizing behavior on the part of companies. As regards the (i) administrative burden, the payout can be requested in three tranches. While tranche 1 can be requested based on estimated losses, companies' eligibility for the remaining tranches needs to be testified by a tax accountant. This might induce companies to only file the requests when submitting their annual financial statements, for which a tax accountant is needed anyway. As far as (ii) low (expected) payout is concerned, in phase 1, the fixed costs eligible for the grant were defined very restrictively. They did not comprise costs for depreciation of investment and lease payments. The low expected payout together with the considerable administrative burden might have deterred companies from requesting the grant. As to (iii) companies' optimizing behavior, companies might have waited to apply for the grant until the end of the period of eligibility to be able to identify the period with the largest sales losses for sure. We assume that the lockdown phase was the period with the largest sales losses. Whatever the reason for the low take-up might be, it indicates that the instrument has not been very effective in swiftly providing liquidity so far, unless we assume large positive confidence gains from its mere existence.

The financial aid directed to households (also via firms) seems to have been more effective. For short-term work payments, the amount requested and approved until November 15, 2020, amounted to EUR 8 billion, of which EUR 5.2 billion have been paid out so far (Budgetdienst, 2020i). According to the Ministry of Finance (2020), the difference between the amount requested by and the amount disbursed to companies is largely due to the fact that companies requested higher amounts than actually needed. In other words, the reduction in working hours has turned out to be lower than anticipated. Moreover, increased long-term unemployment benefits as well as one-off social benefits and wage tax cuts were immediately effective in increasing disposable household income. However, the measures have been less effective in increasing households' consumption expenditure – and thereby in stimulating the economy (Budgetdienst 2020g). Due to the high economic uncertainty, precautionary saving has increased considerably (see ECB, 2020b). In Austria, the saving rate rose considerably from 8% in 2019 to roughly 14% in 2020.

Measures intended to influence companies' investment decisions have been partly effective. While recent research (Devereux et al., 2020) has shown that during times of high uncertainty, many companies do not engage in investment projects, investment premium payouts have already depleted the budgeted amount. We assume high deadweight effects (compare also Budgetdienst 2020g), which means that firms would have carried out investment projects anyway, despite the high economic uncertainty. Degressive depreciation means higher depreciation in the first few years of an investment. Higher depreciation reduces profits and thus implies higher tax relief in the first few years, while profits and tax liabilities increase in the following years. However, if companies do not have taxable profits (or if they have large losses to carry forward to offset current profits), such incentives are largely ineffective (Devereux et al., 2020).[23]

Public investment initiatives are effective in stimulating the economy, unless they are crowding out private investment. The bulk of public investment appears to be building/infrastructure investment. Although some investment initiatives have a green focus (e.g. investment in public transport or renewable energies), it is unclear to what extent infrastructure investment can support an efficient transition to a knowledge-based, digital society and hence increase potential growth after the crisis. Since there has been considerable private construction activity during the COVID-19 crisis, additional public investment might result in price increases, thus crowding out private investment, without considerable effects on overall economic activity. Moreover, as investment projects typically span over several years, they might end up providing a late fiscal impulse that turns out to be procyclical at last and is therefore not effective as a stabilization measure.

Incentives and possible issues in the future

While being effective, some measures might not provide the right incentives. One matter of concern are the deadweight effects associated with the investment premium, i.e. the fact that companies get subsidies for investments which they would have made anyway (usually replacement investment) (see also Budgetdienst, 2020g). Moreover, the local government investment program does not encourage green investments or fast implementation of projects by providing e.g. higher co-financing rates (see Budgetdienst, 2020h). The stepwise structure of reimbursements in phase 1 of the fixed cost grant might encourage companies to curb their economic activity to stay above the respective thresholds (see table 2) to receive higher subsidies (see Pichler et al., 2020). If a company suffers losses of less than 40% of its pre-corona sales, it cannot apply for a subsidy. By contrast, if the losses come to a little more than 40%, the company is eligible for a grant amounting to 25% of its fixed costs. Losses of up to 60% (80%) entitle the company to a reimbursement of 50% (75%) of its fixed costs instead of 25% (50%) if losses are lower. While the stepwise structure has been replaced with a linear setup in phase two of the fixed cost grant, the eligibility threshold of minimum losses has been maintained, albeit at a lower level (30%). Yet, even a linear grant to cover sales losses acts like a tax, with the corresponding negative incentives. Hence, Baum-

[23] *Devereux et al. (2020) indicate that profit-making firms might be incentivized to bring forward investment if degressive depreciation was only provided temporarily. In Austria, however, degressive depreciation is granted permanently.*

gartner et al. (2020) suggest linking grant entitlements to the sales losses of the corresponding sector rather than to sales losses of individual companies and to adapt the measure to different sectors. Another concern is that the design of several measures allows for "over-subsidization:" First, replacing 80% of the sales losses of closed businesses which are entitled to provide delivery/takeaway services or of businesses offering, inter alia, online sales allows for a profit increase compared to regular business activity. Also, short-term work schemes allow for lower costs than in the previous year. Thus, sales of even less than 20% result in higher profits compared to last year.[24] Second, artists registered with the artists' social security fund are entitled to payouts without any conditionality (no social security contributions in previous years, no proof of income loss). Hence, in some cases, the payouts might exceed the revenue generated from regular artistic activity. While this over-subsidization is inherent in the design of specific measures, there is also anecdotal evidence that certain sectors will manage to achieve their internal (and sometimes very ambitious) business targets for 2020 – which were set before the outbreak of COVID-19 – thanks to generous subsidies.

Other downsides of the measures include their medium- to long-run effects. Those measures that freeze the production potential (mostly phase I measures: short-term work schemes, fixed cost grant, guarantees, tax deferrals, moratoria) may limit incentives to adjust to changed business conditions and could cause an overall loss in output by limiting the reallocation of employees between companies as well as sectors (Devereux et al, 2020). While this might not be particularly problematic during lockdown, when reallocation is de facto not possible, caution is needed when certain measures expire. For example, if short-term work schemes were terminated before the economic recovery begins, employees might be dismissed and the economic benefits of maintaining employees, and hence production potential, would be lost. These considerations were taken into account when putting into place phase II of short-term work schemes which featured slightly stricter conditions. Support for hiring new workers might also speed up the economic recovery.

Credit moratoria, the suspension of the obligation to file for insolvency and tax deferrals help sustain business until the corresponding payments become due. However, these legacies might prevent businesses from recovering (hiring new workers, making investments) and might even result in an increased number of bankruptcies. This might affect the banking sector which, in turn, might force governments to further extend current measures. This is why leading economists (e.g. Blanchard, 2020) have called for generous grants instead of credits at the beginning of the second wave of the COVID-19 pandemic in Europe. Nevertheless, governments have to make sure that the measures adopted to contain COVID-19 do not overcompensate private companies, while socializing the associated costs among society.

[24] *While according to EU state aid provisions, overcompensation is not allowed, it is not punished for state aid amounting to a maximum of EUR 200,000 per company (de minimis provision). However, in the current crisis, this limit was raised to a maximum of EUR 800,000 per company. The amount covers 100% guarantees, direct grants (in Austria: fixed cost grant, net turnover compensation), deferrals of tax and social security payments and other types of repayable advances, loans as well as equity specific to individual sectors.*

3 The budgetary impact of fiscal (re)actions

While public finances have undoubtedly contributed significantly to stabilizing the Austrian economy, the effect of this contribution on public finances is often unclear. The figures discussed vary widely: Sometimes they refer to the general government; sometimes to the federal government only (excluding state and local governments). They might focus on discretionary measures alone or they might also comprise the impact of automatic stabilizers. They might cover individual years or provide amounts covering several years. They might refer to the maximum amounts budgeted, amounts already paid out or amounts projected which are likely to be recorded as burdening the Maastricht deficit and debt levels. Moreover, recording conventions might differ, which might result in measures being reflected differently in public finances in different countries. Some expenditure measures might lead to higher deficit and debt levels immediately, while others might be recorded with a lag/lead or might only have an impact on the debt level, without being reflected in the deficit level. The different ways of recording the impact on public finances makes international comparisons difficult. Germany, for example, is usually displayed to provide a huge fiscal aid package, a large part of which includes the envelope of guarantees, which the Bundesbank projects to remain largely untapped (Bundesbank, 2020).

So far, this study has provided information on the maximum fiscal envelope authorized for the measures announced (or budgeted in the 2021 budget) by the federal government as well as on latest available information on the amounts paid out[25] (see table 1, column "2020", "2021", "2022", "Payout"). At the beginning of the COVID-19 pandemic, the measures were only budgeted for 2020, but have since been extended to the 2021 budget.[26] As the measures were originally budgeted rather generously, they were not extended further in view of the second lockdown in November/December 2020. Only one additional measure was passed, namely the net turnover compensation which replaces up to 80% (50% for businesses still closed in December) of the turnover of companies that were closed by government order. Moreover, the guidelines for short-term work have been (re) adjusted to better meet the needs of impacted businesses.

Table 1 indicates whether the measures have an impact on the Maastricht deficit and debt levels (see the last and the second to last column). Expenditure on the fixed cost grant and the hardship fund deteriorate the Maastricht deficit – according to Statistics Austria at the point in time when the damage occurred. As requests for 2020 can be made until 2021,[27] the payouts so far, which have turned out to be rather small, are not indicative of the impact on the Maastricht deficit in 2020. Government guarantees for company loans do not show up in the Maastricht figures at the time of issuance. However, depending on their default probability, they could worsen the Maastricht deficit and debt levels in the future.[28] Deferrals of tax payments and social security contributions as well as accelerated depreciation

[25] *Pay-out information ranges from end October until mid December 2020.*

[26] *According to the provisions of the 2021 Budget Law of October 2020.*

[27] *Applications for the fixed cost grant can be made until the end of 2021 and for the hardship fund until March 15, 2021.*

[28] *According to information provided by Statistics Austria, COVID-19-related guarantees are likely to be recorded at the point in time when they are called. Export guarantees are usually recorded when they are written off.*

rules move the collection of tax into the future and provide immediate liquidity to firms. As deferrals do not affect the liabilities vis-à-vis the government, they are not accounted for on an accrual basis. Statistics Austria uses the accrual method of accounting for recording social security contributions, wage taxes, VAT and motor vehicle registration taxes, while basically recording cash flows[29] for personal income and corporate income taxes. Hence, as indicated in table 1, parts of the tax deferrals (i.e. those that are recorded on a cash basis) worsen the deficit immediately. If the government engages in borrowing to make up for these revenue losses, the debt level will increase. However, the increased debt level will be offset by a corresponding increase in assets, namely the taxes due.

The outlook for public finances largely depends on how the COVID-19 pandemic evolves. Uncertainty prevails not only about the size of the economic slump but also about the extent to which government assistance is being taken up and whether further measures will be passed. Despite this uncertainty, it is already clear that the general government surplus of 2019 will turn into a large deficit in 2020 according to the Maastricht definition. In its December 2020 outlook, the Oesterreichische Nationalbank (OeNB) projects the deficit to reach 9.2% of GDP (see economic outlook for Austria from 2020 to 2023 in this issue). While both automatic stabilizers as well as the discretionary fiscal response to the COVID-19 crisis have played an important role, discretionary measures account for a larger part of the budget deterioration. With the fixed cost grant, short-term work schemes and net turnover compensation, expenditure measures account for about two-thirds of the discretionary deterioration.[30] In 2021, the deficit is expected to decline, as most of the temporary measures will come to an end in 2021 at the latest and the economic situation is expected to improve. Hence, the deficit is projected to amount to 6.3% of GDP, with more than half of this decline still due to discretionary measures. Given the high deficit level and the negative GDP growth rate, it is evident that the debt level is also expected to increase in 2020, namely to 83.3%, before peaking at 86.4% in 2021 and staying elevated thereafter.

Despite the unprecedented fiscal burden that the COVID-19 crisis has put on Austrian public finances, they are not in a critical position.[31] Fiscal policy has been sound in recent years, with low deficits or even surpluses and strongly declining debt ratios. This has created room for letting automatic stabilizers play and engaging in expansionary discretionary measures. The increase in Austria's public debt ratio is slightly higher than that observed in the aftermath of the economic and financial crisis. However, given budget surpluses in previous years and the currently very low interest rate environment, Austria might even be in a better starting position for recovery. Moreover, Austria has a proven record of reducing high debt levels effectively and successfully. Hence, Austrian public finances enjoy a high level of confidence, as indicated by low interest rates on public debt, which are even negative for long maturities. While Austrian public finances are considered sustainable according to various sustainability indicators (see the European Commission or the International Monetary Fund), low/negative interest rates

[29] *Following an optional methodology available for calculating the Maastricht figures, Statistics Austria records cash receipts on a time-adjusted basis (phase shift).*

[30] *For further details, please refer to economic outlook for Austria from 2020 to 2023, box 3 (Reiss) in this issue.*

[31] *This is especially true as the EU fiscal rules have been suspended temporarily.*

should not be taken for granted. What is more, population aging might put an additional strain on public finances, in particular if the economy cannot return to its pre-pandemic growth path. Hence, some (structural) measures might be needed to restore sound public finances in a socially and environmentally sustainable way.

4 Conclusions

Together with the Eurosystem's monetary policy, Austrian public finances have played a significant role to mitigate the effects of the COVID-19 pandemic on the Austrian economy. First, automatic stabilizers have cushioned parts of the economic downturn. Second, unprecedented fiscal policy measures have been taken both in Austria and at the EU level to support the economy. In Austria, like in other EU countries, discretionary measures adopted up until summer 2020 (phase I) were mainly aimed at stabilizing the health care system and mitigating the effects of the first lockdown, while the measures enacted since summer 2020 had a twofold purpose. First, restarting the economy (phase II) by classic stimulus measures was key after the lockdowns. Second, initiatives were taken to promote private and public investments, which, ideally, support the transition to new technologies and ways of working and thus increase the economy's long-term growth potential (phase III). In any case, in the short term, public investments have a stimulating effect on the economy.

While numerous measures were taken, their effectiveness might be limited by the high degree of uncertainty with respect to future economic conditions. In particular, incentives to consume and invest might only be partially successful, as businesses and households might want to "wait and see" and save instead. Moreover, the measures might limit incentives for businesses to adjust to changed business and labor market conditions, causing an overall output loss in the long term. Design issues of certain measures (e.g. net turnover compensation) might lead to overcompensation of certain companies at the cost of society. Hence, future measures should be more targeted to sectors in need of support. However, withdrawing the measures when the economy starts to recover might also create considerable problems. This is particularly true when considering the fading out of tax deferrals or debt moratoria, as companies might face a backlog of tax liabilities and accumulated debt, which might limit their ability to invest and re-employ staff. Hence, the government might consider a slow fading out of the measures and should provide additional public investments or incentives to promote the transition to a knowledge-based digital economy by, e.g., investing more in education and training. Moreover, an evaluation of the efficiency of the measures will be particularly useful for potential future crises.

The unprecedented fiscal policy (re)actions have resulted in unprecedented deficit and high debt levels. The exact costs will depend on how the COVID-19 pandemic evolves, whether additional measures will be taken and to what extent the existing measures will have been taken up. As Austrian public finances are in a better position than at the beginning of the economic and financial crisis, their sustainability is not at risk. Nevertheless, high deficit and debt levels should be reduced in the medium term to maintain the high confidence levels in Austrian public finances in a future-oriented as well as socially and environmentally sustainable way.

References

Ando, A. and E.C. Brown. 1963. Part II. Lags in fiscal policy, in: Commission on money and credit, stabilization policies (Prentice-Hall, Englewood Cliff, NJ) 97-163.

Baumgartner, J., Bierbaumer-Polly, J. Fink, K. Friesenbichler, S. Kaniovski, M. Klien, S. Loretz, H. Pitlik, S. Rocha-Akis, F. Sinabell (all WIFO), A. Schnabl, S. Lappöhn, L. Mateeva, K. Plank, L. Wimmer (all IHS), J. Berger, W. Schwarzbauer and L. Strohner (all EcoAustria). 2020. Ökonomische Bewertung der in der Regierungsklausur am 16. Juni 2020 vorgestellten Maßnahmen. Monographien.

BGBl. II - Ausgegeben am 25. Mai 2020 - Nr. 225 Anhang zur Verordnung des Bundesministers für Finanzen gemäß § 3b Abs. 3 des ABBAG-Gesetzes betreffend Richtlinien über die Gewährung von Zuschüssen zur Deckung von Fixkosten durch die COVID-19 Finanzierungsagenturdes Bundes GmbH (COFAG).

Blanchard, O. 2020. Thread on twitter 29.10.2020: https://twitter.com/ojblanchard1/status/1321805119260921856

Bouabdallah, O., R. Morris, and L. Reiss, (eds.) (forthcoming). Gauging the typical influence of the economic cycle on government finances: New (Eurosystem) methodology. Working Paper Series. ECB.

Budgetdienst. 2020a. Budgetvollzug Jänner bis August 2020 und COVID-19-Berichterstattung. https://www.parlament.gv.at/ZUSD/BUDGET/2020/BD_-_Budgetvollzug_Jaenner_bis_August_2020_und_COVID-19-Berichterstattung.pdf

Budgetdienst. 2020b. Budgetvollzug Jänner bis Juli 2020 und COVID-19-Berichterstattung. https://www.parlament.gv.at/ZUSD/BUDGET/2020/BD_-_Budgetvollzug_Jaenner_bis_Juli_2020_und_COVID-19-Berichterstattung.pdf

Budgetdienst. 2020c. Budgetvollzug Jänner bis Juni 2020 und COVID-19-Berichterstattung https://www.parlament.gv.at/ZUSD/BUDGET/2020/BD_-_Budgetvollzug_Jaenner_bis_Juni_2020_und_COVID-19-Berichterstattung.pdf

Budgetdienst. 2020d. Budgetvollzug Jänner bis Mai 2020 und COVID-19-Berichterstattung https://www.parlament.gv.at/ZUSD/BUDGET/2020/BD_-_Budgetvollzug_Jaenner_bis_Mai_2020_und_COVID-19-Berichterstattung.pdf

Budgetdienst. 2020e. Budgetvollzug Jänner bis April 2020 und COVID-19-Berichterstattung https://www.parlament.gv.at/ZUSD/BUDGET/2020/BD_-_Budgetvollzug_Jaenner_bis_April_2020_und_COVID-19-Berichterstattung.pdf

Budgetdienst. 2020f. Aktuelle Gesetzesvorhaben zum Konjunkturpaket.

Budgetdienst. 2020g. Auswirkungen des Konjunkturstärkungspakets 2020. https://www.parlament.gv.at/ZUSD/BUDGET/2020/BD_-_Anfragebeantwortung_zu_den_Auswirkungen_des_Konjunkturstaerkungspakets_2020.pdf

Budgetdienst. 2020h. Kommunalinvestitionsgesetz 2020 und weitere Initiativanträge zur COVID-19-Krise. https://www.parlament.gv.at/ZUSD/BUDGET/2020/BD_-_Initiativantraege_zum_Kommunalinvestitionsgesetz_2020_u.a..pdf

Budgetdienst. 2020i. Budgetvollzug Jänner bis Oktober 2020 und COVID-19-Berichterstattung. https://www.parlament.gv.at/ZUSD/BUDGET/2020/BD_-_Budgetvollzug_Jaen_bis_Okt_2020_und_COVID-19.pdf

Bruegel Datasets. 2020. The fiscal response to the economic fallout from the coronavirus. https://www.bruegel.org/publications/datasets/covid-national-dataset/

Deutsche Bundesbank. 2020. Public Finances. Deutsche Bundesbank. Monthly Report August 2020. 77.

Devereux, M., I. Güçeri, M. Simmler and E. Tam. 2020. Discretionary fiscal responses to the COVID-19 pandemic, In: Oxford Review of Economic Policy. Volume 36. Issue Supplement_1.225–241. https://doi.org/10.1093/oxrep/graa019

ECB Economic Bulletin. 2020 a. Automatic fiscal stabilisers in the euro area and the COVID-19 crisis. Issue 6 / 2020 – Articles.

ECB Economic Bulletin. 2020b. COVID-19 and the increase in household savings: precautionary or forced? Issue 6 / 2020 – Focus.

European Commission. 2020. The pillars of next generation EU. https://ec.europa.eu/info/live-work-travel-eu/health/coronavirus-response/recovery-plan-europe/pillars-next-generation-eu_en

European Council. 2020. European Council Conclusions 21 July, 2020. EUCO 10/20. https://www.consilium.europa.eu/media/45109/210720-euco-final-conclusions-en.pdf

Fatás, A. and I. Mihov. 2001. Government size and automatic stabilizers: international and intranational evidence. In: Journal of International Economics. Vol. 55. No. 1. 3–28.

Hubmann, G. 2020. Staatliche Kreditgarantien und geldpolitische Maßnahmen des Eurosystems unterstützen Kreditvergabe der Banken an Unternehmen. Statistiken – Daten und Analysen Q4-20. OeNB.

IMF. 2020. Policy Responses to COVID-19. https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19

Ministry of Finance. 2020. Budgetbericht 2021.

Mourre, G., A. Poissonnier and M. Lausegger. 2019. The Semi-Elasticities Underlying the Cyclically-Adjusted Budget Balance: An Update & Further Analysis. European Economy Discussion Papers. No 098. European Commission.

OECD. 2020. Tax and Fiscal Policy in Response to the Coronavirus Crisis: Strengthening Confidence and Resilience. https://www.oecd.org/ctp/tax-policy/tax-and-fiscal-policy-in-response-to-the-coronavirus-crisis-strengthening-confidence-and-resilience.htm

Pichler, P., P. Schmidt-Dengler and C. Zulehner. 2020. Fixkostenzuschuss: Anreizprobleme und Reformvorschläge. Mimeo. Universität Wien.

Pisani-Ferry, J., X. Debrun and A. Sapir. 2008. Government size and output volatility: should we forsake automatic stabilization? International Monetary Fund. No. 8–122.

Price, R., T. Dang and Y. Guillemette. 2014. New Tax and Expenditure Elasticity Estimates for EU Budget Surveillance. OECD Economics Department Working Papers. No 1174. OECD Publishing.

Taylor, J.B. 2000. Reassessing Discretionary Fiscal Policy. In: Journal of Economic Perspectives 14 (3). 21– 36.

Verordnung des Bundesministers für Finanzen gemäß § 3b Abs. 3 des ABBAG-Gesetzes betreffend Richtlinien über die Verlängerung der Gewährung von Zuschüssen zur Deckung von Fixkosten durch die COVID-19 Finanzierungsagentur des Bundes GmbH (COFAG) (VO über die Gewährung von Fixkostenzuschüssen.

WKO. 2020. Verlängerung der Corona-Kurzarbeit ab 1. Oktober 2020 https://news.wko.at/news/oesterreich/Verlaengerung-der-Corona-Kurzarbeit-ab-1.-Oktober-2020.html

Economic outlook of the OeNB

December 2020

Second wave of COVID-19 pandemic delays economic recovery

Economic outlook for Austria from 2020 to 2023 (December 2020)

Gerhard Fenz and Martin Schneider[1]
Cutoff date for data: December 1, 2020.

Over the summer months, the Austrian economy recovered faster than expected from the deep slump observed in the first half of 2020. However, the current second wave of coronavirus infections in Austria caused a renewed downturn in the fourth quarter of 2020. Still, this downturn is likely to be only half as severe as the spring 2020 contraction. The further course of the COVID-19 pandemic will have a substantial impact on the future growth path of the Austrian economy. The Oesterreichische Nationalbank (OeNB) expects a strong economic recovery that rests on the following assumptions: a third wave of coronavirus infections in spring 2021 can be prevented; the related health policy measures will be phased out gradually over the first half of 2021; and a medical solution will be successfully implemented by end-2021. After real GDP growth decreased by 7.1% in Austria in 2020, the OeNB expects growth rates of 3.6% in 2021, 4.0% in 2022 and 2.2% in 2023. In the second half of 2022, Austrian real GDP growth is expected to be back at pre-crisis levels. After having surged in 2020, the saving ratio in Austria is expected to decline again quickly, thus fostering the recovery of private consumption. As a result, Austria's growth outlook for 2020 appears virtually unchanged against the OeNB's economic outlook of June 2020. Growth figures for 2021, in contrast, must be revised downward by 1.3 percentage points in view of the strong second wave of the COVID-19 pandemic and the related second lockdown. On the other hand, growth rates for 2022 are revised upward by 1.3 percentage points as the economic upturn is now projected to begin later in 2021 than forecast in the June 2020 outlook. The unemployment rate (national definition) will climb to 10.2% in 2020 and go down only marginally to 8.9% by 2023. A stronger rise in unemployment will be prevented by short-time work schemes. Despite the massive economic slump, HICP inflation in 2020 will decrease only moderately to 1.3%. Over the remaining forecast horizon, it will increase to 1.7%. The general government deficit (Maastricht definition) is forecast to rise to 9.2% of GDP in 2020, reflecting comprehensive fiscal stimulus packages and the effect of automatic stabilizers, before shrinking markedly to 1.4% of GDP by 2023.

1 Summary

1.1 Progress of COVID-19 pandemic will determine economic growth

The spring 2020 downturn in economic activity was less pronounced, and economic recovery since May 2020 has been stronger, than expected. The current second wave of COVID-19 infections and the related health policy measures many countries had to take to contain the pandemic have temporarily slowed economic recovery, however. Although a medical solution (vaccination) will be available by the beginning of 2021, its effective implementation at a global scale is not likely to be completed before early 2022. We therefore assume that containment measures

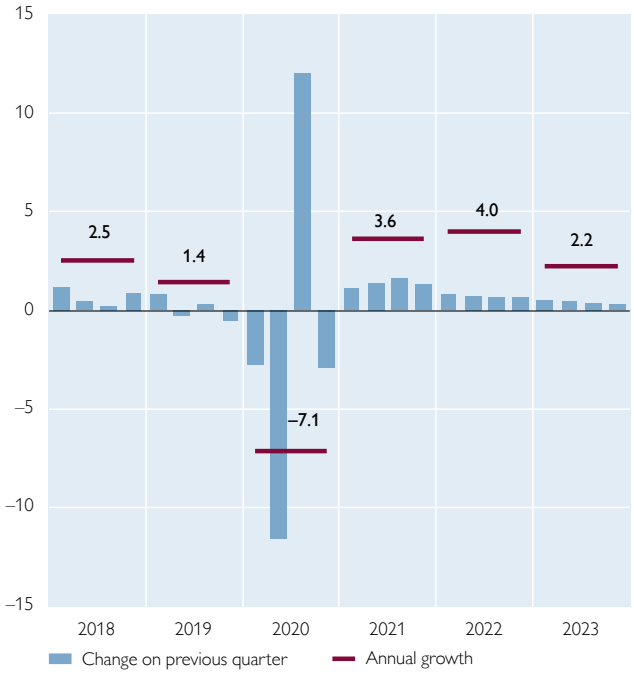
[1] *Oesterreichische Nationalbank, Economic Analysis Division, gerhard.fenz@oenb.at, martin.schneider@oenb.at. With contributions from Friedrich Fritzer, Ernest Gnan, Walpurga Köhler-Töglhofer, Christian Ragacs, Lukas Reiss, Beate Resch, Doris Ritzberger-Grünwald and Klaus Vondra.*

Chart 1

Main results of the forecast

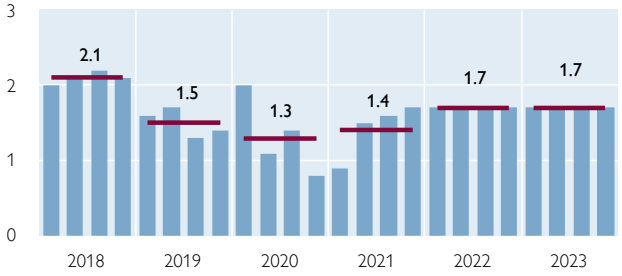
Real GDP growth

Change on previous period in % (seasonally and working day-adjusted)

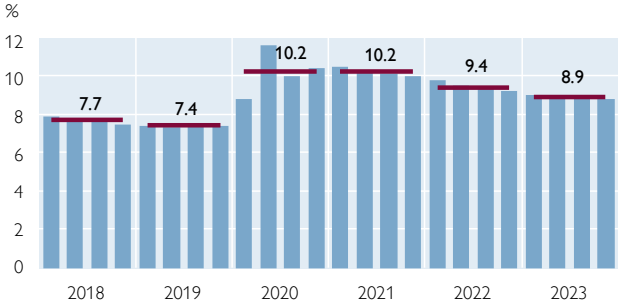


Harmonised Index of Consumer Prices (HICP)

Annual change in %



Unemployment rate (AMS definition)



Source: WIFO, Statistics Austria, Public Employment Service Austria (AMS), OeNB December 2020 outlook.

will be eased only gradually. In the first quarter of 2021, and to a lesser degree also in the second quarter, economic activity in Austria and abroad will thus still be impaired by the COVID-19 pandemic.

1.2 Growth losses during second lockdown only half as large as in spring 2020

The reduction in economic output in Austria will be significantly smaller during the second lockdown than during the first lockdown in spring 2020. We expect Austrian GDP during the second lockdown to decline by 13% against the comparable period of the previous year; the slump observed in spring 2020 was almost twice as strong (–25%). The impact of the second lockdown will be less pronounced mainly because there are fewer disruptions in global value chains, production facilities have not been shut down, learning effects come into play, uncertainty is lower and confidence is stronger as a medical solution is imminent.

1.3 Upward trend in goods exports, but another slump in tourism

In the second quarter of 2020, Austrian exports felt the full impact of the COVID-19 pandemic. In the third quarter, however, the gradual easing of containment measures in Austria and its major trading partners caused a quick recovery. The second wave of coronavirus infections is not likely to trigger another sharp decline in the trade in goods; rather, it will probably just cause a slight deceleration. For tourism exports, however, we expect another round of high losses. In

total, Austria's exports of goods and services are likely to go down by more than 10% in the full year 2020. We expect economic activity in all major destinations of Austrian exports to recover strongly in the course of 2021.

1.4 Forced saving and precautionary saving significantly drive down private consumption

Private consumption in Austria was badly affected by the two lockdowns in 2020. With the related restrictions in place, possibilities for consumer spending were limited and the saving ratio surged. In addition to this forced saving, precautionary saving has increased as people feel increasingly insecure about their income situation. Households' real disposable income was supported by massive government transfers and therefore went down by no more than 3.0%, which is comparably moderate given the deep recession. Private consumption, by comparison, will decline sharply by 8.8% in 2020. Mirroring this development, the saving ratio will rise from 8.2% in 2019 to 13.7% in 2020. We expect real disposable income to stagnate but private consumption will pick up by 3.9% in 2021 on the back of a decrease in the saving ratio. Consumption growth will support employment and household income during the general economic recovery and will help reduce uncertainties; in 2022, it will accelerate to 4.7%.

Unlike other recessions, the 2020 recession had relatively little impact on investment activity in Austria. Gross fixed capital formation in 2020 will decline by 4.1% and thus by less than overall economic activity (–7.1%). In the course of 2021, investment activity will accelerate significantly on the back of the expected global recovery. Persistently favorable financing conditions should also provide support. Following a 4.0% growth rate in 2021, the investment cycle will peak at 4.7% growth in 2022.

1.5 Short-time work prevents stronger rise in unemployment

Hours worked by payroll employees will go down by 8.8% in 2020 because of the economic slump. Thanks to the extensive utilization of short-time work schemes, the reduction in employment will be relatively moderate at –2.3%. In 2021, a slight rise in employment can be expected. At the beginning of 2022, employment is likely to reach pre-crisis levels, and we forecast a strong increase (+2.1%) in 2022 in line with the predicted cyclical recovery. Unemployment as recorded by the Public Employment Service Austria (AMS) will climb by 2.8 percentage points to 10.2% in 2020 and will remain at this level in 2021. In 2022 and 2023, as the economy will recover, we expect the unemployment rate in Austria to decrease slightly to 9.4% and 8.9%, respectively.

1.6 Relatively moderate decline in inflation despite massive economic slump

According to the OeNB's inflation forecast of December 2020, HICP inflation in Austria will decrease somewhat in 2020 year on year, coming to 1.3%. The COVID-19 pandemic and the related demand shortfall in the overall economy have dampened the prices of nonenergy industrial goods and services. In addition, low energy prices have a dampening effect on inflation. In 2021, HICP inflation will increase only moderately to 1.4%, given continued spare production capacities; in 2022 and 2023, it will come to 1.7%.

Table 1

OeNB December 2020 outlook for Austria – main results

	2019	2020	2021	2022	2023
Economic activity	*Annual change in %*				
Gross domestic product (GDP)	+1.4	–7.1	+3.6	+4.0	+2.2
Private consumption	+0.8	–8.8	+3.9	+4.7	+2.0
Government consumption	+1.4	+0.7	+1.2	+0.8	+0.9
Gross fixed capital formation	+3.9	–4.1	+4.0	+4.7	+2.7
Exports of goods and services	+2.9	–11.8	+5.4	+5.5	+3.7
Imports of goods and services	+2.5	–11.0	+4.1	+5.8	+3.8
	% of nominal GDP				
Current account balance	2.8	2.4	2.4	2.3	2.4
Contribution to real GDP growth[1]	*Percentage points*				
Private consumption	+0.2	–3.3	+1.4	+1.7	+0.7
Government consumption	+0.2	+0.1	+0.2	+0.1	+0.1
Gross fixed capital formation	+0.5	–0.5	+0.6	+0.6	+0.4
Domestic demand (excluding changes in inventories)	+1.0	–3.7	+2.1	+2.4	+1.3
Exports	+0.7	–3.7	+1.5	+1.5	+1.1
Changes in inventories (including statistical discrepancy)	+0.0	–0.2	–0.3	+0.1	+0.1
Prices	*Annual change in %*				
Harmonised Index of Consumer Prices (HICP)	+1.5	+1.3	+1.4	+1.7	+1.7
Private consumption expenditure (PCE) deflator	+1.9	+0.9	+1.0	+1.7	+1.8
GDP deflator	+1.7	+0.9	+0.2	+1.5	+1.7
Unit labor costs (whole economy)	+2.4	+5.8	–0.7	+0.2	+1.9
Compensation per employee (nominal)	+2.7	+0.1	+2.1	+2.3	+2.6
Compensation per hour worked (nominal)	+2.2	+7.5	–0.8	+0.8	+2.6
Import prices	+0.3	–1.7	+1.4	+1.9	+1.7
Export prices	+0.0	–0.3	+1.5	+1.7	+1.8
Terms of trade	–0.3	+1.4	+0.0	–0.1	+0.0
Income and savings					
Real disposable household income	+1.3	–3.0	+0.2	+2.3	+1.8
	% of nominal disposable household income				
Saving ratio	8.2	13.7	10.0	7.9	7.7
Labor market	*Annual change in %*				
Payroll employment	+1.4	–2.3	+0.7	+2.1	+1.6
Hours worked (payroll employment)	+1.9	–8.8	+3.5	+3.5	+1.6
	% of labor supply				
Unemployment rate (Eurostat definition)	4.5	5.3	5.6	5.1	4.8
Unemployment rate (AMS definition)	7.4	10.2	10.2	9.4	8.9
Public finances	*% of nominal GDP*				
Budget balance	+0.7	–9.2	–6.3	–2.9	–1.4
Government debt	70.5	83.3	86.4	84.4	82.5

Source: 2019: WIFO, Eurostat, Statistics Austria; 2020 to 2023: OeNB December 2020 outlook.

[1] *The import-adjusted growth contributions were calculated by adjusting all final demand components for their corresponding import shares, which were obtained from input-output tables.*

1.7 COVID-19 pandemic causes massive budget deficit in 2020 followed by a gradual deficit reduction over the next few years

Given the sharp economic downturn and the comprehensive fiscal support measures, Austria's budget balance will deteriorate to –9.2% of GDP in 2020 (following +0.7% of GDP in 2019). Over the subsequent years, the expiration of a number of discretionary measures (in particular short-time work schemes, fixed cost grants and compensation for sales losses) and the cyclical recovery will help to gradually reduce the deficit; for 2023, we expect the budget balance to come to –1.4% of GDP. With budget deficits running high and GDP growth remaining subdued, the government debt ratio will increase sharply in 2020 and 2021 (to 83.3% and 86.4% of GDP, respectively), before receding slightly to 82.5% of GDP by 2023.

2 Assumptions on the further progress of the COVID-19 pandemic and on the international environment

This forecast for the Austrian economy is the OeNB's contribution to the December 2020 Eurosystem staff macroeconomic projections. The forecast horizon ranges from the fourth quarter of 2020 to the fourth quarter of 2023. The cutoff date for all assumptions on the performance of the global economy, interest rates, exchange rates and crude oil prices was November 18, 2020. To prepare these projections, the OeNB used its macroeconomic quarterly model and national accounts data adjusted for seasonal and working-day effects in line with Eurostat requirements. The national accounts data published by Statistics Austria on December 1, 2020, are available up to the third quarter of 2020.

The Eurosystem's projections are based on common assumptions on the further progress of the COVID-19 pandemic. These assumptions are common to the national forecasts produced by all euro area central banks and they also relate to the forecasts for the economies of non-euro area trading partners.

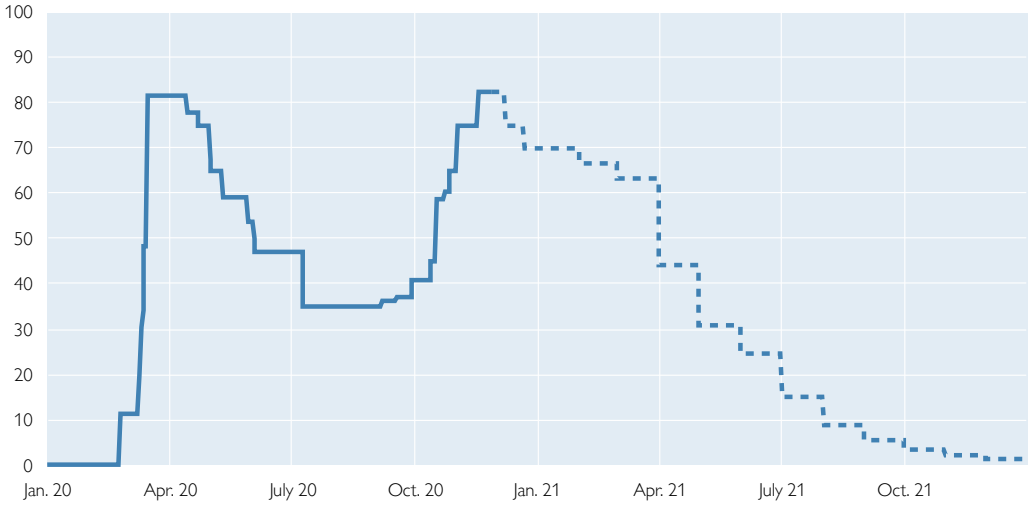
We assume that the lockdown measures imposed in many countries since fall 2020 will successfully contain the second wave of coronavirus infections in the fourth quarter of 2020, but that coronavirus clusters are likely to occur repeatedly over the coming months. We do not assume that a third lockdown will be imposed in the first half of 2021, but further containment measures will continue to be necessary to limit a rise in COVID-19 infections. These measures will gradually be phased out in the course of 2021. Although a medical solution (vaccination) will be available by the beginning of 2021, we do not expect it to be fully and effectively implemented before early 2022. This means that the process of economic recovery will continue to be impaired in 2021.

For Austria, we expect that the second hard lockdown, which entered into force on November 17, 2020, will help to significantly reduce the number of new COVID-19 infections but that this reduction will not be sufficient for all lockdown measures to be lifted on December 7, 2020. We assume that the COVID-19 containment measures will be eased gradually, which means that they will continue to weigh on economic activity in Austria in particular in the first quarter of 2021, and to a lesser extent also in the second quarter. Austrian tourism in particular will continue to be strongly affected. Although we assume that hotels in Austria will be able to reopen for most of the winter tourist season, the travel warnings issued for Austria by many countries will remain in force for quite some time, resulting in a

Chart 2

Oxford Stringency Index for Austria

% of maximum restrictions



Source: University of Oxford, OeNB.

decline in overnight stays by foreign tourists of more than 60% year on year in the 2020/2021 winter tourist season.

Chart 2 shows developments in the *Oxford Stringency Index for Austria*[2]. This index captures the scope of COVID-19 containment measures. It consists of eight individual indicators (school closures, workplace closures, cancellation of public events, bans on assemblies, restrictions on public transport, curfews, domestic travel restrictions, international travel restrictions) and reaches a value of 100 if all restrictive measures captured are fully implemented. During the first and second lockdown periods, the indicator reached levels of just over 80. Values up to November 27, 2020, have been published by the University of Oxford; values for later dates reflect the assumptions made in this outlook for the further evolution of the COVID-19 pandemic.

Further external assumptions of this outlook expect a decline in demand for Austrian exports by 10.1% in 2020 as a result of the global economic crisis as projected by the Eurosystem. For the period from 2021 to 2023, the average growth of export markets is expected to come to around 5%. The short-term interest rate considered for the forecast horizon is based on market expectations for the three-month EURIBOR, which will almost constantly read –0.5% over the forecast horizon. Long-term interest rates, which reflect market expectations for ten-year government bonds, are expected to rise from –0.39% in the fourth quarter of 2020 to –0.10% in the fourth quarter of 2023. We expect the exchange rate of the euro vis-à-vis the US dollar to remain constant at USD/EUR 1.18. The projected path of crude oil prices is based on futures prices, which are going to trend upward slightly, following a major demand-driven setback in 2020. After coming to USD

[2] *The Oxford Stringency Index is a subindex of the Oxford COVID-19 Government Response Tracker developed by the University of Oxford. This tracker contains information on government measures taken in response to the COVID-19 pandemic. It comprises 19 indicators for more than 180 countries. See Hale, T. et al. (2020): Variation in government responses to COVID-19. Blavatnik School of Government-WP 2020/032. October.*

41.6 per barrel (Brent) in the fourth quarter of 2021, the price for crude oil will rise gradually over the remainder of the forecast horizon to USD 47.3 in the fourth quarter of 2023. The prices of nonenergy commodities are also assumed to move in line with futures prices.

Over the forecast horizon, global economic growth will be determined essentially by the course of the COVID-19 pandemic. The spring 2020 downturn in global economic activity was less pronounced, and economic recovery since May 2020 has been stronger, than expected. But recent economic data suggest a loss in momentum around the turn of the year 2020/2021 as a result of the second wave of COVID-19 infections.

Following a 3.1% decline in the first quarter of 2020, global GDP (excluding the euro area) went down by another 5.7% in the second quarter. At +6.1%, the recovery in the third quarter of 2020 was stronger than expected, but dynamics will slow down markedly in the final quarter of the year owing to the containment measures currently imposed by many countries. For 2020 as a whole, we expect a deep global recession. Global GDP excluding the euro area will shrink by 3.0% in 2020 – compared with very moderate growth (0.2%) during the 2009 global financial and economic crisis. For the period from 2021 to 2023, a strong upswing can be expected, given expectations of a medical solution and the support of expansive monetary and fiscal policies; growth rates will range between 4% and 6% over this period. World trade excluding the euro area will record an even deeper slump than global GDP, namely by 9.2% in 2020, owing to disruptions in

Table 2

Underlying global economic conditions

	2019	2020	2021	2022	2023
Gross domestic product	*Annual change in % (real)*				
World excluding the euro area	+2.9	–3.0	+5.8	+3.9	+3.6
U.S.A.	+2.2	–3.6	+3.8	+2.2	+1.8
Japan	+0.7	–5.3	+2.8	+1.3	+0.8
Asia excluding Japan	+5.1	–0.8	+8.4	+5.4	+5.4
Latin America	–0.3	–7.8	+5.5	+3.0	+2.7
United Kingdom	+1.3	–11.3	+3.8	+2.1	+1.3
CESEE EU Member States[1]	+3.9	–4.8	+3.4	+4.4	+3.3
Switzerland	+1.1	–4.5	+2.9	+1.9	+1.7
Euro area[2]	+1.3	–7.3	+3.9	+4.2	+2.1
World trade (imports of goods and services)	*Annual change in %*				
World	+0.6	–9.5	+7.1	+4.3	+3.6
World excluding the euro area	–0.4	–9.2	+7.1	+3.9	+3.4
Growth of euro area export markets (real)	+0.6	–10.7	+6.6	+4.1	+3.2
Growth of Austrian export markets (real)	+2.1	–10.1	+6.3	+5.5	+3.8
Prices					
Oil price in USD/barrel (Brent)	64.0	41.6	44.0	45.7	46.9
Three-month interest rate in %	–0.4	–0.4	–0.5	–0.5	–0.5
Long-term interest rate in %	0.1	–0.2	–0.3	–0.2	–0.1
USD/EUR exchange rate	1.12	1.14	1.18	1.18	1.18
Nominal effective exchange rate of the euro (euro area index)	115.5	119.2	121.6	121.6	121.6

Source: Eurosystem.

[1] *Bulgaria, Croatia, Czechia, Hungary, Poland and Romania.*
[2] *2019: Eurostat; 2020 to 2023: Results of the Eurosystem's December 2020 projections.*

international production and supply chains; over the remaining forecast horizon, world trade will recover at only slightly stronger rates than the global economy.

The 2020 recession is hitting advanced and emerging economies alike, with the advanced economies taking a bigger blow to their GDP. Developments across the emerging economies are very heterogeneous. China, for instance, which had started to ease containment measures earlier than other countries, will be the only large economy in the world to record positive growth in 2020 (+1.8%); the Chinese economy is also set to grow more rapidly than the world economy over the next few years. Other emerging economies, such as India or Latin America, where the health situation is a lot tighter and economic policy has less scope for supporting the economy, will take longer to get back to pre-crisis levels after the pronounced setback in economic output recorded in 2020.

Backed by accommodative monetary and fiscal policies and pent-up demand in private consumption, recovery was strong in the advanced economies over the summer of 2020, following a deep recession in the first half of the year. The current second wave of coronavirus infections will slow down this recovery temporarily in the fourth quarter of 2020 and in early 2021.

At –3.6% in 2020, the economic downturn will be less pronounced in the USA than in Europe. A potential set of measures by the new US administration constitutes an upward risk to the growth outlook for 2021 (+3.8%). The outlook for the United Kingdom is based on the assumption that, after the transition period, trade between the UK and the EU as of 2021 will be governed by the WTO's most-favoured nation (MFN) rules. Over the forecast horizon, this "hard Brexit" will markedly slow down the British economy, which is already set to decline by more than 10% because of the severe course the COVID-19 pandemic has taken in the UK. All in all, economic growth in the UK in the period from 2021 to 2023 will be by more than 2 percentage points lower than if the negotiated settlement had been closer to the CETA agreement between Canada and the EU.

According to the current Eurosystem projections, the euro area will also experience a deep recession in 2020 as a result of the COVID-19 pandemic. Economic output will shrink by around 7½%. Measures to contain the second wave of COVID-19 infections will continue to impair the economy also in 2021, albeit to a lesser degree. On the back of considerable support from fiscal, labor market and monetary policies, sound growth of around 4% can be expected for both 2021 and 2022, however. The euro area countries have felt the impact of the COVID-19 pandemic to different degrees. Of the major economies, Italy, Spain and France recorded exceptionally high economic losses; Austria's most important trading partner, Germany, on the other hand, saw below-average losses.

Economic developments in the central and eastern European countries are strongly linked to those in the euro area and have been characterized by a continued catching-up process over the last few years. In 2020, growth in the region will still be more than 2 percentage points higher than that in the euro area. The COVID-19 pandemic and the related uncertainties about the future EU budget (including the NextGenerationEU (NGEU) recovery plan), which will weigh on public sector investment activities in the region, will put a halt to this catching-up process over the remainder of the forecast horizon.

3 Slump in consumption and exports triggers recession in Austria

3.1 Austrian exports contract sharply due to global economic setback

Austrian export activity had begun to cool off substantially already in the course of 2019 as a result of difficulties in the German automotive industry and the trade conflict between the USA and China. In 2020, the impact of the COVID-19 pandemic hit Austrian exports particularly hard. Real exports slumped by almost 20% year on year in the second quarter of 2020. Production and supply disruptions in all major regions of the world as well as difficulties in the cross-border trade in goods led to interruptions in global value chains. Border closures and travel warnings brought international travel to a halt.

Export dynamics began to recover again in the third quarter of 2020 as containment measures in Austria and its major trading partners were gradually being eased. The massive disruptions in global production processes were corrected more quickly and comprehensively than had largely been expected. For the first time since the outbreak of the COVID-19 pandemic, the value of Austrian goods exports reached pre-crisis levels again in October 2020. Austria's summer tourist season also went slightly better than expected, in particular when compared to that in other European countries. Following a decline by almost 100% during the lockdown in spring 2020, the number of overnight stays by foreign tourists was "only" around one-fourth below the previous year's level in the summer months.

The second lockdown, which entered into force in Austria on November 17, 2020, is not likely to cause a second slump in the domestic trade in goods (see box 1). Austrian tourism, however, will have to expect very high losses once again. Already in October 2020, the travel warnings for Austria issued by many countries caused overnight stays by foreign tourists to drop by two-thirds. As accommodation establishments were closed for anything but business travel at the beginning of November 2020, losses of almost 100% are to be expected, much like in spring 2020. In total, Austria's real exports are likely to shrink by 11.8% in the full year 2020.

We expect economic activity in all major destinations of Austrian exports to recover strongly in 2021. Demand in Austria's export markets will increase by 6.3% in 2021 and will continue to expand dynamically (+5.5% in 2022 and +3.8% in 2023). At 5.4%, the growth of Austrian exports will remain slightly below growth in Austria's export markets in 2021 and will correspond to export market growth in 2022 and 2023. Losses in market shares of 0.9 percentage points are expected for 2021; these are attributable to two factors: On the one hand, as Austrian export prices went up more sharply than those of Austria's trading partners in 2020, price competitiveness deteriorated by 2,6%, which will feed through to external trade with some lag. On the other hand, a difficult first half of the year is ahead for Austrian tourism in 2021. Our outlook is based on the assumption that the number of overnight stays by foreign tourists will be more than 60% lower than 2020 figures in the first quarter of 2021. In the remainder of the year, tourism will recover gradually, but not fully – in line with our assumptions on the further progress of the COVID-19 pandemic.

Table 3

Austria's exports and imports and price competitiveness

	2019	2020	2021	2022	2023
	Annual change in %				
Exports					
Competitor prices on Austria's export markets	+1.8	–2.9	+0.7	+1.9	+1.8
Export deflator	+0.0	–0.3	+1.5	+1.7	+1.8
Changes in price competitiveness[1]	+1.7	–2.6	–0.7	+0.1	+0.0
Import demand on Austria's export markets (real)	+2.1	–10.1	+6.3	+5.5	+3.8
Austrian exports of goods and services (real)	+2.9	–11.8	+5.4	+5.5	+3.7
Austrian market share	+0.9	–1.7	–0.9	+0.0	–0.1
	Annual change in %				
Imports					
International competitor prices on the Austrian market	+1.3	–1.8	+1.5	+1.8	+1.8
Import deflator	+0.3	–1.7	+1.4	+1.9	+1.7
Austrian imports of goods and services (real)	+2.5	–11.0	+4.1	+5.8	+3.8
Terms of Trade	–0.3	+1.4	+0.0	–0.1	+0.0
	Percentage points of real GDP				
Contribution of net exports to GDP growth	+0.3	–0.9	+0.9	+0.0	+0.1
	% of nominal GDP				
Export ratio	55.7	52.3	53.9	54.7	55.6
Import ratio	52.2	48.7	49.6	50.6	51.4

Source: 2019: Statistics Austria, Eurosystem; 2020 to 2023: OeNB December 2020 outlook.

[1] *Changes in price competitiveness are defined as the difference between changes in competitor prices on Austria's export markets and changes in the export deflator.*

Table 4

Austria's current account

	2019	2020	2021	2022	2023
	% of nominal GDP				
Balance of trade	3.2	3.6	3.4	3.4	3.4
Balance of goods	*0.8*	*1.7*	*1.8*	*1.5*	*1.5*
Balance of services	*2.5*	*1.9*	*1.6*	*1.8*	*1.9*
Balance of primary income[1]	0.5	–0.2	–0.2	–0.2	–0.2
Balance of secondary income[2]	–0.9	–0.9	–0.9	–0.9	–0.8
Current account balance	2.8	2.4	2.4	2.3	2.4

Source: 2019: OeNB; 2020 to 2023: OeNB December 2020 outlook.

[1] *Balance of income (compensation of labor, investment income, etc.).*
[2] *Balance of current transfers.*

When compared with the global financial and economic crisis of 2009, the decline in real exports in 2020 is smaller by around 2 percentage points; correspondingly, the recovery after the crisis will also be less pronounced. Austria's current account surplus will decrease to 2.4% in 2020 and will remain at this level throughout the forecast horizon.

Box 1

Second lockdown brings smaller growth losses

The reduction in economic output in Austria will be significantly smaller during the second hard lockdown that entered into force on November 17, 2020, than during the first lockdown in spring 2020. We expect Austrian GDP during the second lockdown to decline by 13% against the comparable period of the previous year; the slump observed in spring 2020 was almost twice as strong (–25%). The impact of the second lockdown will be less pronounced mainly because there are fewer disruptions in global value chains, production facilities have not been shut down (entirely), learning effects come into play, uncertainty is lower and confidence is stronger as a medical solution is imminent.

Private consumption is likely to decline to a similar extent as recorded in spring 2020. The closure of shops (except for those in the basic supply sector), hotels, restaurants as well as cultural institutions and sports and recreational facilities has again strongly limited the options for consumer spending. Drawing on their experience from the first lockdown, enterprises and consumers have, however, been able to adjust more flexibly and quickly to the new conditions and have been making better use of alternative sales and purchase options. Still, private consumption is likely to drop by almost 25% during the weeks of the second lockdown, which is just slightly less dramatic than in spring 2020 (–30%). Again, the impact of the lockdown varies strongly across economic sectors. Individual areas, such as the accommodation and restaurant business as well as recreational and cultural services, will probably see losses of more than 75%. Like in spring, food retailers, by contrast, will record higher sales.

Table B1

Growth losses during lockdowns in Austria

	Second lockdown (from Nov. 17)	Partial lockdown (from Nov. 3)	First lockdown (from March 16)
	Change on same period of previous year in %		
GDP	–13	–7	–25
Private consumption	–23	–12	–31
of which: selected categories of consumption			
Food	*18*	*18*	*20*
Recreational and cultural services	*–85*	*–85*	*–90*
Accommodation and food services	*–75*	*–75*	*–80*
Exports	–12	–7	–36
Goods and services excluding tourism	–5	0	–30
Tourism	–90	–85	–95
Investment	–6	–5	–21
Construction	–5	–5	–17
Research and development	0	0	–10
Investment in plant and equipment	–10	–8	–32
Government consumption	1	1	1

Source: OeNB.

Apart from private consumption, also exports, the second major demand component, were substantially affected during the first lockdown. Nontourism exports went down by 30% in real terms. In spring 2020, many countries imposed lockdown measures at around the same time, and the international trade in goods faced closed borders and trade barriers. The related production and supply disruptions caused interruptions in global value chains. Owing to (initial) difficulties in fulfilling health policy measures, such as the duty to wear face masks and to observe physical distancing, Austria also recorded constraints on production in export-oriented industries. All these difficulties played no role, or a significantly smaller role, during the second lockdown. Nontourism exports will therefore only shrink by 5%. Tourism exports, on the other hand, are likely to fail almost completely, however (as during the first lockdown in spring 2020).

Temporary production shutdowns during the first lockdown drove down construction investment by just under 20%. During the second lockdown, construction activity is expected to see only minor restrictions (resulting in a 5% decline) for the reason given above. Also investment in equipment, a cyclically responsive demand component, will probably drop to a lesser extent during the second lockdown. Investment in equipment is the demand component with the highest import content and therefore is particularly sensitive to disturbances in international trade. We expect such disturbances to play a subordinate role during the second lockdown. In addition, uncertainties about the further progress of the COVID-19 pandemic have clearly subsided since spring. As a medical solution is now within reach, fewer enterprises will postpone their investment projects during the second lockdown.

3.2 Lacking options for consumer spending during lockdowns force households to save

The COVID-19 pandemic and the related containment measures have significantly dampened household income. Real disposable household income went down by 6.5% year on year in the first half of 2020. Apart from reduced compensation of employees, the main reason for this decline was a 46% fall in investment income. This was primarily attributable to the fact that the distribution of profits and dividends was prohibited for businesses that made use of the fixed cost grant.[3] For 2020 as a whole, we expect real disposable household income to shrink by 3.0%. An even stronger decline has been prevented by massive government transfers (unemployment benefits, short-time work subsidies, higher pension benefits, one-off payments, etc.), which have supported household income to the extent of 4 percentage points in total.

Private consumption in Austria in 2020 was deeply affected by the COVID-19 pandemic. The two lockdown periods clearly limited households' options for consumer spending. During the five weeks of the spring 2020 lockdown, private consumption slumped by 31% year on year according to OeNB estimations (see box 1). In the national accounts, this is reflected in a 11.2% decline in private consumption in the second quarter of 2020 (against the previous quarter), following a 4.5% decrease in the first quarter. The easing of measures at the end of the first lockdown triggered a significant recovery in private consumption (+12.9%) in the third quarter of 2020. The second lockdown was slightly less severe than the first lockdown, with regard to both its (announced) duration and its effects on private consumption. For the full year 2020, we expect private consumption to shrink by 8.8% in total.

As a consequence of the substantial decline in consumption, the saving ratio went up significantly in 2020. After coming to 8.2% in 2019, it is expected to reach 13.7% in 2020. The further development of private consumption will primarily depend on the extent to which households will readjust their saving behavior. For this reason, we quantified the two major motives for the observed change in the saving ratio, i.e. precautionary saving owing to higher income insecurity and forced saving as a result of the lockdowns (see box 2). What we find is that half of

[3] *In addition, Article 82 paragraph 5 of the Austrian Limited Liability Company Act contains a more general rule that might have a dampening effect on dividend and profit distributions: If a company's assets are reduced substantially and probably permanently through losses or impairments between the balance sheet date and the adoption of the annual accounts, the profit for the year that may be distributed must be reduced by the amount of the materialized impairments.*

the strong rise in the saving ratio in the second quarter of 2020 can be traced to forced saving and one-fifth to precautionary saving.

Precautionary saving is likely to play a role as a motive for saving also in the first half of 2021, given people's persistently higher insecurity about their income situation. As regards forced saving, we assume that it will gradually go down to zero as containment measures are being lifted, and that consumption dynamics will then be quick to accelerate. Chart 2 B2 also hints at a quick recovery of consumption. It shows planned major purchases – at present and during the next 12 months – according to the European Commission's business and consumer survey for Austria. In normal times, the two estimates are mostly congruent. Also during the slump observed in April and May 2020, the two indicators developed in parallel. Since then, however, figures for major purchases planned in the next 12 months have been rising a lot more strongly, while those for major purchases planned at present have stagnated. As the economic effects of the COVID-19 pandemic will still be felt far into the year 2021, we expect the saving ratio to remain elevated at 10.0% also for the full year 2021. Only in 2022 will the saving ratio in Austria decline to its pre-crisis level. Real disposable household income will stagnate in 2021 owing to continually declining investment income and the phasing-out of numerous supportive public sector measures. According to our assumptions, consumers' propensity to save will go down and consumer demand will increase significantly (+3.9%) when compared to 2020. In 2022, household income will again expand vigorously and the saving ratio will continue to decline, making it possible for consumption growth to accelerate to 4.7%.

This outlook is subject to substantial uncertainties. An upward risk to the saving ratio (and thus a downward risk to consumption) arises from the fact that households might expect tax rises for the time after the crisis, aimed at reducing government debt incurred during the crisis. A downward risk to the saving ratio (and thus an upward risk to consumption) might arise from stronger-than-expected pent-up demand in private consumption as well as shifts in the composition of household income. The share of investment income – a type of income with an above-average saving component – in total household income came to 5½% in the first half of 2020, only half the average recorded in the period from 2015 to 2019.

Box 2

Higher saving ratio in the second quarter of 2020: the role of forced saving

In the second quarter of 2020, the household saving ratio increased significantly to 15.6% from 8.3% in the first quarter (seasonally adjusted). With shops shut down and curfews in place during the first lockdown in spring 2020, options for consumer spending were widely limited. At the same time, unemployment – and thus also the uncertainty about future income developments – increased substantially. The rise in the saving ratio is therefore likely to be attributable to a combination of forced saving and precautionary saving. This box aims to quantify these two saving motives. To this end, we estimate an equation in which the saving ratio is determined by the following factors: first, by precautionary saving. We use two proxy variables: 1) the change in the unemployment rate as an indicator for income uncertainty; 2) current "optimal saving" according to the European Commission's business and consumer survey.[4] Second, we use two variables to control for further factors – namely household sector

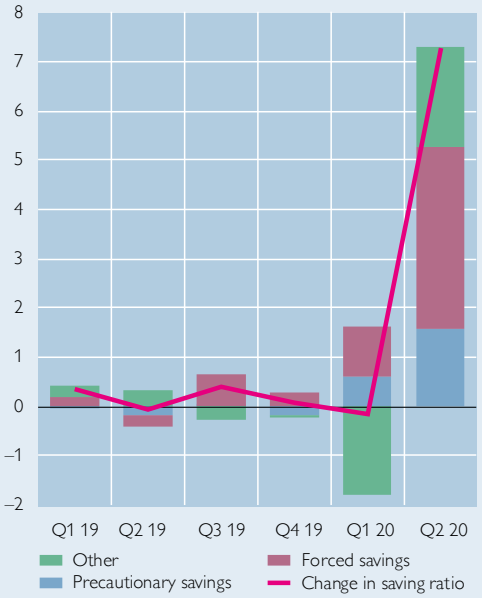
[4] *Question 10: Do you feel it is advisable to save under the current economic conditions?*

wealth[5] (as a percentage of GDP) as a proxy for a desired saving level and growth of households' real disposable income – to account for saving options. Estimation results are consistently significant at the 1% level. Our equation explains 78% of the variation in the saving ratio. For the first two quarters of 2020, its residual goes up sharply. We interpret this rise as evidence of forced saving. Around half (51%) of the strong increase in the saving ratio by 7.3 percentage points in the second quarter of 2020 can be attributed to forced saving and around one-fifth (22%) to precautionary saving (chart 1 B2).[6]

Chart 1 B2

Determinants of changes in the saving ratio

Change on previous quarter in percentage points

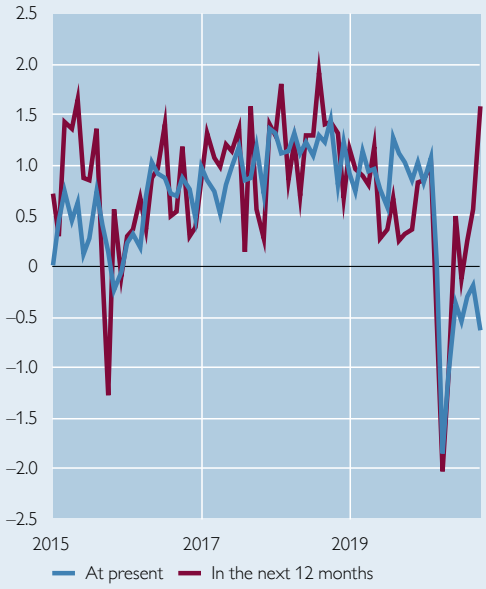


Source: Statistics Austria, OeNB calculations.

Chart 2 B2

Planned major purchases

Balance of respondents who plan to spend more/less in the period indicated (standardized)



Source: European Commission, November 2020 business and consumer survey.

Because of the strong rise in the saving ratio, households' financial investment doubled in the first half of 2020 year on year, to EUR 13.5 billion. What is striking here is a visible change in the composition of financial investment. Investments in "equity excluding quoted shares as well as cash and other receivables" increased from EUR 0.7 billion in the first half of 2019 to EUR 6.1 billion in the first half of 2020. The key driver of this development were capital increases by the household sector to enterprises that encountered economic distress because of the COVID-19 pandemic (around EUR 3 billion). Gold purchases also went up. Household sector gross fixed capital formation went down by 5%, thus releasing funds for other types of investment.

[5] *The wealth variable we use is composed of the capital stock, government debt and the net international investment position.*

[6] *This means that our results are similar to those of an estimation performed by the European Commission in its November 2020 forecast. In this estimation, the GDP forecast was decomposed according to the global multi-country model, a New Keynesian macroeconomic model. According to this estimation, around half of the economic slump of 2020 can be traced to saving. Two-thirds of saving in 2020 are identified as forced saving. (European Economic Forecast Autumn 2020, European Commission, Institutional Paper 136, November 2020).*

Table 5

Determinants of nominal household income and private consumption growth in Austria

	2019	2020	2021	2022	2023
	Annual change in %				
Payroll employment	+1.4	–2.3	+0.7	+2.1	+1.6
Wages and salaries per employee	+2.7	+0.1	+2.1	+2.3	+2.6
Compensation of employees	+4.1	–2.1	+2.9	+4.4	+4.2
Property income	+2.3	–38.4	–14.1	+10.2	+5.1
Self-employment income and operating surpluses (net)	+2.7	–6.6	+2.4	+5.9	+5.0
Contribution to household disposable income growth	*Percentage points*				
Compensation of employees	+3.6	–1.8	+2.5	+3.9	+3.7
Property income	+0.3	–4.4	–1.0	+0.6	+0.3
Self-employment income and operating surpluses (net)	+0.5	–1.1	+0.4	+0.9	+0.8
Net transfers less direct taxes[1]	–1.1	+5.1	–0.8	–1.5	–1.2
	Annual change in %				
Disposable household income (nominal)	+3.2	–2.1	+1.2	+4.0	+3.6
Consumption deflator	+1.9	+0.9	+1.0	+1.7	+1.8
Disposable household income (real)	+1.3	–3.0	+0.2	+2.3	+1.8
Private consumption (real)	+0.8	–8.8	+3.9	+4.7	+2.0
	% of nominal disposable household income growth				
Saving ratio	8.2	13.7	10.0	7.9	7.7

Source: 2019: Statistics Austria; 2020 to 2023: OeNB December 2020 outlook.

[1] *Negative values indicate an increase in (negative) net transfers less direct taxes; positive values indicate a decrease.*

3.3 Pandemic puts end to long investment cycle

The outbreak of the COVID-19 pandemic brought to an end an unusually long and pronounced investment cycle. From 2015 to 2019, gross fixed capital formation increased by an average 4% each year. Initially driven by investment in plant and equipment and R&D, the investment cycle was also increasingly supported by construction investment in the past three years.

In 2020, above all in the first half of the year, the exceptionally high level of uncertainty caused by the pandemic prompted many businesses to halt or postpone investment projects. In some cases, interruptions or shortfalls in delivery or production made it impossible to fully complete ongoing investment projects. This affected primarily cyclically sensitive investment in plant and equipment, which was more than 20% below the previous year's level in the second quarter of 2020. For the full year of 2020, we expect a decline by 8.9%.

Construction, by contrast, has been showing a more stable and better performance than the economy as a whole. Significantly negative effects on construction output were observed only at the beginning of the first lockdown, when there was a lack of labor and construction sites had to be closed. Rising property prices are signaling ongoing high demand, and favorable funding conditions are having an additional stimulating effect. Overall, investment in residential construction is expected to decline by "only" 3.7% in 2020, while nonresidential construction investment is forecast to drop by 2.6%.

Investment in intellectual property products is the only investment sector growing in 2020 (+1.4%). That said, investment in computer software and research

Table 6

Investment activity in Austria

	2019	2020	2021	2022	2023
	Annual change in %				
Total gross fixed capital formation (real)	+3.9	–4.1	+4.0	+4.7	+2.7
of which:					
investment in plant and equipment	*+4.1*	*–8.9*	*+4.9*	*+7.9*	*+2.6*
residential construction investment	*+3.6*	*–3.7*	*+1.8*	*+2.7*	*+2.4*
nonresidential construction investment and other investment	*+3.9*	*–2.6*	*+6.3*	*+3.7*	*+3.4*
investment in research and development	*+3.7*	*+1.4*	*+1.8*	*+3.1*	*+2.1*
public sector investment	*+0.5*	*–1.2*	*+1.9*	*+1.9*	*+0.9*
private investment	*+4.4*	*–4.5*	*+4.3*	*+5.1*	*+2.9*
Contribution to the growth of real gross fixed capital formation	*Percentage points*				
Investment in plant and equipment	+1.4	–3.1	+1.6	+2.6	+0.9
Residential construction investment	+0.7	–0.7	+0.3	+0.5	+0.4
Nonresidential construction investment and other investment	+1.0	–0.7	+1.6	+1.0	+0.9
Investment in research and development	+0.8	+0.3	+0.4	+0.7	+0.5
Public sector investment	+0.1	–0.1	+0.2	+0.2	+0.1
Private investment	+3.8	–3.9	+3.7	+4.5	+2.6
Contribution to real GDP growth	*Percentage points*				
Total gross fixed capital formation	+0.9	–1.0	+1.0	+1.2	+0.7
Changes in inventories	–0.7	–0.9	–0.3	+0.3	+0.2
	% of nominal GDP				
Investment ratio	24.6	25.6	26.0	26.1	26.2

Source: 2019: Statistics Austria; 2020 to 2023: OeNB December 2020 outlook.

and development had been expanding rapidly already in the years before the crisis. The pandemic has, if anything, increased the necessity to invest in these areas. What is more, lockdown measures are no big obstacle to such investment compared to other categories.

In sum, gross fixed capital formation is set to decrease by 4.1% in 2020, i.e. less than overall economic activity (–7.1%). This is remarkable in that investment activity usually tends to be much more volatile than GDP growth. Historical fluctuations of overall investment measured by the standard deviation are double as high as historical GDP fluctuations, those of investment in plant and equipment are even three times as high. The comparatively moderate current decline in investment activity reflects the – pandemic-related – unusually steep drop in private consumption, which under normal conditions has a stabilizing effect; this is one of the special characteristics of the current recession.

The impact of the second lockdown will continue to weigh on investment activity in early 2021. Now that vaccines against COVID-19 are starting to be rolled out, the uncertainty about the outlook for the Austrian and the global economy is set to diminish considerably, which means that the influence of the factor that has been particularly strongly depressing the propensity to invest will be weakening. The global recovery expected for 2021 will visibly push up investment, additionally supported by ongoing favorable funding conditions. Investment growth will accelerate to 4.0% in 2021 before the investment cycle will peak at 4.7% in 2022.

The investment ratio is set to increase to more than 25% in 2020 given the sharp contraction in private consumption and exports, thereby reaching a level around 2 percentage points above the long-term average. For the years to come, we expect a further rise to a level beyond 26%.

Box 3

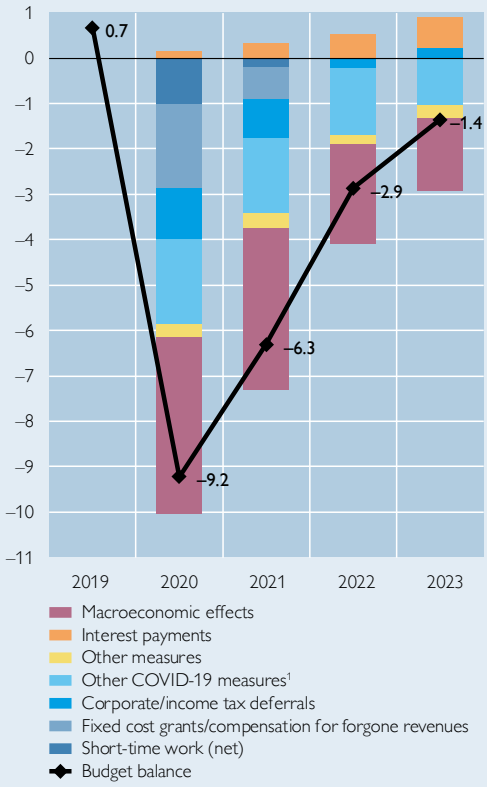
Substantial 2020 budget deficit caused by COVID-19 to be reduced gradually over following years[7]

The small budget surplus of 0.7% recorded in 2019 is set to turn into a substantial deficit of 9.2% of GDP in 2020; for the years 2021 to 2023, we expect the budget balance to improve gradually. Chart 1 B3 illustrates which components have been driving the current deterioration, with the four different blue bars showing the effects of the discretionary fiscal response to the pandemic. The subsidies for short-time work schemes, fixed cost grants and compensation for foregone revenue feed through above all in 2020 and less so in 2021. Extensive deferrals of assessed personal and corporate income taxes are reducing government revenues by a significant amount in 2020 and 2021 compared with 2019 (also through loss carrybacks); parts of these losses in revenues will be offset by higher revenues in the following years, though. Other fiscal measures taken in response to the COVID-19 crisis will have a more sustained effect lasting beyond the forecast horizon. This is true above all for the permanent cut in personal income taxes as well as the measures to encourage real investment, which have an effect over a relatively long term. Additional spending on medical equipment, tests and vaccinations will no longer have a significant effect in 2023, and they even do not have a substantial impact on the budget in 2020 and 2021. The yellow bars in the chart show the effect of measures adopted before 2020 (in particular the cuts in personal income taxes and the rise in pensions adopted in summer 2019; the latter was partly taken back in part in November 2020, though). Deposit insurance payouts triggered by the insolvency of Commerzialbank Mattersburg are playing a marginal role, as are additional revenues, expected to materialize from 2021 onward, from the expanded EU budget (above all from the Recovery and Resilience Facility).

Chart 1 B3

Change in budget balance since 2019

Percentage points



Source: OeNB.

[1] Including economic stimulus package.

The red bars show the effect of automatic stabilizers, which is particularly strong in 2020 and 2021 and is projected to remain clearly negative until 2023, given that in 2023 real GDP will still be only around 2% above the level of 2019. In 2020 and 2021, the macro effects also include the pandemic-related temporary reduction in certain components of expenditure on goods and services (including rehabilitation and overtime remuneration for civil servants out-

[7] *Author: Lukas Reiss, Oesterreichische Nationalbank, Economic Analysis Division, lukas.reiss@oenb.at.*

side health care) and income from production activity (including public transport and cultural establishments).

The high budget deficits and weak GDP growth will cause the government debt ratio to increase sharply in 2020 and 2021, before dropping slightly thereafter. Given that the high amount of new debt will be financed, on average, at marginally negative interest rates, interest expenses are projected to decline over the forecast horizon despite the sharp increase in the debt ratio. This also supports our current expectations that the fiscal consolidation needs after the pandemic will be significantly lower than after the recession of 2008/09.

3.4 Only small decrease in employment in 2020 thanks to short-time work schemes

The unprecedented 25% year-on-year drop in economic activity recorded in spring 2020 also had a visible impact on the labor market. The number of unemployed people increased by more than 200,000 within only 2½ weeks. Thanks to the large-scale use of short-time work schemes, a further rise in unemployment could be avoided and employment was kept at broadly stable levels. The left-hand panel of chart 3 shows the increase in (seasonally-adjusted) unemployment compared with the fourth quarter of 2019 according to Public Employment Service Austria (AMS) figures. In the second quarter of 2020, the average increase in joblessness was 153,000 persons.

In addition, 882,000 people were on short-time work over the same period. If we take into account the 43.5% average reduction in working hours per person on short-time work in the second quarter, we arrive at an additional reduction in total hours worked that corresponds to 394,000 full-time equivalents. This figure can also be interpreted as the maximum number of jobs saved through short-time work schemes, since it is unlikely that enterprises would have made redundant as many employees as they have put on short-time work schemes. Adding up the actual rise in joblessness and the maximum number of jobs saved by short-time work schemes, we see that, in sum, the pandemic caused unemployment to rise by 547,000 in the second quarter of 2020. Owing to the quick recovery after the end of the first lockdown in spring, the number of both unemployed people and those on short-time work dropped significantly. The latter reached a high of 1.04 million in May; in July, only 268,000 were on short-time work. In September, when the second phase of short-time work schemes expired, this number stood at 140,000 according to own estimates. In the fourth quarter, new infections were surging again, and the government imposed a second lockdown. As a result, unemployment and short-time work figures increased again, albeit considerably less strongly than during the first lockdown. The current short-time work scheme (no. III) remains in force until the end of March 2021. However, the federal government has already announced that short-time work schemes will continue to be available for certain sectors until September 2021, if necessary. The number of people on short-time work is expected to decrease from the first quarter of 2021 onward. Unemployment is forecast to reach a high at the end of the year and decline only gradually in the course of 2021. In addition to the generally lagged response of the labor market

to changes in economic activity, we expect that the deferral of taxes and social security contributions will be discontinued in 2021, which will lead to an increase in corporate insolvencies and, consequently, unemployment.[8]

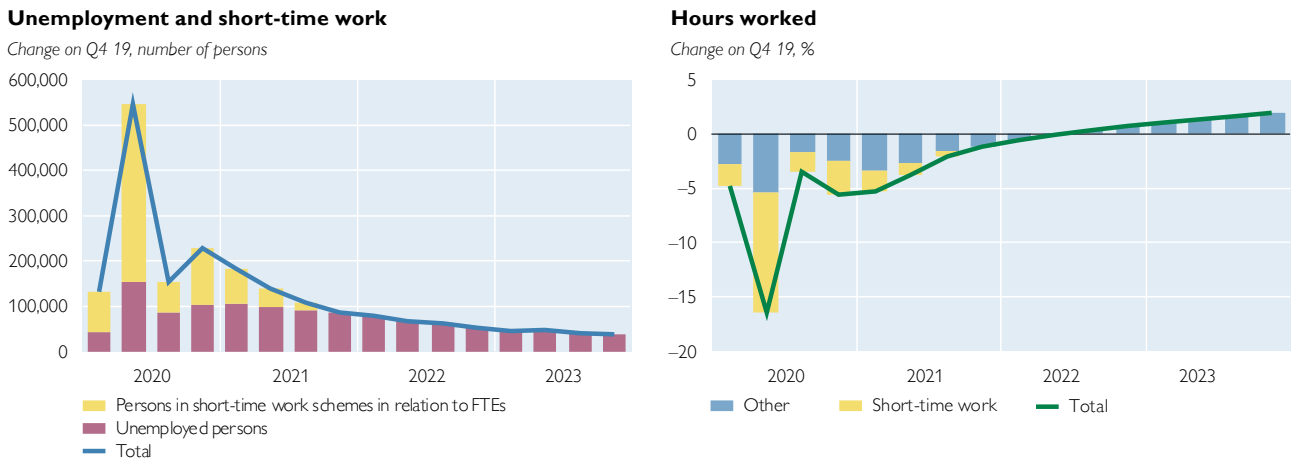
The right-hand panel of chart 3 shows the change in total hours worked since the fourth quarter of 2019. The second quarter of 2020 saw a 16% decrease, but the rate of decline abated quickly as the economy recovered in the third quarter. Two-thirds of the decrease in the second quarter were attributable to a reduction in working hours under short-time work schemes, the remaining third was due to job cuts as well as cuts in working hours per employed person.

The sharp increase in unemployment – by 153,000 persons – between the fourth quarter of 2019 and the second quarter of 2020 shown by AMS data is reflected only to a very small degree in the unemployment rate published by Eurostat. The latter rose by no more than 1.2 percentage points, that is, much less than the unemployment rate according to the national definition (4.2 percentage points). This gap is due to differences in computation: While the unemployment rate according to the national definition is based on the number of unemployed persons registered with the AMS, Eurostat's unemployment rate uses data from the EU Labour Force Survey. The latter counts as unemployed only those who are actively searching for a job. During the first lockdown, a large number of jobless people did not actively look for employment because they had been given re-employment guarantees by their employers or because they considered a job search futile under the given circumstances. These people were not included in EU unemployment figures.

The total number of hours worked is projected to be 7.8% down in 2020 compared to the previous year. At –1.9%, the drop in employment is moderate, by comparison, thanks to extensive short-time work schemes. We expect employment

Chart 3

Impact of COVID-19 pandemic on unemployment and hours worked in Austria



Source: Public Employment Service Austria (AMS), Statistics Austria, OeNB.

Note: FTEs = full-time equivalents.

[8] *Guth, M., C. Lipp, C. Puhr and M. Schneider. 2020). Modeling the COVID-19 effects on the Austrian economy and banking system. In: Financial Stability Report 40. OeNB. 63–86. Puhr, C. and M. Schneider. 2020. Have mitigating measures helped prevent insolvencies in Austria amid the COVID-19 pandemic? In: Monetary Policy & the Economy Q4/20–Q1/21. OeNB. Forthcoming.*

Table 7

Labor market growth in Austria

	2019	2020	2021	2022	2023
	Annual change in %				
Total employment (heads)	+1.1	–1.9	+0.9	+1.9	+1.5
Payroll employment	*+1.4*	*–2.3*	*+0.7*	*+2.1*	*+1.6*
of which: public sector employees	*+0.7*	*+0.3*	*+0.1*	*+0.1*	*+0.1*
Self-employment	*–0.5*	*+0.7*	*+1.7*	*+0.9*	*+0.6*
Total hours worked	+1.5	–7.8	+4.2	+3.2	+1.4
Payroll employment	*+1.9*	*–8.8*	*+3.5*	*+3.5*	*+1.6*
Self-employment	*–0.2*	*–2.7*	*+7.2*	*+1.8*	*+0.7*
Labor supply	+0.7	–1.2	+0.9	+1.4	+1.1
Registered unemployment	–7.4	+17.8	+5.6	–7.4	–5.7
	% of labor supply				
Unemployment rate					
Eurostat definition	4.5	5.3	5.6	5.1	4.8
AMS definition	7.4	10.2	10.2	9.4	8.9

Source: 2019: Statistics Austria; 2020 to 2023: OeNB December 2020 outlook.

Table 8

Compensation of employees

	2019	2020	2021	2022	2023
	Annual change in %				
Gross wages and salaries[1]					
In nominal terms	+4.1	–2.1	+2.9	+4.4	+4.2
Consumption deflator	+1.9	+0.9	+1.0	+1.7	+1.8
In real terms	+2.3	–3.0	+1.9	+2.7	+2.4
Collectively agreed wages and salaries[1]	+3.1	+2.3	+1.5	+1.7	+2.5
Wage drift	–0.3	–2.2	+0.6	+0.6	+0.1
Compensation per employee					
Gross[2] compensation (nominal)	+2.7	+0.1	+2.1	+2.3	+2.6
Gross compensation (real)	+0.9	–0.8	+1.1	+0.6	+0.8
Net[3] compensation (real)	+0.5	–0.8	+0.8	+0.3	+0.4
Compensation per hour worked					
Gross compensation (nominal)	+2.2	+7.5	–0.8	+0.8	+2.6
Gross compensation (real)	+0.4	+6.6	–1.8	–0.8	+0.8
	% of nominal GDP				
Wage share	48.5	50.7	50.2	49.6	49.8

Source: 2019: Statistics Austria; 2020 to 2023: OeNB December 2020 outlook.

[1] *Overall economy.*
[2] *Including employers' social security contributions.*
[3] *After tax and social security contributions.*

to edge up somewhat in 2021, to reach pre-pandemic levels in early 2022 and to rise strongly in 2022 (+1.9%) on the back of the projected economic upswing. The unemployment rate according to the AMS is set to increase by 2.8 percentage points to 10.2% in 2020 and remain at this level in 2021. After that, the jobless rate is forecast to go back to 9.4% in 2022 and to 8.9% in 2023.

Wage growth benefited from a collectively bargained wage hike of +2.3% in 2020, which, in retrospect, can be considered relatively high. However, since the crisis can be expected to significantly reduce overtime pay and other payments in

excess of the collectively negotiated wages, the wage drift is likely to be starkly negative. Therefore, nominal gross wages are set to increase hardly at all in 2020 (+0.1%), leading to falling real wages (–0.8%). At the same time, hourly wages, and hence employers' costs, are increasing because of the strong decrease in hours worked (+7.5%).[9]

Based on the results of the wage bargaining round in the fall, collectively negotiated wages are forecast to increase by 1½% in 2021. Assuming that the wage drift will turn back positive, we predict nominal gross wages to rise by 2.1%, which would imply rising net real wages (+0.8%). In 2022 and 2023, the growth of compensation of employees is assumed to accelerate slightly.

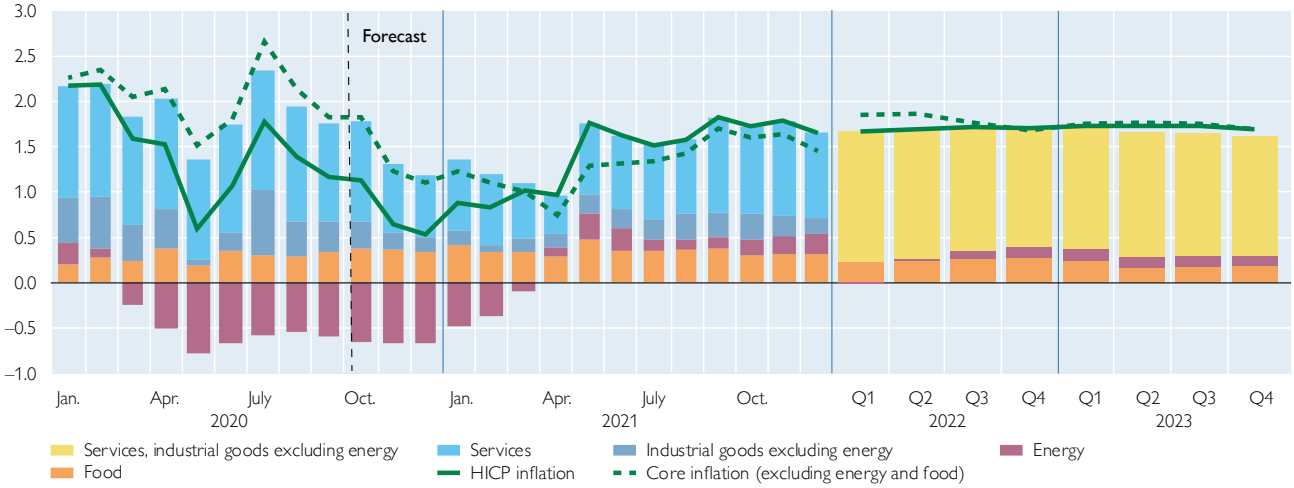
3.5 Gradual increase in inflation[10]

In line with the OeNB's inflation forecast of December 2020, HICP inflation is expected to reach 1.4% in 2021 and to climb to 1.7% in 2022 and 2023 (chart 1). We expect the energy component of the HICP to have a dampening impact until early 2021. Moreover, the COVID-19 pandemic and the ensuing fall in aggregate demand are likely to have a moderating impact on the components of core inflation (industrial goods excluding energy and services). The energy price effects of this year's slump in crude oil prices will peter out in the second quarter of 2021. As the inflation-reducing effect of the COVID-19 pandemic will be gradually weakening in 2021, HICP inflation will be rising progressively. Core inflation (i.e. inflation excluding energy and food) is expected to fall to 1.3%, a rate below HICP inflation. Over the remaining forecast horizon, we see core inflation climb to 1.8% and 1.7% in 2022 and 2023, respectively, as services and nonenergy industrial goods will be recovering.

Chart 4

Contributions to Austrian HICP inflation and core inflation

Inflation in %; inflation contributions in percentage points



Source: OeNB, Statistics Austria.

[9] *However, subsidies like funds for short-time work schemes are not deducted from wages as measured by national accounts data, which results in an overestimation of employers' actual costs.*

[10] *Author: Friedrich Fritzer, Oesterreichische Nationalbank, Economic Analysis Division, friedrich.fritzer@oenb.at.*

Energy and industrial goods and services determine path of inflation

The oil price slide that started in March 2020 hit bottom at end-April; since then, oil prices have been trending moderately upward. However, the recent rise notwithstanding, oil prices are still clearly below pre-pandemic levels, which is why energy inflation will remain negative into the first quarter of 2021. Only from the second quarter on will energy prices show moderately positive annual growth rates.

Nonenergy industrial goods inflation has been slowing recently, a trend expected to continue into the first months of 2021. Especially the growth of prices for consumer durables (e.g. vehicles, furniture) is likely to decelerate against the background of heightened uncertainty and high unemployment.

Services inflation did not fall as strongly as expected after the onset of the pandemic, which is attributable, in part, to a large proportion of prices having been computed by way of carryovers and imputations (especially for April and May 2020, but to some extent also for June and July). Moreover, price rigidities, which are frequently observed especially in the services sector, prevent prices from adjusting quickly to changes in demand. But after hitting a high of 2.8% in July 2020, services inflation has also been falling more recently. This trend is expected to continue over the coming months. According to the European Commission's business and consumer survey, businesses in the sectors hit particularly hard by the COVID-19 pandemic (passenger transport by air, hotels and restaurants) expect prices to grow at clearly below-average rates during the next few months. Services inflation will trend upward again only from the second quarter of 2021 on.

The growth of food prices (including alcohol and tobacco) is expected to accelerate in 2021, as global agricultural commodity prices, in particular, are predicted to pick up, which will contribute to upward pressures on imported food prices. Finally, the tobacco tax hike to enter into force in Austria in spring 2021 will push up food inflation (including tobacco) by 0.2 percentage points in 2021.

Table 9

Price, cost, productivity and profit indicators for Austria

	2019	2020	2021	2022	2023
	Annual change in %				
Harmonised Index of Consumer Prices (HICP)	+1.5	+1.3	+1.4	+1.7	+1.7
HICP energy	+0.7	–6.1	+0.5	+0.7	+1.5
HICP excluding energy	+1.7	+1.9	+1.3	+1.8	+1.7
Private consumption expenditure (PCE) deflator	+1.9	+0.9	+1.0	+1.7	+1.8
Investment deflator	+2.1	+1.6	+1.1	+1.6	+1.5
Import deflator	+0.3	–1.7	+1.4	+1.9	+1.7
Export deflator	+0.0	–0.3	+1.5	+1.7	+1.8
Terms of trade	–0.3	+1.4	+0.0	–0.1	+0.0
GDP deflator at factor cost	+1.8	+0.7	+0.4	+1.6	+1.7
Collective wage and salary settlements	+3.1	+2.3	+1.5	+1.7	+2.5
Compensation per employee	+2.7	+0.1	+2.1	+2.3	+2.6
Compensation per hour worked	+2.2	+7.5	–0.8	+0.8	+2.6
Labor productivity per employee	+0.3	–5.3	+2.7	+2.1	+0.7
Labor productivity per hour worked	–0.1	+0.8	–0.6	+0.8	+0.7
Unit labor costs	+2.4	+5.8	–0.7	+0.2	+1.9
Profit margins[1]	–0.7	–5.1	+1.1	+1.4	–0.2

Source: 2019: Statistics Austria; 2020 to 2023: OeNB December 2020 outlook.

[1] GDP deflator divided by unit labor costs.

4 Assessing the risks to the OeNB's outlook: 2021 growth forecast largely depends on assumptions about pandemic developments

The current economic outlook is fraught with a high degree of uncertainty, depending primarily on whether infection rates can be brought down to sustainably low levels. In the short run, the effectiveness of the second lockdown of November and December is decisive. Over the medium term, the availability of an effective vaccine will be key in containing the virus. Substantial progress has been reported in this respect in the past few weeks. As of end-November, three highly effective vaccines against COVID-19 were about to be approved for use. The USA is planning to begin vaccinations already as early as December 2020, while Europe, and hence also Austria, expects the first vaccines to be available from early 2021 onward. However, only after a sufficiently large part of the population has been immunized will it be possible to successfully stop the spread of the virus and lift all remaining containment measures. There is uncertainty above all as regards the availability of a sufficiently large number of vaccine doses and the take-up of vaccines. To take into account these uncertainties in this outlook, we calculated two scenarios that provide an illustrative range of outcomes that seem possible from today's perspective.

All central banks involved in preparing the joint Eurosystem staff projections calculated these two scenarios, which is why they reflect both domestic and international developments.

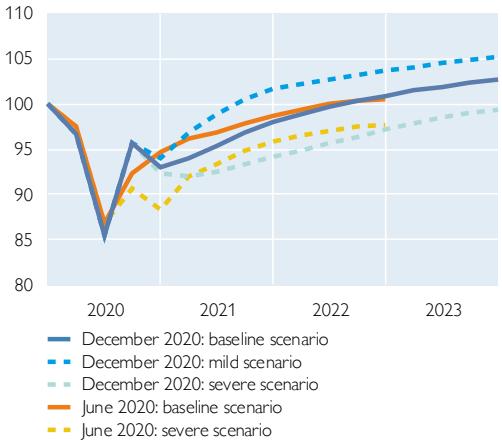
4.1 Mild scenario

The mild scenario assumes that the second lockdown in Austria from November 17 to December 6 suffices to significantly bring down infection numbers so that the majority of economic containment measures can be lifted. This implies that the tourism sector will be open for business – albeit with some restrictions – during the winter season. Furthermore, the mild scenario assumes that there will not be another lockdown in the course of the first quarter of 2021. Given recent positive news about the imminent availability of several effective coronavirus vaccines, the mild scenario moreover assumes that vaccinations will already start in early 2021 and that a sufficiently large proportion of the population will be immunized by mid-year. As regards the international macroeconomic environment, the mild scenario envisages a considerably better performance than the baseline scenario. Demand for Austrian exports is assumed to grow by 11.6% in 2021, a rate 4.9 percentage points up compared to the baseline.

Also, the recovery kicks in significantly earlier under the mild scenario. While for 2020, it assumes a contraction that, at –6.8%, is only slightly less severe than that envisaged in the baseline scenario (–7.1%), a much higher rate of expansion (+7.0%) is expected for 2021. Hence, the mild scenario sees growth return to pre-pandemic levels already in the second half of 2021, i.e. one year earlier than the baseline scenario; in the period 2020 to 2023, cumulated growth is assumed to be 4.9% (baseline: 2.3%).

Chart 5

GDP paths in different scenarios



Source: OeNB.

4.2 Severe scenario

The severe scenario covers the risks associated with a more unfavorable course of the pandemic. It assumes that the second lockdown scheduled to last until December 6 will not suffice to bring infections under control. The containment measures will remain in place throughout the entire winter and lifted only gradually until mid-2021. Furthermore, it is assumed that only by mid-2022 will a sufficiently large proportion of the population be vaccinated against COVID-19. Delays in the delivery of vaccine doses and a slow take-up of the vaccine among the public could contribute to this. The severe scenario also envisages significantly worse international macroeconomic conditions, with Austria's export markets stagnating in 2021 and growing again only in 2022.

In Austria, economic activity is expected to stagnate in the first half of 2021. For the second half of 2021, the severe scenario sees the economy back on a growth path, but given the strongly negative fourth quarter of 2020 and the resulting carry-over effect, the GDP growth rate for 2021 as a whole would also remain modest (+0.4%). In contrast to the baseline and the mild scenarios, the severe scenario does not see positive cumulated growth for the period 2020 to 2023; in other words, the economy will not have reached pre-pandemic levels by the end of the forecast horizon.

4.3 Additional risks

The mild and the severe scenarios together cover the uncertainties directly associated with the COVID-19 pandemic. In addition to that, there is a number of other risks to the outlook.

While uncertainty prevailing during the US presidential campaign has eased since the election, there is still a high degree of uncertainty regarding the future

Table 10

GDP growth under different scenarios

	December 2020			June 2020	
	Baseline scenario	Mild scenario	Severe scenario	Baseline scenario	Severe scenario
	Annual change in %				
2020	–7.1	–6.8	–7.2	–7.2	–9.2
2021	3.6	7.0	0.4	4.9	3.5
2022	4.0	3.5	3.3	2.7	3.4
2023	2.2	1.7	2.8	x	x
2020 to 2023 cumulated	2.3	4.9	–1.1	x	x

Source: OeNB.

course of US trade policies. A fiscal stimulus package that may be adopted by the new US administration represents an upside risk to the 2021 growth outlook (+3.8%). Furthermore, our outlook assumes a hard Brexit, which will adversely affect growth in the UK and in the euro area, primarily through trade channels. Should, in addition to that, disruptions occur in financial markets, the negative effects may be even larger than assumed. If, on the contrary, the Brexit talks result in a deal, growth will be higher. In Austria, the easing of insolvency law as well as social security institutions and tax authorities refraining from requesting the opening of insolvency proceedings resulted in a decline in the number of corporate insolvencies by one-third in the first three quarters of 2020. The expiry of these measures scheduled for 2021 entails the risk of higher insolvency numbers and represents a downside risk to the economic outlook.

5 Strong downward revision of outlook for 2021

We revised the outlook for 2020 up by 0.1 percentage points from our June outlook. This marginal revision is attributable to a combination of several factors. The downward revision of historical 2019 data led to a smaller carry-over effect, which dampened 2020 growth by 0.3 percentage points. Third-quarter growth, in turn, was significantly higher than expected in June, resulting in an upward revision by 1.4 percentage points. At the same time, the second wave of infections caused a significant downward revision of the growth forecast for the fourth quarter of 2020 so that the growth rate projected for 2020 as a whole was cut by 1.1 percentage points.

The revision of the outlook for 2021 was also due to several factors. The external environment, weakened by the second wave of COVID-19 infections, dampens growth expectations by 1.3 percentage points, and the containment measures implemented in Austria cut the outlook by another 2.5 percentage points. At the same time, the stronger-than-expected recovery in the third quarter of 2020

Table 11

Breakdown of revisions to the outlook

	GDP			HICP		
	2020	2021	2022	2020	2021	2022
	Annual change in %					
December 2020 outlook	–7.1	+3.6	+4.0	+1.3	+1.4	+1.7
June 2020 outlook	–7.2	+4.9	+2.7	+0.8	+0.8	+1.5
Difference	+0.1	–1.3	+1.3	+0.5	+0.6	+0.2
Caused by:	*Percentage points*					
External assumptions	–0.2	–1.3	+0.5	+0.0	+0.1	–0.1
New data[1]	+1.4	+2.5	x	+0.3	+0.3	x
of which: revisions to historical data up to Q1 20	*–0.6*	*x*	*x*	*x*	*x*	*x*
projection errors for Q2 and Q3 20	*+2.1*	+2.5	*x*	*+0.3*	*+0.3*	*x*
Other reasons[2]	–1.1	–2.5	+0.8	+0.2	+0.2	+0.3

Source: OeNB December 2020 and June 2020 outlooks.

Note: Due to rounding, the sum of growth contributions subject to individual revisions may differ from the total revision.

[1] "New data" refer to data on GDP and/or inflation that have become available since the publication of the preceding OeNB outlook.
[2] Different assumptions about trends in domestic variables such as wages, government consumption, effects of tax measures, other changes in assessments and model changes.

improved the outlook for 2021 by 2.5 percentage points. In sum, the growth outlook for 2021 was revised down by 1.3 percentage points. Given that the recovery expected for 2021 is anticipated to kick in later than forecast in June, the outlook for 2022 was significantly revised up (by 1.3 percentage points).

The inflation outlook was revised up for the entire forecast horizon. Due to an underestimation of inflation in the second half of 2020, we re-estimated our forecast models, which resulted in a higher inflation outlook. For 2022, the upward revision was additionally driven by a higher GDP outlook. Changes to external assumptions only had a marginal effect.

Table 12

Comparison of the OeNB December 2020 outlook and the June 2020 outlook

	December 2020				Revision since June 2020 outlook		
	2020	2021	2022	2023	2020	2021	2022
Economic activity	*Annual change in % (real)*						
Gross domestic product (GDP)	–7.1	+3.6	+4.0	+2.2	+0.1	–1.3	+1.3
Private consumption	–8.8	+3.9	+4.7	+2.0	–3.0	–2.2	+2.1
Government consumption	+0.7	+1.2	+0.8	+0.9	–0.5	–0.4	+0.0
Gross fixed capital formation	–4.1	+4.0	+4.7	+2.7	+2.6	–0.7	+1.6
Exports of goods and services	–11.8	+5.4	+5.5	+3.7	–0.2	–1.5	+0.8
Imports of goods and services	–11.0	+4.1	+5.8	+3.8	–2.1	–1.6	+2.1
Current account balance	+2.4	+2.4	+2.3	+2.4	+0.9	+0.2	+0.0
Contribution to real GDP growth	*Percentage points*						
Private consumption	–3.3	+1.4	+1.7	+0.7	–1.1	–0.8	+0.7
Government consumption	+0.1	+0.2	+0.1	+0.1	–0.1	–0.1	+0.0
Gross fixed capital formation	–0.5	+0.6	+0.6	+0.4	+0.3	+0.1	+0.2
Domestic demand (excluding changes in inventories)	–3.7	+2.1	+2.4	+1.3	–0.9	–0.9	+0.9
Net exports	–3.7	+1.5	+1.5	+1.1	+0.0	–0.4	+0.2
Changes in inventories (including statistical discrepancy)	–0.2	–0.3	+0.1	+0.1	+0.1	–0.2	+0.2
Prices	*Annual change in %*						
Harmonised Index of Consumer Prices (HICP)	+1.3	+1.4	+1.7	+1.7	+0.5	+0.6	+0.2
Private consumption expenditure (PCE) deflator	+0.9	+1.0	+1.7	+1.8	+0.0	+0.2	+0.2
GDP deflator	+0.9	+0.2	+1.5	+1.7	–0.4	+0.1	+0.1
Unit labor costs (whole economy)	+5.8	–0.7	+0.2	+1.9	+1.4	+0.6	–0.7
Compensation per employee (nominal)	+0.1	+2.1	+2.3	+2.6	+1.1	+0.5	+0.0
Compensation per hour worked (nominal)	+7.5	–0.8	+0.8	+2.6	+3.9	–0.4	–0.4
Import prices	–1.7	+1.4	+1.9	+1.7	–1.2	+0.9	+0.6
Export prices	–0.3	+1.5	+1.7	+1.8	+0.5	+0.9	+0.1
Terms of trade	+1.4	+0.0	–0.1	+0.0	+1.7	–0.1	–0.4
Income and savings							
Real disposable household income	–3.0	+0.2	+2.3	+1.8	–2.6	+0.6	–0.1
	% of nominal disposable household income						
Saving ratio	13.7	10.0	7.9	7.7	+0.3	+2.3	+0.5
Labor market	*Annual change in %*						
Payroll employment	–2.3	+0.7	+2.1	+1.6	–0.1	–1.5	+0.6
Hours worked (payroll employment)	–8.8	+3.5	+3.5	+1.6	–2.3	–0.8	+0.9
	% of labor supply						
Unemployment rate (Eurostat definition)	5.3	5.6	5.1	4.8	–1.5	–0.2	–0.2
Public finances	*% of nominal GDP*						
Budget balance (Maastricht definition)	–9.2	–6.3	–2.9	–1.4	–0.3	–2.4	–1.4
Government debt	83.3	86.4	84.4	82.5	–1.1	2.7	3.0

Source: 2018 (actual figures): WIFO, Statistics Austria, OeNB; OeNB June 2019 and December 2018 outlooks.

Annex

Table 13

Demand components (real)

Chained volume data (reference year = 2015)

	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
	EUR million					*Annual change in %*				
Private consumption	191,292	174,488	181,358	189,816	193,681	+0.8	–8.8	+3.9	+4.7	2.0
Government consumption	71,787	72,316	73,179	73,753	74,405	+1.4	+0.7	+1.2	+0.8	0.9
Gross fixed capital formation	91,585	87,848	91,340	95,653	98,205	+3.9	–4.1	+4.0	+4.7	2.7
of which: investment in plant and equipment	*31,665*	*28,832*	*30,255*	*32,657*	33,510	*+4.1*	*–8.9*	*+4.9*	*+7.9*	*2.6*
residential construction investment	*16,793*	*16,179*	*16,465*	*16,908*	17,312	*+3.6*	*–3.7*	*+1.8*	+2.7	*2.4*
nonresidential construction investment and other investment	*23,543*	*22,922*	*24,369*	*25,264*	*26,127*	*+3.9*	*–2.6*	*+6.3*	+3.7	*3.4*
Changes in inventories (including statistical discrepancy)	4,444	1,388	–403	717	1,410					
Domestic demand	359,108	336,040	345,474	359,939	367,701	1.1	–6.4	2.8	4.2	2.2
Exports of goods and services	214,868	189,477	199,706	210,640	218,491	+2.9	–11.8	+5.4	+5.5	3.7
Imports of goods and services	199,744	177,747	185,000	195,818	203,295	+2.5	–11.0	+4.1	+5.8	3.8
Net exports	15,124	11,730	14,706	14,822	15,197					
Gross domestic product	374,232	347,770	360,180	374,761	382,897	+1.4	–7.1	+3.6	+4.0	2.2

Source: 2019: Eurostat; 2020 to 2023: OeNB December 2020 outlook.

Table 14

Demand components (nominal)

	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
	EUR million					*Annual change in %*				
Private consumption	205,326	188,981	198,364	211,055	219,190	+2.7	–8.0	+5.0	+6.4	+3.9
Government consumption	77,191	79,188	79,672	80,988	83,034	+3.7	+2.6	+0.6	+1.7	+2.5
Gross fixed capital formation	97,932	95,436	100,324	106,728	111,203	+6.0	–2.5	+5.1	+6.4	+4.2
Changes in inventories (including statistical discrepancy)	3,095	–4,257	–8,432	–7,329	–6,723	×	×	×	×	×
Domestic demand	383,544	359,348	369,927	391,442	406,704	+3.1	–6.3	+2.9	+5.8	+3.9
Exports of goods and services	221,313	194,643	208,159	223,355	235,745	+2.9	–12.1	+6.9	+7.3	+5.5
Imports of goods and services	207,458	181,534	191,589	206,604	218,198	+2.8	–12.5	+5.5	+7.8	+5.6
Net exports	13,855	13,109	16,570	16,751	17,547	×	×	×	×	×
Gross domestic product	397,399	372,458	386,498	408,193	424,251	+3.2	–6.3	+3.8	+5.6	+3.9

Source: 2019: Eurostat; 2020 to 2023: OeNB December 2020 outlook.

Table 15

Demand components (deflators)

	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
	2010 = 100					*Annual change in %*				
Private consumption	107.3	108.3	109.4	111.2	113.2	+1.9	+0.9	+1.0	+1.7	+1.8
Government consumption	107.5	109.5	108.9	109.8	111.6	+2.2	+1.8	–0.6	+0.9	+1.6
Gross fixed capital formation	106.9	108.6	109.8	111.6	113.2	+2.1	+1.6	+1.1	+1.6	+1.5
Domestic demand (excluding changes in inventories)	107.3	108.7	109.4	111.0	112.9	+2.0	+1.3	+0.7	+1.5	+1.7
Exports of goods and services	103.0	102.7	104.2	106.0	107.9	+0.0	–0.3	+1.5	+1.7	+1.8
Imports of goods and services	103.9	102.1	103.5	105.5	107.3	+0.3	–1.7	+1.4	+1.9	+1.7
Terms of trade	99.2	100.6	100.6	100.5	100.5	–0.3	+1.4	+0.0	–0.1	+0.0
Gross domestic product	106.2	107.1	107.3	108.9	110.8	+1.7	+0.9	+0.2	+1.5	+1.7

Source: 2019: Eurostat; 2020 to 2023: OeNB December 2020 outlook.

Table 16

Labor market

	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
	Thousands					*Annual change in %*				
Total employment	4,539.1	4,452.4	4,490.6	4,578.0	4,646.3	+1.1	–1.9	+0.9	+1.9	+1.5
of which: private sector	*3,782.1*	*3,692.9*	*3,730.4*	*3,817.1*	*3,884.7*	*+1.2*	*–2.4*	*+1.0*	*+2.3*	*+1.8*
Payroll employment (national accounts definition)	3,998.6	3,908.1	3,937.0	4,019.0	4,083.6	+1.4	–2.3	+0.7	+2.1	+1.6
	% of labor supply									
Unemployment rate (Eurostat definition)	4.5	5.3	5.6	5.1	4.8	x	x	x	x	x
	EUR per real unit of output x 100									
Unit labor costs (whole economy)[1]	58.5	61.9	61.5	61.6	62.7	+2.4	+5.8	–0.7	+0.2	+1.9
	EUR thousand per employee									
Labor productivity (whole economy)[2]	82.4	78.1	80.2	81.9	82.4	+0.3	–5.3	+2.7	+2.1	+0.7
	EUR thousand									
Compensation per employee (real)[3]	44.9	44.6	45.1	45.3	45.7	+0.9	–0.7	+1.1	+0.6	+0.8
	At current prices in EUR thousand									
Compensation per employee (gross)	48.2	48.3	49.3	50.4	51.7	+2.7	+0.1	+2.1	+2.3	+2.6
	At current prices in EUR million									
Total compensation of employees (gross)	192,769	188,687	194,128	202,638	211,171	+4.1	–2.1	+2.9	+4.4	+4.2

Source: 2019: Eurostat; 2020 to 2023: OeNB December 2020 outlook.

[1] *Gross wages and salaries divided by real GDP.*
[2] *Real GDP divided by total employment.*
[3] *Gross wages and salaries per employee divided by private consumption expenditure deflator.*

Table 17

Current account balance

	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
	EUR million					*% of nominal GDP*				
Balance of trade	12,795.0	13,370.2	13,241.8	13,703.5	14,417.9	3.2	3.6	3.4	3.4	3.4
Balance of goods	2,981.0	6,339.8	7,139.4	6,246.8	6,169.6	0.8	1.7	1.8	1.5	1.5
Balance of services	9,814.0	7,030.4	6,102.4	7,456.7	8,248.2	2.5	1.9	1.6	1.8	1.9
Balance of primary income	1,983.0	–815.7	–671.4	–671.4	–671.4	0.5	–0.2	–0.2	–0.2	–0.2
Balance of secondary income	–3,479.0	–3,431.0	–3,437.1	–3,596.3	–3,596.3	–0.9	–0.9	–0.9	–0.9	–0.8
Current account balance	11,299.0	9,123.5	9,133.3	9,435.8	10,150.1	2.8	2.4	2.4	2.3	2.4

Source: 2019: Eurostat; 2020 to 2023: OeNB December 2020 outlook.

Table 18

Quarterly outlook results

	2020	2021	2022	2023	2020				2021				2022				2023			
					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Prices, wages, costs	*Annual change in %*																			
HICP	+1.3	+1.4	+1.7	+1.7	+2.0	+1.1	+1.4	+0.8	+0.9	+1.5	+1.6	+1.7	+1.7	+1.7	+1.7	+1.7	+1.7	+1.7	+1.7	+1.7
HICP excluding energy	+1.9	+1.3	+1.8	+1.7	+2.2	+1.8	+2.2	+1.4	+1.1	+1.1	+1.5	+1.6	+1.9	+1.9	+1.8	+1.7	+1.8	+1.8	+1.8	+1.7
Private consumption expenditure deflator	+0.9	+1.0	+1.7	+1.8	+1.5	+0.7	+1.1	+0.2	+0.4	+1.2	+0.7	+1.6	+1.6	+1.6	+1.7	+1.8	+1.8	+1.8	+1.8	+1.8
Gross fixed capital formation deflator	+1.6	+1.1	+1.6	+1.5	+1.8	+1.7	+1.7	+1.2	+1.0	+1.0	+1.0	+1.4	+1.6	+1.6	+1.6	+1.5	+1.5	+1.5	+1.5	+1.4
GDP deflator	+0.9	+0.2	+1.5	+1.7	+1.2	+1.4	+0.6	+0.3	+0.1	–0.4	+0.4	+0.6	+1.1	+1.4	+1.5	+2.0	+2.1	+1.9	+1.6	+1.3
Unit labor costs	+5.8	–0.7	+0.2	+1.9	+5.9	+10.0	+3.4	+4.0	–0.2	–4.4	+2.5	–0.3	+1.2	+0.2	–0.6	+0.0	+0.9	+1.5	+2.3	+2.9
Compensation per employee (nominal)	+0.1	+2.1	+2.3	+2.6	+2.2	–1.7	+0.2	–0.2	–1.0	+3.6	+3.1	+2.9	+3.8	+2.7	+1.3	+1.3	+2.0	+2.3	+2.8	+3.1
Productivity	–5.3	+2.7	+2.1	+0.7	–3.5	–10.6	–3.0	–4.0	–0.7	+8.3	+0.5	+3.2	+2.6	+2.5	+1.9	+1.3	+1.1	+0.8	+0.5	+0.2
Compensation per employee (real)	–0.7	+1.1	+0.6	+0.8	+0.6	–2.4	–0.8	–0.4	–1.4	+2.3	+2.3	+1.3	+2.2	+1.1	–0.4	–0.4	+0.2	+0.5	+1.0	+1.3
Import deflator	–1.7	+1.4	+1.9	+1.7	–0.6	–2.6	–1.8	–1.8	–0.5	+1.7	+1.9	+2.6	+2.2	+2.0	+1.8	+1.7	+1.7	+1.7	+1.7	+1.8
Export deflator	–0.3	+1.5	+1.7	+1.8	+0.0	–0.6	–0.3	–0.2	+0.4	+1.5	+1.8	+2.1	+1.9	+1.7	+1.7	+1.7	+1.7	+1.8	+1.8	+1.8
Terms of trade	+1.4	+0.0	–0.1	+0.0	+0.6	+2.1	+1.5	+1.6	+0.9	–0.2	–0.1	–0.5	–0.3	–0.2	–0.1	+0.0	+0.1	+0.1	+0.0	+0.0
Economic activity	*Annual and/or quarterly changes in % (real)*																			
GDP	–7.1	+3.6	+4.0	+2.2	–2.8	–11.6	+12.0	–2.9	+1.1	+1.4	+1.6	+1.3	+0.8	+0.7	+0.6	+0.6	+0.6	+0.5	+0.4	+0.3
Private consumption	–8.8	+3.9	+4.7	+2.0	–4.5	–11.2	+12.9	–4.8	+2.4	+1.4	+1.5	+1.4	+1.2	+0.9	+0.7	+0.5	+0.4	+0.4	+0.4	+0.4
Government consumption	+0.7	+1.2	+0.8	+0.9	+0.1	+0.5	+0.5	+0.3	+0.3	+0.2	+0.2	+0.3	+0.3	+0.1	+0.1	+0.1	+0.3	+0.3	+0.3	+0.3
Gross fixed capital formation	–4.1	+4.0	+4.7	+2.7	–0.2	–7.2	+7.9	–0.5	+0.6	+0.8	+1.5	+1.8	+1.3	+0.9	+0.6	+0.5	+0.7	+0.7	+0.7	+0.7
Exports	–11.8	+5.4	+5.5	+3.7	–4.2	–18.4	+16.1	–1.4	+0.1	+3.1	+2.9	+1.4	+0.8	+0.9	+0.8	+0.8	+0.7	+1.1	+1.1	+1.2
Imports	–11.0	+4.1	+5.8	+3.8	+0.1	–17.4	+12.1	–1.6	+0.9	+2.6	+2.6	+1.6	+1.3	+1.0	+0.8	+0.7	+0.7	+1.1	+1.3	+1.5
	Contribution to real GDP growth in percentage points																			
Domestic demand	–5.3	+3.2	+3.7	+1.9	–2.4	–7.3	+8.6	–2.5	+1.4	+0.9	+1.2	+1.2	+1.0	+0.7	+0.6	+0.4	+0.4	+0.4	+0.4	+0.4
Net exports	–0.9	+0.9	+0.0	+0.1	–2.5	–1.1	+2.4	+0.0	–0.4	+0.4	+0.3	–0.1	–0.2	+0.0	+0.0	+0.1	+0.1	+0.0	–0.1	–0.1
Changes in inventories	–0.8	–0.5	+0.3	+0.2	+2.1	–3.2	+1.0	–0.5	+0.1	+0.0	+0.1	+0.1	+0.0	+0.0	+0.0	+0.1	+0.0	+0.0	+0.0	+0.0
Labor market	*% of labor supply*																			
Unemployment rate (Eurostat definition)	5.3	5.6	5.1	4.8	4.5	5.5	5.5	5.8	5.8	5.7	5.6	5.5	5.3	5.2	5.1	5.0	4.9	4.9	4.8	4.7
	Annual and/or quarterly changes in %																			
Total employment	–1.9	+0.9	+1.9	+1.5	–0.4	–4.0	+3.0	–1.1	+0.2	+0.8	+0.7	+0.5	+0.5	+0.3	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4
of which: private sector	*–2.4*	*+1.0*	*+2.3*	*+1.8*	*–0.4*	*–4.9*	*+3.6*	*–1.3*	*+0.2*	*+1.0*	*+0.8*	*+0.6*	*+0.5*	*+0.4*	*+0.4*	*+0.4*	*+0.4*	*+0.4*	*+0.4*	*+0.5*
Payroll employment	–2.3	+0.7	+2.1	+1.6	–0.4	–4.5	+3.2	–1.3	+0.1	+0.9	+0.7	+0.6	+0.5	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4
Additional variables	*Annual and/or quarterly changes in % (real)*																			
Disposable household income	–3.0	+0.2	+2.3	+1.8	–7.1	–1.3	+13.4	–6.4	–1.9	+0.7	+1.1	+0.7	+0.6	+0.4	+0.1	+0.4	+0.7	+0.5	+0.4	+0.5
	% of potential output																			
Output-Gap	–7.3	–4.8	–2.3	–1.6	–3.3	–14.5	–4.3	–7.1	–6.4	–5.4	–4.2	–3.3	–2.8	–2.4	–2.1	–1.8	–1.6	–1.6	–1.6	–1.6

Source: OeNB December 2020 outlook. Quarterly values based on seasonally and working day-adjusted data.

Table 19

Comparison of current economic forecasts for Austria

	OeNB				WIFO		IHS		OECD			IMF		European Commission		
	December 2020				November 2020		October 2020		December 2020			October 2020		November 2020		
	2020	2021	2022	2023	2020	2021	2020	2021	2020	2021	2022	2020	2021	2020	2021	2022
Main results	*Annual change in %*															
GDP (real)	–7.1	+3.6	+4.0	+2.2	–7.7	+2.8	–6.7	+4.7	–8.0	+1.4	+2.3	–6.7	+4.6	–7.1	+4.1	+2.5
Private consumption (real)	–8.8	+3.9	+4.7	+2.0	–8.2	+3.4	–6.3	+5.4	–7.9	+2.9	+2.3	×	×	–7.2	+5.0	+2.5
Government consumption (real)	+0.7	+1.2	+0.8	+0.9	+1.1	+1.0	+1.0	+1.5	+1.2	+1.2	+1.2	×	×	+1.7	+1.5	+0.9
Gross fixed capital formation (real)	–4.1	+4.0	+4.7	+2.7	–6.4	+2.2	–6.7	+4.1	–7.0	+1.9	+3.2	×	×	–6.0	+3.2	+2.4
Exports (real)	–11.8	+5.4	+5.5	+3.7	–13.0	+4.7	–9.6	+6.7	–13.3	+4.0	+4.3	×	×	–11.5	+5.5	+3.8
Imports (real)	–11.0	+4.1	+5.8	+3.8	–11.5	+4.6	–7.9	+5.8	–12.7	+3.9	+4.5	×	×	–9.4	+4.8	+3.1
Labor productivity[1]	–5.3	+2.7	+2.1	+0.7	×	×	–5.2	+3.4	–5.4	+1.5	+0.8	×	×	–4.6	+2.6	+1.4
GDP deflator	+0.9	+0.2	+1.5	+1.7	+2.0	+1.4	+1.7	+1.3	+0.7	+1.1	+1.1	×	×	+2.0	+1.9	+1.6
CPI	×	×	×	×	+1.3	+1.3	+1.4	+1.6	×	×	×	×	×	×	×	×
HICP	+1.3	+1.4	+1.7	+1.7	×	×	+1.4	+1.6	+1.3	+1.3	+1.6	+1.2	+1.8	+1.5	+1.7	+1.7
Unit labor costs	+5.8	–0.7	+0.2	+1.9	×	×	+6.0	–2.5	+7.1	+5.8	+2.9	×	×	+6.0	–2.0	+0.6
Payroll employment[2]	–1.9	+0.9	+1.9	+1.5	–2.0	+0.7	–1.6	+1.3	–2.6	+0.0	+1.5	×	×	–2.5	+1.5	+1.2
	% of labor supply															
Unemployment rate (Eurostat definition)	5.3	5.6	5.1	4.8	5.5	5.6	5.4	5.3	+5.6	+5.6	+5.1	5.8	5.5	5.5	5.1	4.9
	% of nominal GDP															
Current account balance	2.4	2.4	2.3	2.4	×	×	×	×	+2.9	+3.1	+3.2	2.4	2.5	2.3	2.9	3.2
Budget balance (Maastricht definition)	–9.2	–6.3	–2.9	–1.4	–10.4	–6.2	–11.7	–6.1	–10.5	–6.7	–2.6	–9.9	–3.9	–9.6	–6.4	–3.7
External assumptions																
Oil price in USD/barrel (Brent)	41.6	44.0	45.7	46.9	×	×	41.5	47.3	+40.6	+40.0	+40.0	41.7	46.7	42.6	44.6	46.4
Short-term interest rate in %	–0.4	–0.5	–0.5	–0.5	–0.5	–0.6	–0.4	–0.5	–0.4	–0.5	–0.5	–0.4	–0.5	–0.4	–0.5	–0.6
USD/EUR exchange rate	1.14	1.18	1.18	1.18	×	×	1.14	1.19	+1.10	+1.20	+1.20	1.14	1.23	1.14	1.18	1.18
	Annual change in %															
Euro area GDP (real)	–7.3	+3.9	+4.2	+2.1	×	×	–7.4	+5.6	–7.5	+3.6	+3.3	–8.3	+5.2	–7.8	+4.2	+3.0
US GDP (real)	–3.6	+3.8	+2.2	+1.8	×	×	–4.0	+4.0	–3.7	+3.2	+3.5	–4.3	+3.1	–4.6	+3.7	+2.5
World GDP (real)	–3.5	+5.6	+3.9	+3.4	×	×	–4.0	+5.3	–4.2	+4.2	+3.7	–4.4	+5.2	–4.3	+4.6	+3.6
World trade[3]	–9.5	+7.1	+4.3	+3.6	×	×	–8.5	+5.5	–10.3	+3.9	+4.4	–10.4	+8.3	–10.2	+6.2	+4.4

Source: OeNB, WIFO, IHS, OECD, IMF, European Commission.

[1] *OeNB, WIFO: productivity per hour worked; IHS, OECD, European Commission: productivity per employee.*
[2] *WIFO: payroll employment.*
[3] *IHS: goods according to CPB; European Commission: world imports.*