

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

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

JEL classification: H53, D30

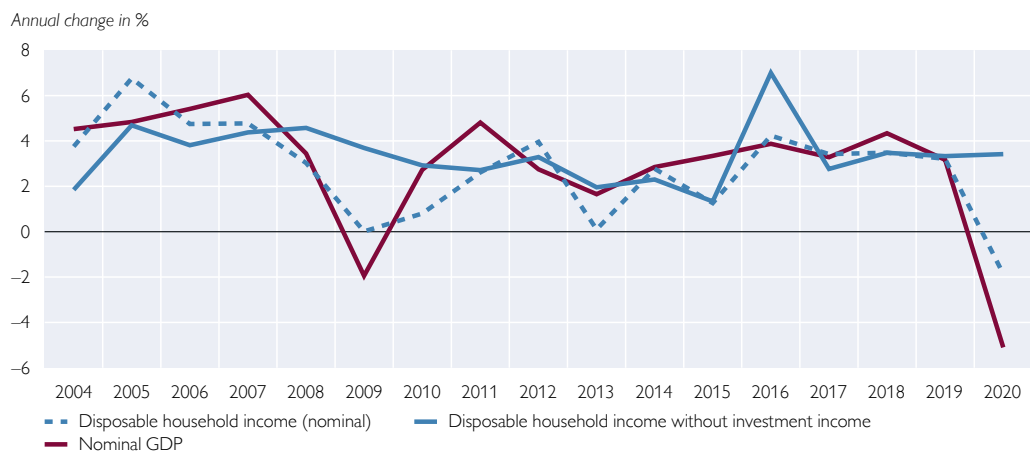
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The macroeconomic shock triggered by the lockdown measures to contain the COVID-19 pandemic caused a slump in GDP in 2020 (chart 1, dark red line).

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

Chart 1

Nominal GDP and disposable household income



Source: Statistics Austria, Eurostat.

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

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

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

The extent to which interventions to contain the pandemic restricted economic activity varied sharply across sectors. Therefore, we model the COVID-19 shock to the labor market on a sectoral basis, so that household incomes from economic activity in severely hit sectors suffered higher losses. We follow an approach broadly similar to that used by Baumgartner et al. (2020), who analyze the cyclical, fiscal and distributional effects of the measures adopted during the COVID-19 crisis, arriving at consistent results as regards the associated changes in disposable household incomes. However, while Baumgartner et al. (2020) look primarily at the distribution of support among households broken down by the latter’s income levels, we also analyze the distribution among households in relation to actual income losses they experienced. Christl et al. (2021), who also examined the impact of the COVID-19 crisis and countermeasures, find that Austria was mostly successful in avoiding an increase in the risk of poverty⁴; without government measures, this risk would have risen notably. In our study, we take into account a wider range of measures, including, in particular, measures implemented to compensate for losses in self-employed income.

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

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

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

1 Overview of the analyzed fiscal measures

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

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

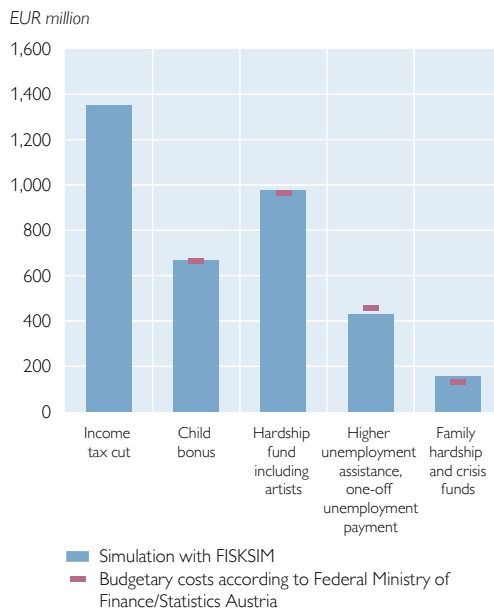
We only take into account measures that had a direct impact on households' disposable incomes.⁶ We do not include the distributional effects of subsidies for

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

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

Chart 2

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



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

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

family benefit payments and grants from the hardship fund (blue columns) and compare these amounts with actual budgetary costs (red lines).⁸ We see that the simulated values match the actual costs (to the extent that related data are available) very well.

2 Methodology⁹

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

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

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

In chart 2, we show the FISKSIM-simulated costs of the income tax cut as well as the unemployment and

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

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

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

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

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

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

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

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

The drop in earned income in the wake of the crisis is attributable to three factors: a sharp increase in the number of people on short-time work, a big rise in unemployment and a steep fall in self-employed income (to varying degrees across sectors). There was also a marked decline in capital income in 2020¹², but we do not analyze its distributional effect for the following two reasons: First, household surveys tend to very much understate capital income, which is also very unevenly distributed; both these factors make an analysis much more difficult. Second, stock markets recovered quickly after their nosedive at the beginning of the pandemic. This means that an isolated assessment of the decline in capital income in 2020 would overestimate the pandemic-related financial losses for higher-income households.

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

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

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

3 Aggregate effect of COVID-19-related fiscal measures

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

Our simulation shows that more than one-third of households in Austria experienced income losses due to the COVID-19 shock if the effect of the support measures is not factored in¹⁴ (left-hand panel of chart 3). The share of households affected by pandemic-related income losses is similar in Albacete et al. (2021; p. 121), who also analyze differences in the extent to which households were financially affected by the COVID-19 shock, which depends, inter alia, on people's work status.

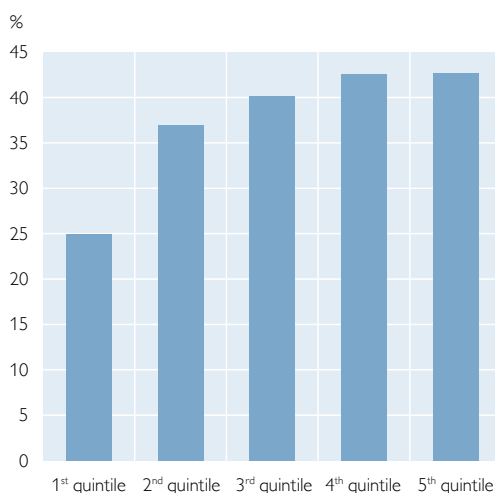
Overall, the COVID-19 shock would have reduced the average household income in the bottom quintile by around 2.1% (blue column in the right-hand panel of chart 3) if no fiscal measures had been taken. The relative drop in household income decreases slightly with rising incomes – from 1.9% in the second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

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

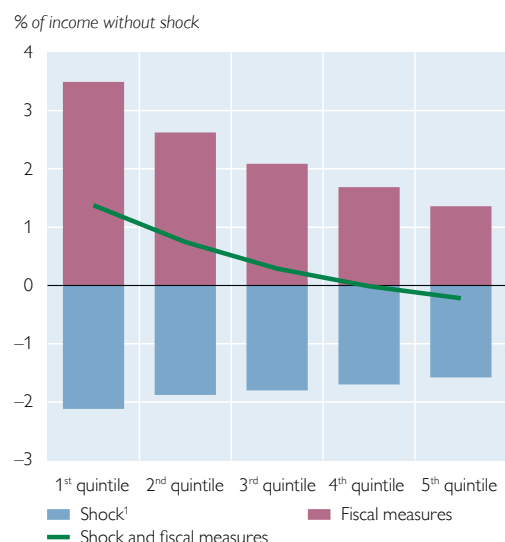
Chart 3

How did the COVID-19 shock¹ affect income distribution?

Share of households that suffered income losses because of the COVID-19 shock¹



Distributional effects of the COVID-19 shock¹ and fiscal measures



Source: Office of the Fiscal Advisory Council, OeNB.

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

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

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

Chart 4

Distributional effect of the COVID-19 crisis broken down by severity of shock impact¹



Source: Office of the Fiscal Advisory Council, OeNB.

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

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

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

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

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

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

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

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

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

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

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

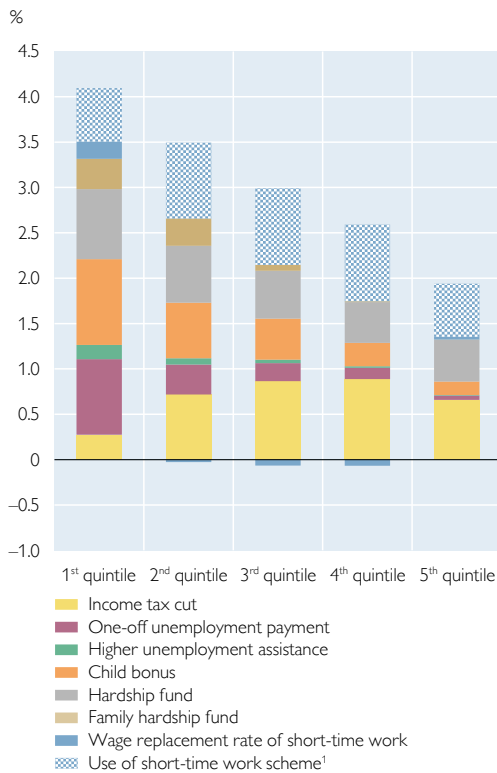
¹⁶ See also Christl et al. (2021), who arrive at very similar results regarding the effect of one-off payments for people on unemployment benefits or families in the lower part of the income distribution.

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

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

Chart 5

Distributional effect of fiscal measures broken down by instruments



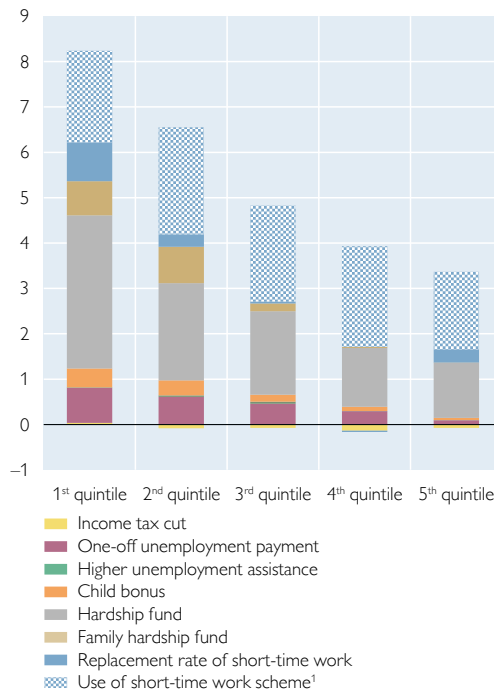
Source: Office of the Fiscal Advisory Council, OeNB.

¹ This effect is excluded in charts 3 and 4.

Chart 6

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

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



Source: Office of the Fiscal Advisory Council, OeNB.

¹ This effect is excluded in charts 3 and 4.

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

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

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

Table 1

How did individual measures affect horizontal and vertical effectiveness?

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

Source: Office of the Fiscal Advisory Council, OeNB.

Note: Relative to household income, measures benefit lower-income households and/or households more severely affected (in financial terms) by the COVID-19 shock much more (++), more (+), more or less equally (~), less (-) than higher-income households and/or households that have not been affected financially by the COVID-19 shock.

Meaning of "benefit much more. (++)" in terms of vertical equity: in percentage terms, the 1st quintile benefits at least twice as much as the overall average, and the 2nd quintile by at least 50% more than the overall average.

Meaning of "benefit much more. (++)" in terms of horizontal equity: at least in the first four quintiles, measures benefit households severely affected by the COVID-19 shock at least twice as much as the quintile average.

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

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

5 Conclusions

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

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

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

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

According to reports by the Public Employment Service Austria (AMS), around 1.2 million people in Austria received support through COVID-19 short-time work arrangements in 2020. To calculate the average reduction in working hours across ÖNACE 2008 sections of economic activities, FISKSIM uses a special AMS (2021) analysis as the basis for calibrating data from the microcensus labor force survey of the second quarter of 2020.¹⁸ In the entire economy, working hours declined by an average of 43% in 2020; the reduction was significantly higher in accommodation and food services (62%), compared with 33% and 43% in manufacturing and wholesale and retail trade. We assume the distribution of lost working hours within a section of economic activity to be normally distributed, with the mean corresponding to sector averages and the standard deviation amounting to half of the gap between averages and the permitted highest or lowest reduction of working hours (i.e. 10% and 90%).¹⁹

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

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

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

basis of their information about their employer's NACE sector²⁰. Apart from that, no other correlation between the probability of short-time work and, for instance, an employee's pay or position in the company is assumed, as no such correlation can be derived from microcensus data. The average duration of short-time work is calculated on the basis of a breakdown of AMS payments by economic activity, the number of persons on short-time work, and short-time work subsidy per person calculated on the basis of SILC data and taking into account the reduction of working hours. This yields an average duration between around two months (e.g. in manufacturing) and around four months (e.g. in accommodation and food services).

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

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

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

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

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

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

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

The decline in self-employed income was derived from quarterly national accounts data broken down by economic activity. The subsidies (which, like the data for all individual sectors, are only part of not yet published annual national accounts data) were calculated on the basis of data on the compensation for lost sales and short-time work by sector. The change in self-employed income under the 2020 shock scenario compared with 2019 is assumed to be a normal distribution with a mean²³ corresponding to the adjusted change in a sector's net operating surplus²⁴.

Annex 2: The simulation of the fiscal measures in detail

Some measures are implemented in FISKSIM through the tax and transfer systems implemented in the model, e.g. the income tax rate cut, the child bonus, one-off payments to people on unemployment benefits and the increase of unemployment assistance. In order to implement payments from the hardship fund in FISKSIM, the model limits the group of self-employed to one-person businesses, freelancers and micro businesses, relying on structural business statistics. The maximum number of businesses eligible for support within a sector is derived under the assumption that these businesses employ fewer than ten people. For the implementation in FISKSIM we use an approximation of the average income of businesses in this group. On this basis, it is assumed that applications are submitted by those self-employed in the AT-SILC data whose incomes are at similar levels²⁵ and who, taking into account income thresholds, experienced the highest income losses.²⁶ In combination with data from the monthly advance VAT returns and PRODCOM statistics on monthly sales, these data yield the number of self-employed eligible for support as well as the number of applications.²⁷ This is a crude approximation of

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

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

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

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

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

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

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