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Evidence from firm-level data

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Efficiency and effectiveness of the COVID-19 government support: Evidence from firm-level data

Tibor Lalinsky[1] and Rozália Pál[2]

Abstract

We utilize several unique firm-level datasets in order to assess the efficiency and effectiveness of the government support aiming to curb the economic consequences of the coronavirus (COVID-19) pandemic. The results, drawing on the experience of a small open European country (Slovakia), suggest the distributed COVID-19 subsidies save non-negligible number of jobs and sustain economic activity during the first wave of the pandemic. General distribution rules designed on the fly may bring close to optimal results, as relatively more productive, privately owned, foreign-demand oriented firms are prioritized and firms with a higher environmental footprint or zombie firms record a relatively lower chance of obtaining government funding. By assuming constant cost elasticities to sales, we show that the pandemic deteriorates strongly firm profits and increases significantly the share of illiquid and insolvent firms. Government wage subsidies somewhat mitigate firm losses and have statistically significant effect, but relatively mild compared to the size of the economic shock. Our estimates also confirm that larger firms, receiving smaller relative size of the support, have more space to cover their additional liquidity needs by increasing trade liabilities or liabilities to affiliated entities, while SMEs face higher risk of insolvencies.

Keywords: coronavirus, COVID-19, firm-level, policy measures, wage subsidies, profit, liquidity, solvency

JEL: D22, H20, G32, G33, J38

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1. Introduction

The spread of the coronavirus COVID-19 led to a steep decline in economic activity across the world. Unprecedented measures to contain the epidemic, including lockdowns, resulted in temporary closures of many businesses, especially those that provide in-person services. While widespread restrictions on travel and mobility, together with an erosion of confidence and increased overall uncertainty, led to loss of revenue in most industries.

As summarized by Baldwin and Weder di Mauro (2020a) we can recognize three types of economic shock from COVID-19: medical shocks, economic impacts of containment measures and expectation shocks. According to Gourinchas (2020) the economy was facing a 'flatten the curve' problem and without proper macroeconomic support we would face a sharper and more intense economic downturn associated with larger losses.

The outlook of massive and permanent cuts in employment and investments motivated governments to introduce extensive measures that would help businesses survive the pandemic without unnecessary layoffs or bankruptcies, and avoid a greater economic decline. Governments and financial and monetary authorities across the world took action and introduced various fiscal, monetary or financial policy measures. A standard list of policy responses ranges from tax deferrals and public guarantees to direct grants.[3]

The speed and the scale of the economic shock associated with the new coronavirus called for immediate action. Preliminary analyses (e.g. Schivardi and Romano 2020) showed that firms, especially the ones operating in the most affected sectors with no or limited revenues, could relatively quickly suffer from insufficient liquidity. Therefore, there was strong pressure to introduce unique economic measures without in-depth ex ante impact analyses.

Many relevant questions arise. Did the firms in need receive the support? Which firms have been supported? Was the support sufficiently efficient and effective? What macroeconomic implications of the support can we expect?

We consider the selection of firms to receive subsidies with respect to various firm characteristics. We find that more productive firms with a higher share of labour cost and ex-ante experience in dealing with the state received support with higher probability. Financially less disciplined, distressed and zombie firms had a lower chance of being supported during the pandemic in Slovakia. And firms having adverse environmental impacts were also less likely to receive support. Last but not least, our findings suggest that the rules implemented directed the support quite efficiently to firms from sectors in need, subdued their illiquidity or insolvency and saved a non-negligible number of jobs in the economy.

In the few months that the world has known Covid-19, there has been an unprecedented volume of papers published related to this disease (Teixeira da Silva et al. 2020), and this holds not only for the fields of medicine, immunology and microbiology, biochemistry, genetics and molecular

[3] Several lists of policy responses related to COVID-19 have emerged. For example, COVID-19 policy measures from the European Systemic Risk Board (ESRB 2020) provides information on the policy measures taken by Member States, EU institutions and national authorities. In parallel, IMF (2020a), IMF (2020b) and OECD (2020) compile similar information for larger number of countries.

biology, but also for social sciences (Haghani and Bliemer 2020). Brodeur et al. (2020) bring one of the first surveys on available literature, focusing not only on containment measures, but also policy reactions.

Our study connects with a number of important research works on the firm-level Covid-19 impact. Gourinchas et. al. (2020) estimates the impact of the crisis on business failures among European SMEs using a cost minimising theoretical framework. Maurin and Pal (2020) use sector-specific sales-cost elasticity to measure the impact of crisis on firms' revenue and its effect on investments-debt trade-offs. Demmou et. al. (2020) and Demmou et. al. (2021) investigates the likelihood of corporate insolvency derived from the drop in equity buffers and increase in their leverage ratio. We follow similar methodology to measure the sales shock on firm's revenues and risk of insolvencies. Additionally, we are the first, according to our knowledge, to utilize several public and confidential firm-level datasets of COVID-19 government support. This allows us to identify and analyse the characteristics of firms that received the support and to compare the level of shock with the government support for each firm. For this, we employ a fairly exhaustive sample of non-financial firms from Slovakia – a small, open and pro-export-oriented economy significantly hit by the coronavirus crisis.

To some extent, our approach is related to studies analysing distributions and outcomes of other public subsidies to the non-financial private sector. Given the nature of the COVID-19 pandemic, incentives and characteristics of firms that apply for, and eventually receive, support may differ from those who apply for and receive government grants intended to stimulate innovation and growth.

We focus on wage subsidies – the most frequently used group of measures according to the OECD (2020). Following Céspedes (2020) these measures, in contrast to standard fiscal ones, can help to maintain employment and productivity.

Wage subsidies are not a novel policy measure and they can take different forms.[4] For example, Hujer et al. (2009) study the effect of wage subsidies on labour demand in Germany, where they have historical experience with various employment subsidies.[5] Experiences from other countries are among others described in Huttunen et al. (2013) or Gamberoni et al. 2016. All three studies focus on the impact of the policies on employment and find no impact on the employment level of the treatment group or only a short-term increase.[6] However, we do not go that far and do not try to estimate the effect of the subsidies on employment at the firm level. This kind of evaluation requires some time delay. At the time of preparation of this study, the COVID-19 support is still active and firm performance indicators unavailable. Therefore, we can only focus on the distribution of the support and cannot say much on its effect yet.

More details on our data originating from various firm-level datasets are available in the next section (Section 2). The following section (Section 3) describes the methodology. Our analysis

[4] Wage and hiring subsidy programmes have been part of the toolbox of Active Labour Market Programmes (ALMPs) for more than 30 years (Bördős et al. 2015). More recently, they were introduced as a means of fighting youth unemployment and are found to be more efficient if well targeted, e.g. at disadvantaged groups.

[5] But they are certainly not just a one country or one continent related topic. Phelps (1994) discusses different alternatives and their broader impact more than two decades ago.

[6] The observations from the first wave of the COVID-19 pandemic confirm at least the short-term effect. Botelho et al. (2020), drawing on the comparison with the US employment developments, state that the widespread use of short-time work schemes in the euro area is one of the key factors behind the overall muted immediate response of the labour market to the COVID-19 crisis.

builds on the logistic regressions comparing firms that received government support with firms that did not receive the support. Section 4 gives an overview of the measures introduced to curb the economic consequences of the COVID-19 pandemic in Slovakia and discusses key macroeconomic implications of the COVID-19 government support. Section 5 represents a structured presentation of our results related to the distribution of the support, not excluding highly relevant consequences for the green economy or prevalence of zombie firms. Section 6 continues with the analyses of the efficiency of the support and its consequences for firm profits, liquidity and solvency. The last section concludes our study.

2. Data

Our analysis builds on the early availability of a detailed list of recipients receiving government financial support for firms experiencing difficulties caused by the COVID-19 pandemic. The list has been made available by Transparency International Slovakia (TIS 2020), based on the Freedom of Information Act and has been updated on a monthly basis. It reveals information on the recipients and allocated support by priorities.[7] We focus on the period from March to June, i.e. the period during which the pandemic hit the economy the most.[8]

In order to thoroughly decompose the government financial help, we merge the list of supported firms with several publicly available, but also some confidential, micro-level datasets.

The commercial register provides information on main firm characteristics like sector, region, ownership or employment-based size-group information. The date of each firm's establishment allows us to calculate the age of each firm.[9]

Financial indicators originate from the Bisnode dataset. The dataset represents a key source for firm-level balance sheet and income statement information, offering satisfactory coverage in terms of medium and small firms, which is not the case of other available micro-level datasets. In addition to the original balance sheet or income statement items that allow us to derive various profitability, productivity, efficiency or debt indicators, the dataset contains other important auxiliary indicators. For example, we employ the information on defaulters, i.e. firms that do not fulfil their financial commitments to the state in terms of taxes or social security.

So that we can study differences in the trade or debt characteristics of the recipients, we employ also confidential firm-level customs and bank credit registers. It allows us to distinguish between domestically oriented firms, exporters, importers or two-way traders and study the scale of indebtedness of the firms supported by the government.

In order to study the role of state-firm relationships in allocation of the funds we merge the above-mentioned datasets with the Register of partners of the public sector. The register records all firms that either actively take part in public procurement of goods or services or plan to do so.

Firm profits, liquidity and solvency during the pandemic are modelled using actual monthly sectoral sales and short-term cost elasticities to sales. The sales data originates from Eurostat and sales in manufacturing subindustries, unavailable in Eurostat, are supplemented from the

[7] See Section 4.1 for the priorities and overall allocations.
[8] The strongest impact was recorded in April. In June revenues in most of the sectors returned close to the pre-crisis levels. See Figure D1 and D2 in the Appendix D.
[9] See Appendix A1 for the detailed description of all variables.

Statistical office of the Slovak Republic. As documented in Table B1 in Appendix B, all but two industries experienced decline in sales in the analysed period from March to June. The largest drop in sales was recorded in manufacturing of transport equipment. Sales in manufacturing of pharmaceuticals or chemicals increased in that particular period.

The Slovak economy is one of the most concentrated in the European Union and heavily relying on manufacturing. Based on the Eurostat Structural business statistics manufacturing of transport equipment created 9% of the overall business sector value added – the largest share among EU countries – in 2018. This makes the Slovak economy more vulnerable to shocks to production and international trade.

Table 1 Summary statistics for baseline variables

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Labour productivity	69141	28682.75	64362.41	5	5375835
Return on equity	69141	0.3407	0.4680	0.0001	4.4983
High indebtedness (dummy)	69141	0.7331	0.4424	0	1
High labour share (dummy)	69141	0.5047	0.5000	0	1
Firm age	69141	11.8680	7.0112	2	71
Exporter (dummy)	69141	0.1767	0.3814	0	1
Public ownership (dummy)	69141	0.0055	0.0737	0	1
Environmental impact	67120	3.8867	9.5294	0.28	172.21
Public sector supplier (dummy)	69141	0.0696	0.2545	0	1
Zombie (dummy)	24253	0.0545	0.2269	0	1

Note: Post-estimation summary statistics. Original values of continuous variables presented. See Appendix A for description of variables.

Source: Authors' calculations based on firm-level datasets.

3. Methodology

We are the first to bring an in-depth empirical analysis of COVID-19 related wage subsidies and their consequences for financial situation of firms using actual firm level data. The database of government support made available by Transparency International Slovakia, combined with other unique datasets, allows us to go deep into the details of the distribution of subsidies allocated to firms affected by the economic consequences of the coronavirus.

The aim of this paper is to investigate which firms have received direct COVID-19 government support, what was the size of the support and assess the consequences for profits, risk of illiquidity and insolvency.

In the first step, we consider the role of various firm characteristics for receiving government support. The unit of analysis is the receipt of employment subsidy at the firm level.

In the baseline estimation strategy, we estimate the effect of independent variables on the probability of the firm receiving the grant using logit regression. The dependent variable in these regressions takes the value of 1 if the firm receives direct support and 0 otherwise. We take into account several financial and non-financial explanatory firm-level variables and control for the firm's size, sector and location.

The explanatory variables cover all aspects of the firm characteristics and can be allocated to relatively independent groups. We name them efficiency, performance, indebtedness, responsibility, structure, trade openness, ownership, environmental impact, zombie and connection with the state. In the numerous robustness estimates, we then compare the significance of all variables within the groups. The list of the variables with detailed descriptions is available in Appendix A1. Some of them take the form of continuous independent variables and some take the form of categorical independent variables.

Our empirical analysis is based on the standard logistic regression, where Y_t is regressed on a vector of explanatory variables X_{t-n}:

$$\Pr(Y_t = 1|X_{t-n}) = \frac{1}{1+\exp(-X_{t-n}\beta)} \qquad (1)$$

where $\Pr(Y_t=1|X_{t-n})$ denotes the probability of receiving support for a given firm in period *t* given X_{t-n} , where X_{t-n} is a row vector of explanatory variables and β is the corresponding column vector of regression coefficients.

The vector X_{t-n} contains main control variables (sector, size and region), continuous explanatory variables (e.g. labour productivity or return on equity) and binary explanatory variables (e.g. for high indebtedness or high labour share). Continuous explanatory variables enter the model in logarithm. n takes values of 1 or 2, i.e. the probability of a firm receiving government support in year 2020 depends on the firm's characteristics from year 2019 or 2018.

In the next step, we continue to shed more light on the government support distribution and its efficiency in relation to the pandemic's firm profits, liquidity and solvency. First, by employing the actual sectoral evolution of sales during the first wave of the pandemic (from March to June 2020) and applying industry specific cost elasticities to sales we estimate firm-level profits. Then we consider historical firm-level values of cash holdings, equity or various types of current liabilities to identify firm illiquidity or insolvency.

The pandemic firm-level $Sales_{ist}$ are derived from the pre-pandemic firm $Sales_{ist-1}$ and annual index of sectoral turnover I_{st} recorded during the pandemic following the relationship

$$Sales_{ist} = I_{st} \,.\, Sales_{ist-1} \qquad (2)$$

where *i* stands for individual firm, *s* for industry , *t* for pandemic period and *t-1* for pre-pandemic period.

Assuming the following relationship between total firm sales $Sales_i$ and total firm costs $Costs_i$

$$\Delta Costs_i = \alpha_s \,.\, \Delta Sales_i \text{ with } 0 < \alpha_s < 1 \qquad (3)$$

we estimate sectoral cost elasticities α_s, that allow us to quantify pandemic changes in costs associated with pandemic changes in sales. Following Maurin and Pal (2020), we employ the ORBIS- Bureau Van Dijk dataset of non-financial corporation located in the EU. We estimate the sectoral short-term elasticities of costs to sales using data from 17 EU countries (almost 13 million firms from all available sectors) over the years 2014-2017. The elasticities range between 0.36 (Real estate activities) to 0.61 (Manufacture of basic metals), reflecting different composition of firm costs across industries.[10]

By applying the basic formula

[10] See Table B1 in Appendix B.

$$Profit_i = Sales_i - Costs_i \qquad (4)$$

we estimate pandemic firm-level profits.[11] A firm is then considered to be illiquid if

$$Profit_i + Cash_i < 0 \text{ and } Profit_i < 0 \qquad (5)$$

i.e. when it does not have a sufficient amount of cash and cash equivalents to cover its loss.

And it is considered to be insolvent when

$$Profit_i + Equity_i < 0 \text{ and } Profit_i < 0 \qquad (6)$$

i.e. when its loss exceeds equity.

In the regression analysis we then utilize information on firm's liquidity or solvency together with the firm-level data on the pandemic governmental wage support. We apply the same logit regression approach as in (1), but $Pr(Y_t=1|X_{t-n})$ denotes the probability of a firm being illiquid (or insolvent) in period *t* given X_{t-n} , where X_{t-n} is a row vector of explanatory variables including binary dummy variables indicating whether the firm received or not the wage support and standard control variables (sector, size, age and region).

4. COVID-19 support for business

The spread of the new coronavirus led to an unprecedented boost in policy measures at all levels. Vast health protection orders were soon followed by economic policy measures safeguarding economies all around the globe.

Although the economic measures related to COVID-19 vary across countries in term of their strength, breadth and scope, the lists of implemented policies recorded by the IMF (2020), the OECD (2020) or other institutions show that both preventive actions and acute treatments are broad-spectrum, employing fiscal, monetary and financial policy measures.[12]

Utilizing the IMF policy tracker IMF (2020a), Elgin et al. (2020) develop a COVID-19 Economic Stimulus Index. They correlate the standardized index with predictors of government response, such as population characteristics, public health related and economic variables and they come to the conclusion that the economic stimulus is more pronounced for countries with more COVID-19 cases, a higher median age, lower number of hospital beds per-capita and higher GPD per capita. In addition, Elgin et al. (2020) develop a Stringency Index covering measures such as school closures and travel restrictions. And they find that the Stringency Index does not predict the level of economic responses. At the same time, Deb et al. (2020) find that while workplace closures and stay-at-home orders are more effective in curbing infections, they are associated with the largest economic costs.

Céspedes et al. (2020) suggest an economic model with two essential components. First, the coronavirus forces firms to shed labour beyond a certain threshold, and productivity suffers. Then, expected productivity determines collateral value; in turn, collateral value can limit borrowing and productivity. As a result, adverse shocks have large magnification effects, in an

[11] To be more specific, as documented later, we focus on the 1st wave of the pandemic in Slovakia, i.e. we consider only 4-month profits ($Profit_i/3 = (Sales_i - Costs_i)/3$).

[12] Virus containment measures are gathered e.g. by CoronaNet that develops the COVID-19 Government Response Database, which accounts for policy announcements made by countries across the world, see Cheng et al. (2020) for details.

unemployment and asset price deflation doom loop. The authors conclude that traditional expansionary fiscal policy has no beneficial effects, only several unconventional policies can help. Wage subsidies, helicopter drops of liquid assets, equity injections, and loan guarantees can keep the economy in a full-employment, high-productivity equilibrium.

The exact classification of all policy measures targeting businesses differs across institutions. Following the OECD (2020) we can distinguish four groups of measure: labour, deferral, financial instruments and structural policies. In general, the first group covers all initiatives to avoid layoffs, keep employment stable or promote job creation. The second group includes deferrals of taxes, tariffs or social contributions. The third group refers to financial support in terms of either direct financing, loans or guarantees. The last group covers the remaining more structural or targeted support (e.g. support of market expansion, innovation or training).

A cross-country comparison of the measures implemented in OECD and EU countries (OECD 2020) shows that employment subsidies together with income tax deferrals and loan guarantees represent the most widely used measures.

The fiscal policy reaction to the coronavirus emergency has been quick and powerful at the global level. Governments have taken a wide range of measures to support individuals and firms. But there is also a large variability among countries in the size and composition of fiscal packages. Emerging economies' responses have been much more limited. Probably, the most relevant factor is their limited fiscal space, which has been further constrained by the tightening of their financing conditions due to the pandemic shock (Alberola et al. 2020).

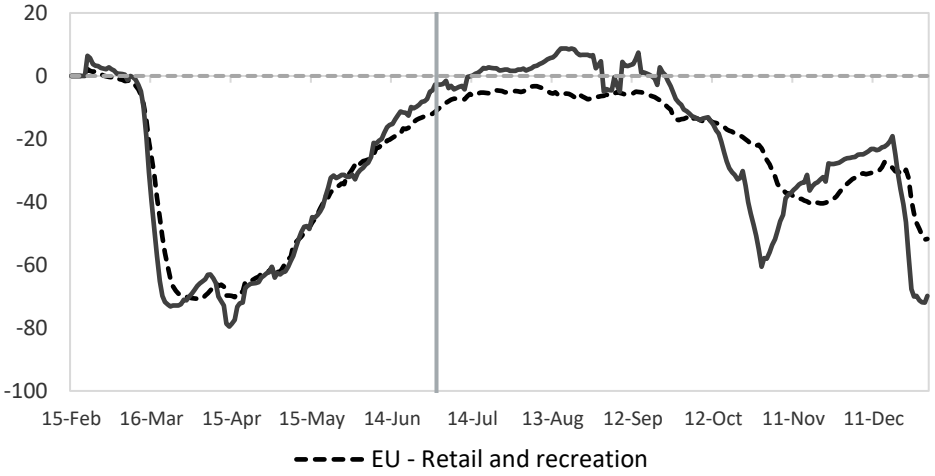
The estimates of the size of stimulus vary depending on the source, its scope and date of publication (see e.g. Alberola et al. 2020, Anderson et al. 2020,), available data indicates that the size of the overall stimulus and fiscal measures introduced in Slovakia is significantly smaller than in the most advanced G20 countries.[13]

In response to the COVID-19 pandemic, Slovakia introduced strict containment measures and introduced them very quickly. The successful suppression of the pandemic during its first wave has been recognized by the media.[14]

Google mobility index showing how visits and length of stay at different places change compared to a baseline confirms somewhat stronger impact of the measures taken in Slovakia during the first wave of the pandemic, especially focusing at the trough of the mobility. At the same, it indicates faster recovery in Slovakia compared to the EU average at the end of the analysed period from March to June (marked by the vertical line), that could probably be associated with low COVID-19 incidence recorded during the first wave of the pandemic.

[13] Based on IMF (2020b) the fiscal response in form of additional spending and forgone revenue in areas other than health, which includes wage support, in Japan, USA and Germany reaches between 9.8% GDP to 14.4% GDP and only 3.7% GDP in Slovakia.
[14] For example, Bloomberg (2020) or Financial Times (2020).

Figure 1 Google Mobility index



Note: Changes for each day are compared to a baseline value for that day of the week. The baseline is the median value, for the corresponding day of the week, during the 5-week period during the 3rd of Jan to the 6th of Feb 2020. Presented retail and recreation group includes visits to restaurants, cafes, shopping centres, theme parks, museums, libraries, and movie theatres. The vertical line marks 31 June 2020, the end of the period analysed in the paper.
Source: Authors' calculations based on Covid-19 Google Mobility Report.

Stringent containment measures took their toll and together with international trade disruption severely hit the small, open and pro-export-oriented economy. Despite a surprisingly moderate decline in private consumption, in the second quarter of 2020 Slovakia recorded above median quarterly real GDP decline in the European Union (Figure D1 in Appendix D).[15]

Observed and foreseen negative economic developments triggered the introduction of a long list of measures to mitigate the economic impact of the coronavirus. The measures ranged from relaxing labour code requirements or deferral of payments, to direct financial support. Firms could decide to delay their payments of payroll and corporate tax, or opt for deferral and waiver of employers' health insurance and social security contributions without any financial consequences. Another kind of measure included easing of the administrative burden on businesses and temporary relaxation of certain labour code requirements. Last but not least, the Government introduced COVID-19 related rental subsidies, wage compensation and loan guarantees.

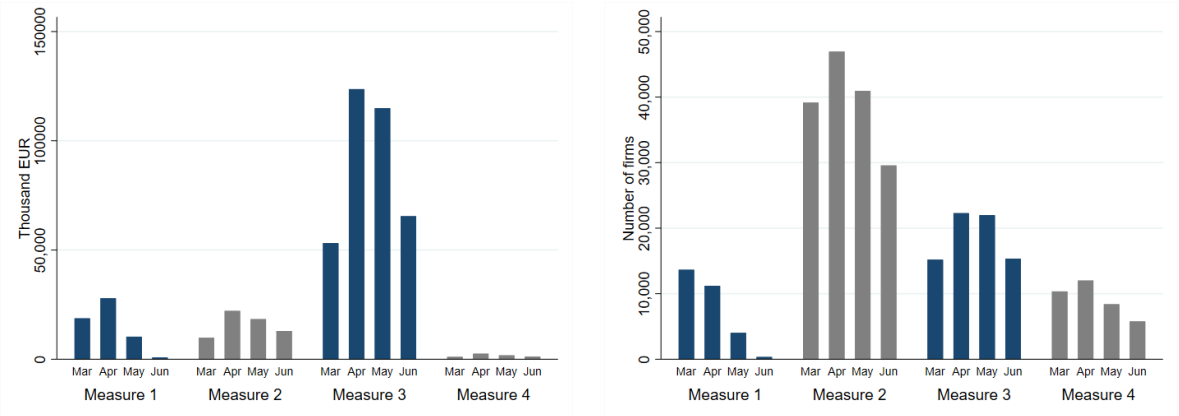
The most extensive set of direct financial support was introduced within the so called First Aid package[16] that covers measures targeted at employers and self-employed. In our analysis, we focus on the temporary (short-term) work instrument designed for employers.[17] It means we utilize data on support allocated, based on two out of four measures (Measure 1 and Measure 3) within the First Aid package.

[15] Following NBS (2020) the decline in household final consumption was the most moderate in any European country. These developments can be at least partly explained on the one hand by a relatively high share of housing or food and on the other hand a relatively low share of hotel or restaurants services in the Slovak consumer basket. Following Yilmazkuday (2020), we may hypothesize that the effect of consuming-at-home was stronger (and to a larger extent compensated the drop in consumption of goods and services that cannot be consumed at home) in Slovakia than in other European countries.
[16] See Appendix for details.
[17] Some countries already had policies in place that could be reused during the COVID-19 pandemic. However, there was no „kurzarbeit"or furlough scheme implemented in Slovakia prior to the corona crisis.

Measure 1 was introduced for firms that halted their operations on the order of the Slovak health authority. The employers could apply for financial support of up to 80 percent of the average wages of its employees. Measure 3 was designed for companies that decided to interrupt their operations to protect the health of their employees and clients, or due to decreased demand or sales. Measure 1 was relevant mainly for restaurants and shops, or other businesses which had to be closed during lockdown. Measure 3 pertains, for example, to carmakers and other producers, which halted their operations based on their own decision.

In Figure 1 we can see that most of the resources were allocated to measure 3 in the form of wage subsidies to firms that experienced significant declines in revenue. On the contrary, the largest number of subjects was satisfied within measure 2, that together with measure 4 targeted self-employed individuals who lost part of their income or had no income.

Figure 2 Distribution of the direct subsidies



Note: Employment subsidies from March to June 2020. Measures considered highlighted by blue colour. Measure 1 – for employers obliged to limit their activity, Measure 2 – for self-employed individuals obliged to limit their activity, Measure 3 - for employers experiencing decline in activity, Measure 4 – for self-employed individuals without income. See Appendix C for more details on the measures.
Source: Authors' calculations based on TIS.

The large share of self-employed individuals in the overall number of supported entities is in line with the organizational structure of the economy.[18] We exclude self-employed individuals from our analysis due to lack of information, especially insufficient coverage of financial variables originating from balance sheet and income statements.

Although we do not study implemented tax deferrals or measures to lower the overall administrative burden, it is important to mention that the standard March deadline to file tax returns and obligations to pay corporate or income taxes for the previous calendar year was postponed to the end of October 2020. The option to postpone the submission applied automatically, with no need to notify the tax authorities. This measure had a certain fiscal impact, but it also influenced firm-level data availability, because firms postponed the submission of balance sheets and income statements that represent a key data source for calculation of financial indicators.[19]

[18] In the second quarter of 2020, there were 344 thousand active self-employed individuals and 247 thousand active firms in Slovakia.
[19] At the time of preparation of this analysis, financial indicators for approximately 20 % of firms were still unavailable. Therefore, whenever appropriate, we report results based on both 2018 and 2019 calendar year data.

The Slovak government support scheme targeted relatively large group of subjects, when almost one quarter of firms received some amount of wage subsidy.[20] The share of firms receiving COVID-19 related subsidies varies across firm size classes and industries. At the aggregate level the proportion of supported firms increases with firm size, reflecting the smaller population in higher size classes.[21] Firm frequency (and size) then translates into differences in shares of supported firms across industries, that ranges between 6% to 50%. Top 5 most supported industries (in terms of relative number of supported firms) include Manufacturing of transport equipment, Accommodation and food services, Art and recreation, Manufacturing of machinery and Other manufacturing.

Table 2 Share of firms receiving wage subsidies in Slovakia (in %)

	Micro	Small	Medium	Large	All sizes
Agriculture	10.8	14.0	15.7	100.0	10.0
Mining	13.2	28.9	46.2	66.7	20.7
Food manufacturing	24.2	38.4	23.2	30.4	26.3
Textiles	23.3	40.7	42.4	65.0	28.4
Wood	18.8	44.2	44.1	50.0	21.6
Coke and petroleum	0.0	100.0	50.0	0.0	14.3
Chemicals	21.2	28.9	34.6	33.3	20.7
Pharmaceuticals	11.1	37.5	0.0	0.0	15.4
Rubber and plastic	16.5	41.3	60.0	66.7	28.7
Basic metal	19.7	43.3	62.2	77.4	26.8
Manuf. of computer electronics	21.7	43.1	56.7	61.5	26.5
Manuf. of electrical equipment	22.2	47.9	43.2	40.0	28.8
Machinery	19.8	53.4	58.2	69.2	35.0
Transport equipment	16.5	43.6	82.3	88.9	50.2
Other manufacturing	26.6	43.2	56.2	63.2	30.3
Electricity and gas	7.4	15.0	17.4	25.0	10.0
Water	19.3	20.0	31.7	25.0	19.6
Construction	16.1	27.8	43.1	41.2	17.0
Trade	23.7	47.3	51.7	32.6	25.7
Transportation	18.1	42.1	57.5	69.8	20.7
Accommodation and food services	35.3	69.7	84.8	33.3	41.3
Publishing	19.0	38.9	36.4	50.0	18.7
Telecommunication	7.0	15.4	0.0	0.0	6.0
IT	12.2	31.8	29.8	0.0	12.6
Real estate	15.2	37.0	50.9	0.0	15.9
Legal and accounting	15.8	40.3	25.5	23.5	16.5
R&D	12.0	21.9	20.0	0.0	11.3
Other professional services	19.8	37.0	50.0	25.0	20.1
Health	24.3	63.3	54.4	27.8	26.0
Art and recreation	32.3	59.6	70.6	88.9	33.3
All industries	20.3	41.5	48.5	51.1	22.3

Note: with respect to all firms in the given cell, only firms with available information on size and industry.

[20] Following the official data of the Statistical office of the Slovak Republic, at the end of the year 2020 there were 127 344 active firms with available information on the number of employees in Slovakia. While analyzing employment subsidies we exclude approximately 6 thousand firms with no employees from our analysis.

[21] Micro firms represent 85% and large firms only 0,6% of all firms active in Slovakia. See Table G1 Composition of firms by size and industry in Slovakia in Appendix G for more details.

Median size of the government support, based on all supported firms, covered around 5% of firm labour costs. In contrast to the proportion of supported firms, the size of the subsidy (with respect to total firm-level labour costs or assets) decreases with firm size. As documented in the table below, the Art and recreation and Accommodation and food services, i.e. the two industries most hardly hit by COVID-19 lockdowns, enjoyed the highest relative support. An alternative approach using total assets as denominator leads to similar conclusions.[22]

Table 3 Relative firm-level support (median, % of labour costs)

	Micro	Small	Medium	Large	All sizes
Agriculture	7.03	2.68	2.29	1.67	4.75
Mining	6.14	2.26	2.62	1.15	2.89
Food manufacturing	7.47	3.91	2.30	0.78	5.09
Textiles	7.28	4.81	4.06	3.12	5.51
Wood	7.27	3.63	2.19	1.02	5.54
Coke and petroleum	0.00	10.05	0.63	0.00	5.34
Chemicals	4.35	4.33	1.44	2.31	4.06
Pharmaceuticals	4.08	0.77	0.00	0.00	1.79
Rubber and plastic	5.73	3.88	3.27	3.59	4.01
Basic metal	6.17	3.32	2.81	2.33	4.04
Manuf. of computer electronics	7.37	3.23	1.85	3.20	4.51
Manuf. of electrical equipment	5.82	3.96	2.68	2.12	3.68
Machinery	4.78	3.45	2.69	2.08	3.26
Transport equipment	10.71	3.07	4.46	4.40	4.40
Other manufacturing	6.58	3.50	2.36	3.83	5.10
Electricity and gas	1.77	1.27	1.53	0.08	1.34
Water	4.24	2.60	1.66	0.83	3.80
Construction	6.91	4.05	2.93	1.97	6.02
Trade	5.21	3.29	2.75	3.29	4.60
Transportation	6.08	3.89	2.07	2.74	4.81
Accommodation and food services	7.98	7.03	5.17	5.16	7.51
Publishing	7.77	2.43	2.73	1.71	7.00
Telecommunication	5.11	1.58	0.00	0.00	2.16
IT	6.18	2.67	1.42	0.00	5.17
Real estate	7.10	3.92	2.07	0.00	6.49
Legal and accounting	5.97	3.07	2.48	6.05	5.51
R&D	5.86	3.58	3.68	0.00	4.66
Other professional services	6.84	4.38	2.84	4.97	6.30
Health	3.40	2.45	1.66	6.36	3.25
Art and recreation	9.32	5.41	6.21	3.51	7.95
All industries	6.04	3.82	2.80	2.97	5.02

Information on the number of grants or firms per sector does not necessarily inform us regarding the scale and overall impact of the government support. We need to investigate the amount of resources allocated. Following Figure 3, we can see that the sum of wage subsidies increases with the size of the sector with respect to valued added and employment recorded in the sector. This suggests that the support could potentially have not only a firm-level, but also an aggregate impact. By supporting firms and sectors with higher contribution to the overall value added or employment and by distribution of higher relative subsidies to these firms and sectors we potentially safeguard larger part of the aggregate country value added or employment.

[22] See Table G2 Relative firm-level support (median, % of total assets) in Appendix G.

Figure 3 Cross-sectoral division of the financial resources

Note: The left-hand figure presents the number of persons employed versus sum of wage subsidies. The right-hand figure presents sectoral value added versus sum of wage subsidies. The data originates from the most recent available Structural business statistics dataset referring to values for year 2018. Sectors displayed: B - Mining, CA - Food manufacturing, CB - Textiles, CC - Wood, CD - Coke and petroleum, CE - Chemicals, CF - Pharmaceuticals, CG - Rubber and plastic, CH - Basic metal, CI - Manuf. of computer electronics, CJ - Manuf. of electrical equipment, CK - Machinery, CL - Transport equipment, CM - Other manufacturing, D - Electricity and gas, E - Water, F - Construction, G - Trade, H - Transportation, I - Accommodation and food services, JA - Publishing, JB - Telecommunication, JC - IT, L - Real estate, MA - Legal and accounting services, MB - R&D, MS - Other professional services.
Source: Eurostat, TIS and authors' calculations.

For the assessment of the overall effect we may take a closer look at the supported firms in terms of their population, employment or value added. Although supported firms represent about 22% of all firms, they employ more than 30% of all private sector employees and create more than 40% of revenue or value added. This suggests a potentially high impact on the aggregate developments.

An additional information on the differences in employment and value added developments across size classes indicates that the COVID-19 government subsidies could potentially save a relatively significant number of jobs. Aggregate statistics show moderation of employment growth at the beginning of 2020 largely driven by long-term employment restructuring in large firms. However, COVID-19 triggered layoffs across all main size classes (in the second quarter of 2020). In contrast to previous periods, a higher reduction of employment in relative terms was recorded in smaller size classes. The high proportion of supported firms among the large firms indicates that the government policy measures could save a significant number of jobs. If we assume that supported firms postponed their layoffs, government support could save at least one percent of jobs in the second quarter of 2020.

Table 4 Aggregate developments and government support

	Aggregate changes (%)[1]			Share of supported firms on		
Size (employees)	2019 / 2018	Q1.2020 / Q4.2019	Q2.2020 / Q1.2020	Employment (%)	Revenue (%)	Value added (%)
0-49	1.5	0.2	-2.6	0.27	0.33	0.34
50-249	2.9	0.6	-1.5	0.35	0.53	0.50
250+	-0.6	-0.3	-1.4	0.38	0.62	0.61
Total	1.0	0.1	-1.9	0.33	0.45	0.47

Source: Statistical Office, TIS and authors' calculations.

In addition, the significant share of overall revenue and value added produced in the supported firms in year 2019 suggests that the implemented wage subsidies also contributed to a lower decline in GDP recorded in the second quarter of 2020.

5. Firm-level probability of receiving support

5.1 Baseline results

The baseline estimation results for the logit model describing the probability of receiving employment support (defined in Section 3) are presented in Table 5. We show average marginal effects that tell us how our dependent variable changes when a specific explanatory variable changes, while other covariates are assumed to be held constant at their mean values. More information on the output and a robustness analysis are available in Appendix E.

Our results show that more productive firms have higher probability of receiving COVID-19 government support regardless of the inclusion of alternative explanatory variables and the effect is relatively large, when a one percent increase in labour productivity leads to a roughly two percent rise in the probability of receiving the grant.[23] The result for the Slovak firms partially contradicts a potential doubt that the quickly designed rules for distribution of the funds could lead to higher allocation to less efficient firms. However, more analysis on the actual size of the support with this respect will be needed.

Profitability variables show a different pattern, more profitable firms have a lower probability of receiving a public grant. However, the effect is relatively small. This finding suggests that profitable firms have a sufficient amount of other resources to overcome the corona crisis.

In terms of indebtedness, our estimates indicate that the COVID-19 support does not substitute credit financing and does not create an opportunity for excessively indebted firms to gain additional financing. Highly indebted firms, i.e. firms exceeding the 90th percentile of the loan to assets ratio, have an approximately four percent lower probability of receiving funding.

On the contrary, firms with a high labour share, i.e. firms exceeding the 90th percentile of the labour cost to revenue ratio, have about a six percent higher probability of acquiring the financial support. It represents an important outcome of the policy measure targeted at subjects having potentially the highest difficulties in maintaining employment during the coronavirus pandemic.

[23] The results presented in Table 5 take into account firm characteristics from year 2018 to reflect higher firm coverage. One of the pandemic measures allowed firms to postpone their tax declarations and submissions of balance sheet and income statements, as a result at the time of our analysis, the information on the financial situation of a number of firms was missing. As shown in Table E2 in the Appendix E that presents results based on the available sample of firms, the baseline results continue to hold and the size of the effect is very similar. However, due to approximately 19% lower number of observations for year 2019, indebtedness variable was omitted, therefore we prefer to present results based on the 2018 characteristics as our baseline.

In addition to control variables reflecting differences in size, sectoral or regional allocation, we control also for the age of the firm. The baseline estimates show that granting funds increases with age, but the relationship is nonlinear.[24]

Besides the main productivity, profitability, indebtedness, structure and available control variables, we are interested in the role of domestic or foreign demand, ownership, pre-existing experience with public institutions, but also the firm's broader impact on the environment. The main findings are summarized in the following paragraphs. A more detailed discussion for each group of explanatory variables is available in Appendix F.

On the one hand, the nature of the shock would suggest that a higher proportion of domestically oriented firms should apply for the support. On the other hand, Slovakia represents a country with very high global value chain participation and dominance of pro-export-oriented sectors. Our results suggest that internationally active firms had a higher chance of being funded. Being an exporter brings about a five percent higher probability of being supported. This may reflect agility and experience of exporting firms in dealing with institutions, but also the higher eligibility of export oriented manufacturing firms significantly hit by a temporary trade shock.

From the policy point of view, it is interesting to see that public sector suppliers, i.e. firms having previous experience in dealing with public institutions,[25] exhibit approximately a three percent higher probability of receiving financial help during the pandemic. This finding may suggest a presence of administrative or psychological burdens in applying for the state support.

Last, but not least, we focus on broader financial, productivity and environmental consequences. Following the literature on financially distressed firms (e.g. McGowan et al. 2017), so called zombie firms have a negative impact on non-zombie firms and contribute to misallocation of resources. Our results indicate that a relatively small amount of COVID-19 support funds was allocated to financially distressed firms and zombies have more than a three percent lower probability of being supported.

With rising awareness of climate change, it is important to promote environmentally friendly solutions. In line with the recovery plan for Europe (EC 2020), which supports modern policies and sets a path to a sustainable and resilient recovery, climate action should be mainstreamed in government policies and programmes. By employing one of the very few environmental impact indicators (Trucost score), we find that the COVID-19 support studied should not contribute to excessive subsidizing of businesses representing an environmental burden. A one percent increase in the value of the environmental indicator results in a more than one percent decline in the probability of receiving COVID-19 funding.

[24] For further discussion on the control variables, see the next sub-section 5.2. As suggested by Figure 3, the effect is relatively smaller for the highest age group.
[25] See section "Experience in dealing with the state" in Appendix F for more information.

Table 5 Estimated average marginal effects for the baseline model

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Labour productivity	0.0215***	0.0191***	0.0215***	0.0219***	0.0207***	0.0108***
	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0037)
Return on equity	-0.0044***	-0.0042***	-0.0045***	-0.0040***	-0.0044***	-0.0134***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0019)
High indebtedness (dummy)	-0.0406***	-0.0368***	-0.0405***	-0.0399***	-0.0396***	-0.0273***
	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0060)
High labour share (dummy)	0.0634***	0.0642***	0.0636***	0.0616***	0.0631***	0.0470***
	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0067)
Age	0.0072***	0.0067***	0.0072***	0.0079***	0.0069***	0.0088***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0015)
Age squared	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Exporter (dummy)		0.0497***				
		(0.0045)				
Public ownership (dummy)			-0.0474**			
			(0.0232)			
Environmental impact				-0.0137***		
				(0.0029)		
Public sector supplier (dummy)					0.0328***	
					(0.0062)	
Zombie (dummy)						-0.0322**
						(0.0138)
Controls variables:						
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,141	69,141	69,141	67,120	69,141	24,253

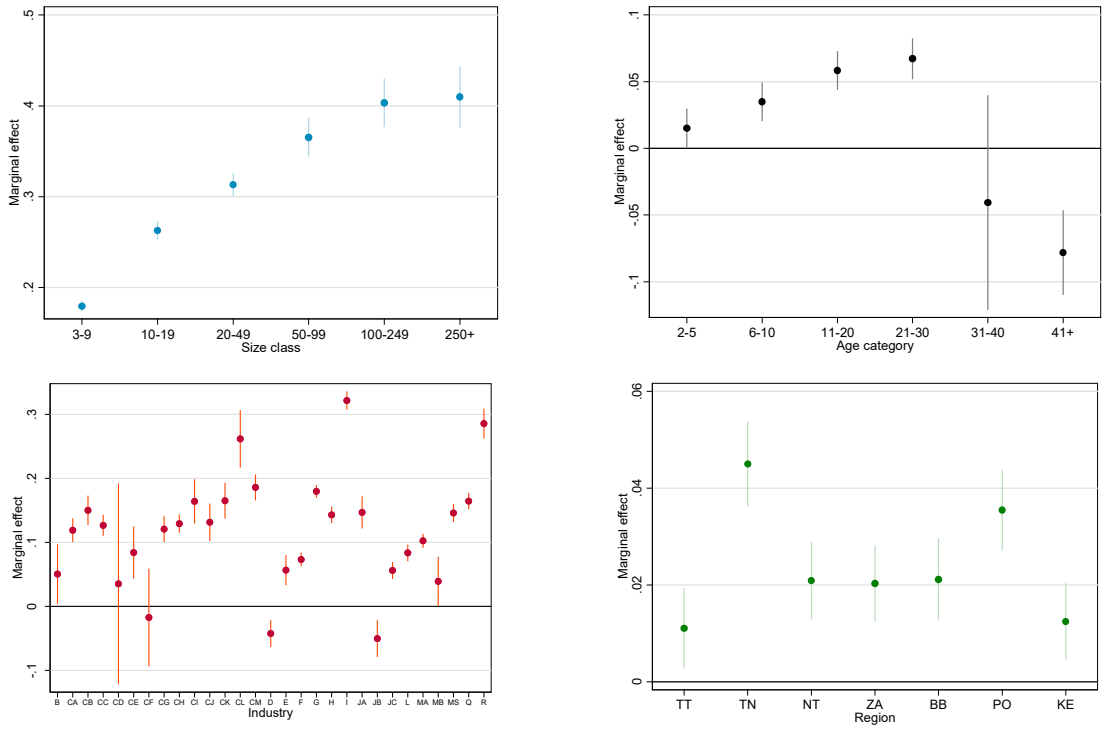
Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from measure 1 or 3. Lagged explanatory variables from year 2018. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

5.2 Wage support allocation across firm size, age, sector and region

Figure 4 shows a graphical representation of marginal effects for the control variables originating from the estimate of our baseline logit model. The results indicate that the probability of receiving government support increases almost linearly with a firm's size. Although standard errors of the estimates rise with the size class, the largest firms tend to have the highest chance of being subsidized. The marginal effect increases also with age, but only up to 30 years of age; older firms have a lower chance of receiving financial help. We take this into account in our further estimates and besides age we control for age squared.[26]

[26] Presented categorical representation of the age variable serves only for the illustration of the nonlinearity in the effect, regression outputs shown in the paper take into consideration continuous version of the age variable.

Figure 4 Marginal effects of control variables (percentage change with respect to base value)

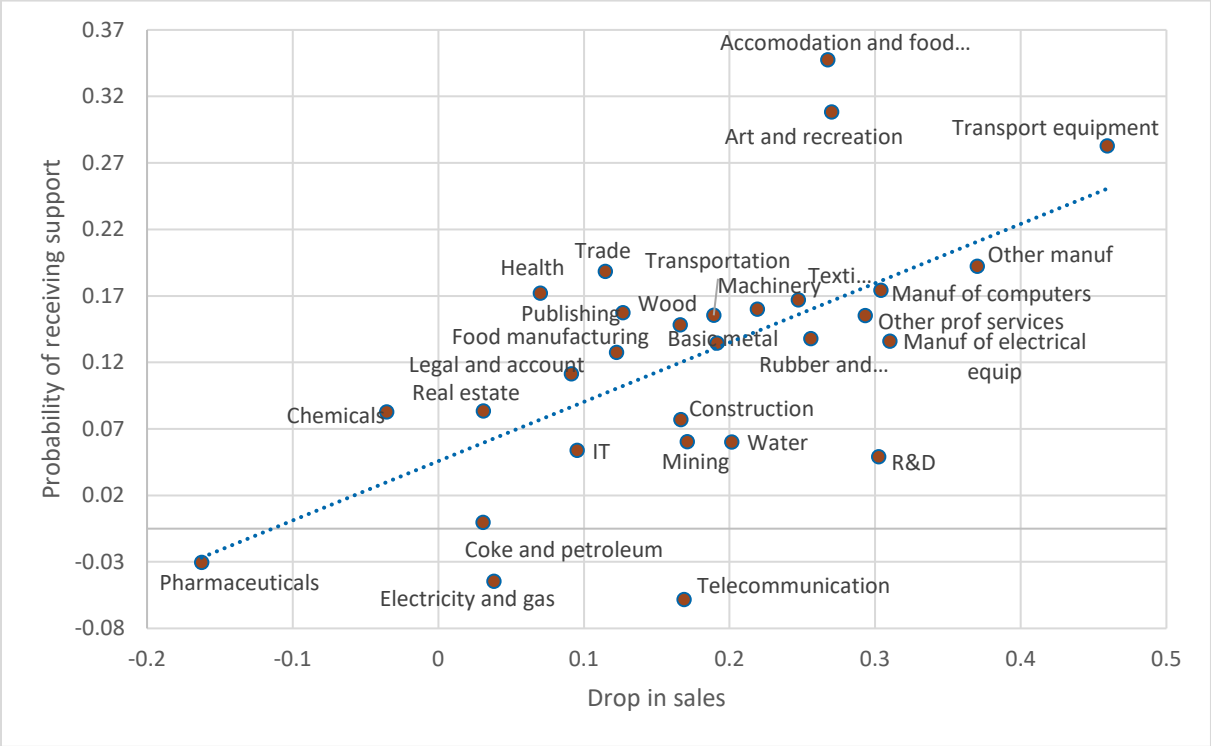


Note: Lowest size class, lowest age category, Sector A – Agriculture and forestry and Bratislava – the most developed region used as base values. ISIC industries: A - Agriculture, B - Mining, CA - Food manufacturing, CB - Textiles, CC - Wood, CD - Coke and petroleum, CE - Chemicals, CF - Pharmaceuticals, CG - Rubber and plastic, CH - Basic metal, CI - Manuf. of computer electronics, CJ - Manuf. of electrical equipment, CK - Machinery, CL - Transport equipment, CM - Other manufacturing, D - Electricity and gas, E - Water, F - Construction, G - Trade, H - Transportation, I - Accommodation and food services, JA - Publishing, JB - Telecommunication, JC - IT, L - Real estate, MA - Legal and accounting services, MB - R&D, MS - Other professional services, Q - Health, R - Art and recreation. NUTS 3 regions: TT – Trnava, TN – Trencin, NT – Nitra, ZA – Zilina, BB – Banska Bystrica, PO – Presov, KE – Kosice.
Source: Authors' calculations.

Our estimates suggest that sectoral distribution of wage subsidies broadly follows the intensity of the adverse effects of the containment measures. On the one hand, Accommodation and Food Service Activities (Sector I), followed by Arts, Entertainment and Recreation (Sector R), and Manufacturing of transport equipment (Sector CL) record the highest marginal effect, i.e. highest relative probability of receiving the government support. On the other hand, firms from Electricity, Gas, Steam and Air Conditioning Supply (D) and Information and Communication (J) have the lowest or a low chance of getting the support. The regional division shows a smaller overall dispersion and higher marginal effects for all less developed regions (with respect to the most developed region of the capital city).

Results indicate that firms operating in industries experiencing larger overall decline in sales were allocated government support with higher probability. Figure 5 confirms that firms producing pharmaceuticals or chemicals, i.e. firms from industries that did not record decline in sales during the first wave of the pandemic, have lower probability to be subsidised. Moreover, firms delivering transport equipment of other manufacturing products, i.e. firms from industries facing large drops in sales, enjoy higher probability of receiving government support.

Figure 5 Probability of receiving subsidies and sales drops by industry



Note: Probability of receiving support represents marginal sectoral effects from logit regression for binary dummy representing firms that received COVID-19 government support from measure 1 or 3 (with respect to baseline industry – Agriculture). Drop in sales represents average negative change in sectoral sales. Values of both variables refer to the period from March to June 2020.
Source: Authors' calculations.

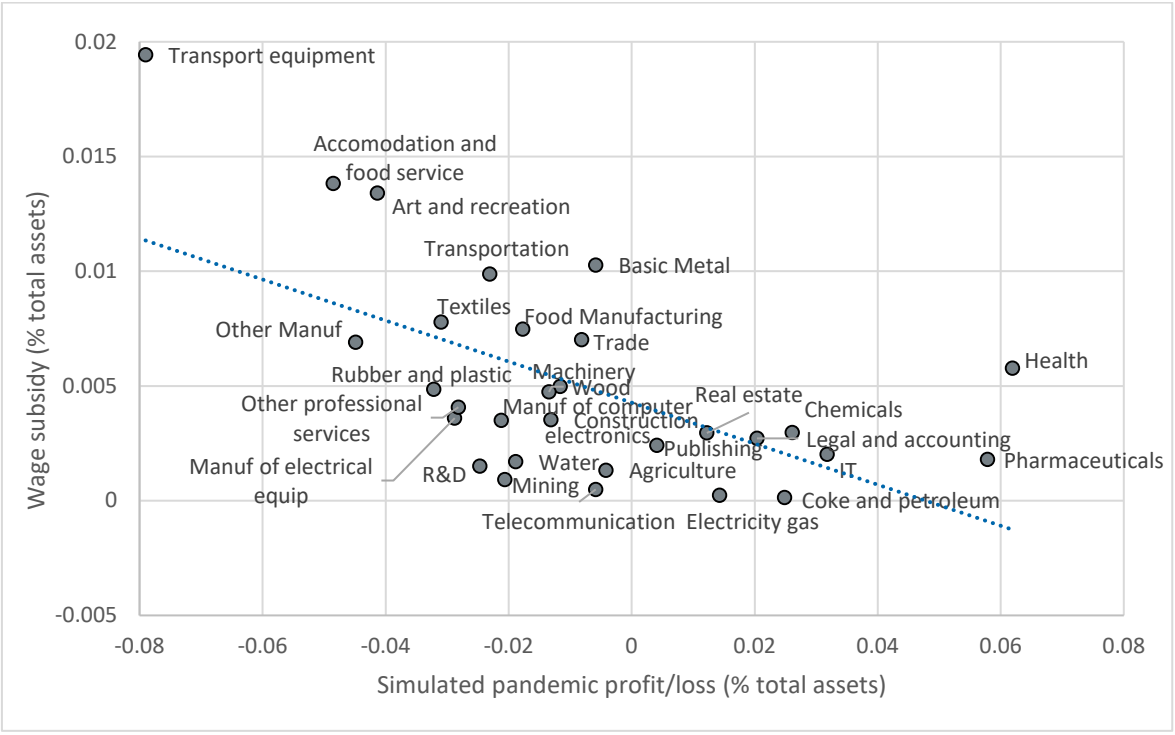
6. Effectiveness of the wage support

Firms from the sectors with higher sales drops receive higher support during the first wave of the COVID-19 pandemic in Slovakia. Based on our estimates, manufacturing firms from the transport equipment sector that documented the deepest drop in sales (by 45%) receive on average wage subsidies reaching close to 2% of total assets (or 4.5 % of labour costs).[27]

The pandemic related drops in income triggers various types of cost optimization and result in different sector specific profits or losses. Our estimates presented in Figure 6 suggest that the industries suffering higher losses receive larger government support. After taking into account different costs structures, highly affected sectors like manufacturing of transport equipment or accommodation and food services now stand out even more than in case of sales drops and relatively higher support flows to these industries are justified.

[27] See Figure G1 and G2 in Appendix G for details. Country specific composition and higher prevalence of large firms in the more adversely hit industries translate in sales drop increasing with firm size. See Figure G3 for details.

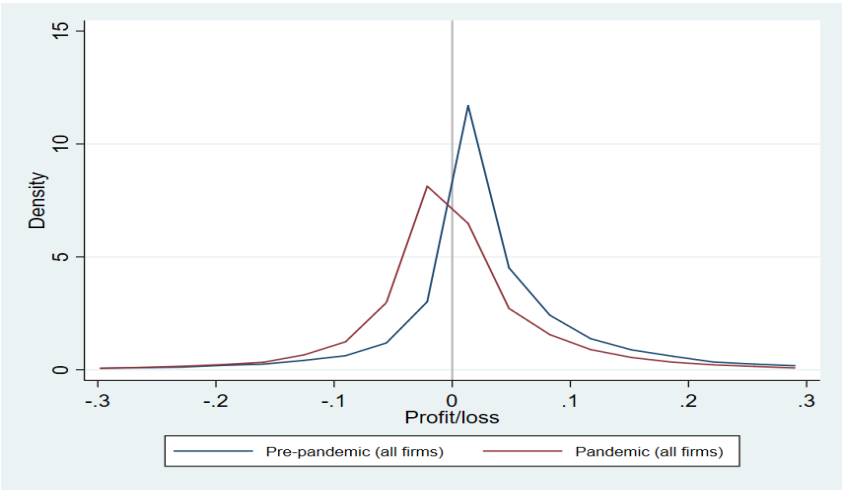
Figure 6 Mean wage subsidies and simulated profits by industry



Note: Wage subsidy represents average relative firm subsidy from measures 1 and 3. Profit (loss) represents average relative value of estimated firm profit during the first wave of the pandemic. Values of both variables refer to the four-month period from March to June 2020.
Source: Authors' calculations.

Our calculations suggest that the first wave of the pandemic deteriorates financial prospects for most of the firms. As shown in Figure 7 the entire distribution of profits shifts leftwards and many originally profitable firms record losses.

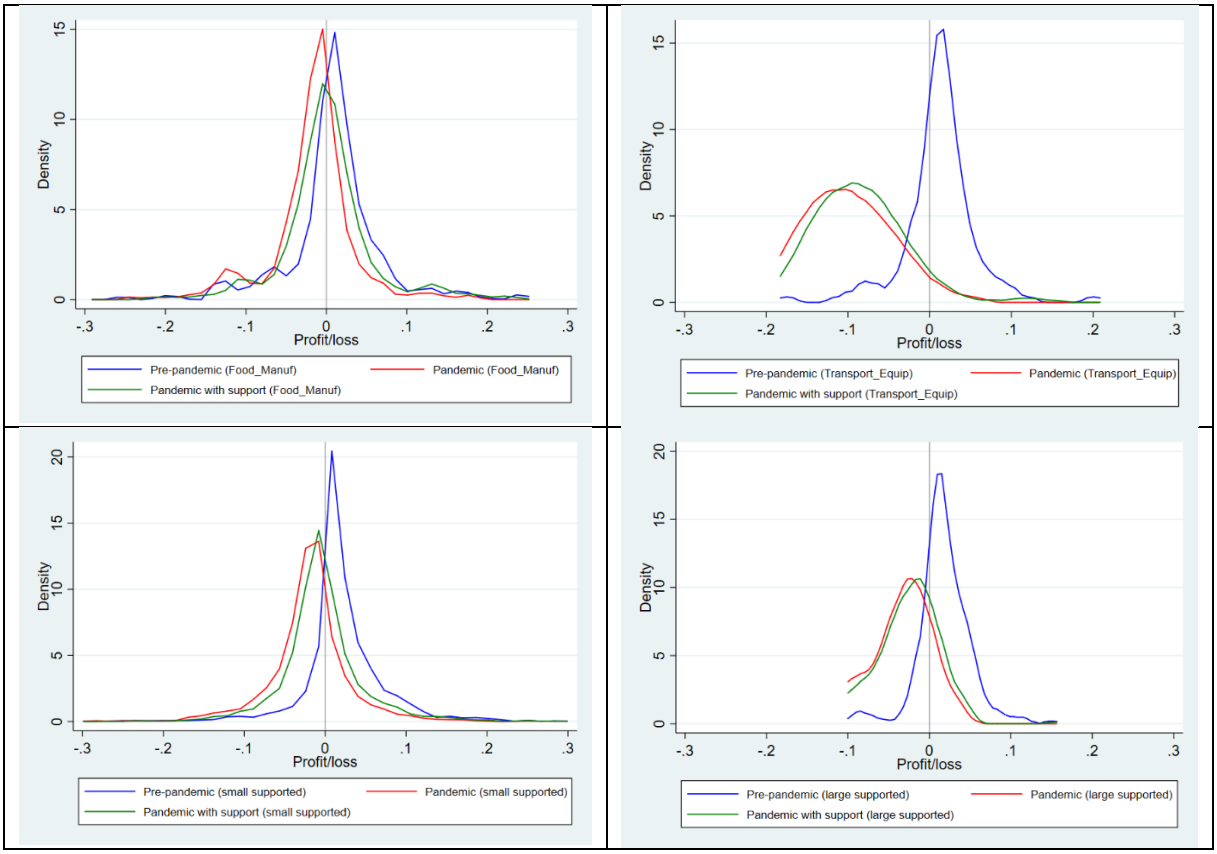
Figure 7 Distribution of pre-pandemic and pandemic profits (all firms)



Note: Profit (loss) represents relative value of firm profit with respect to firm total assets. Four-month equivalents for both series. The estimate of the pandemic profit assumes constant sectoral cost elasticities to sales.
Source: Authors' calculations.

The developments differ across firm characteristics, with somewhat larger distribution shifts within large than small firms, or industries with sizeable and small sales' drops. As shown in Figure 8, government support only marginally reverts the initial distribution shifts.

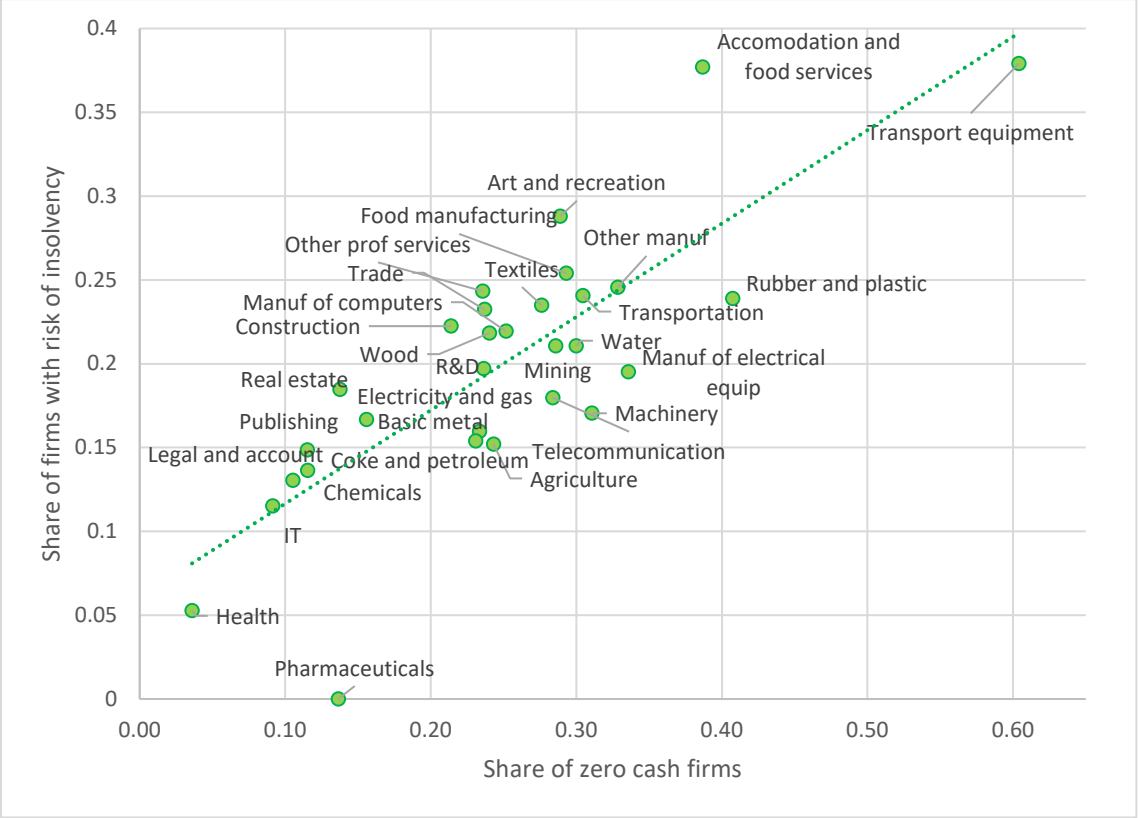
Figure 8 Distribution of profits before the pandemic, during the pandemic and with support (supported firms only) – selected industries and size classes



Note: Profit (loss) represents relative value of firm profit with respect to firm total assets. Pandemic profit with support is the sum of the estimated firm pandemic profit and firm wage support from the 1st wave of the pandemic. Four-month equivalents for all series.
Source: Authors' calculations.

Besides significant shifts in profits and increases in the mass of loss-making firms, the pandemic increases the risk of illiquidity and insolvency. As shown in Figure 9, the illiquidity and insolvency issues are closely related and the pandemic shakes even originally sound industries, like the manufacturing of transport equipment.

Figure 9 Share of firms with zero or negative cash buffer and insolvent firms during the pandemic

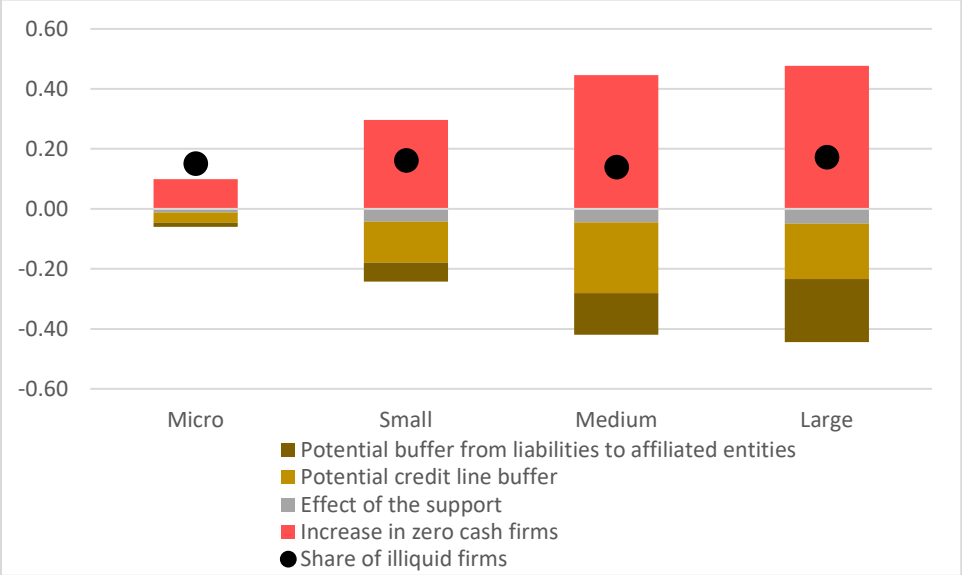


Note: Share of illiquid and insolvent firms with respect to all firms in industry. Values of both variables refer to the four-month period during the 1st wave of the pandemic. The estimates of the pandemic liquidity and solvency assume constant sectoral cost elasticities to sales.
Source: Authors' calculations.

Given the specific Slovak firm size distribution, we can observe that the negative effect of the pandemic on liquidity increases with firm size. The share of illiquid large firms on total number of large firms quadruples. However, the larger the firm the higher space for manoeuvre. Larger firms have easier access to loans or can use other short-term liabilities to fill additional temporary liquidity needs. The available historic levels of loans and short-term liabilities suggest that larger firms can significantly reduce their risk of illiquidity by employing the available additional sources of financing. Our calculations show that temporary pandemic elevation in the risk of illiquidity in medium or large firms can vastly be mitigated by short-term credit lines and current trade liabilities to affiliated entities.[28]

[28] For a robustness test we consider both entire (short-term and long-term) liabilities to affiliated entities and overall short-term trade liabilities. The unconditional results (in Figure 10) are confirmed by results of our regression analysis presented in Table 6.

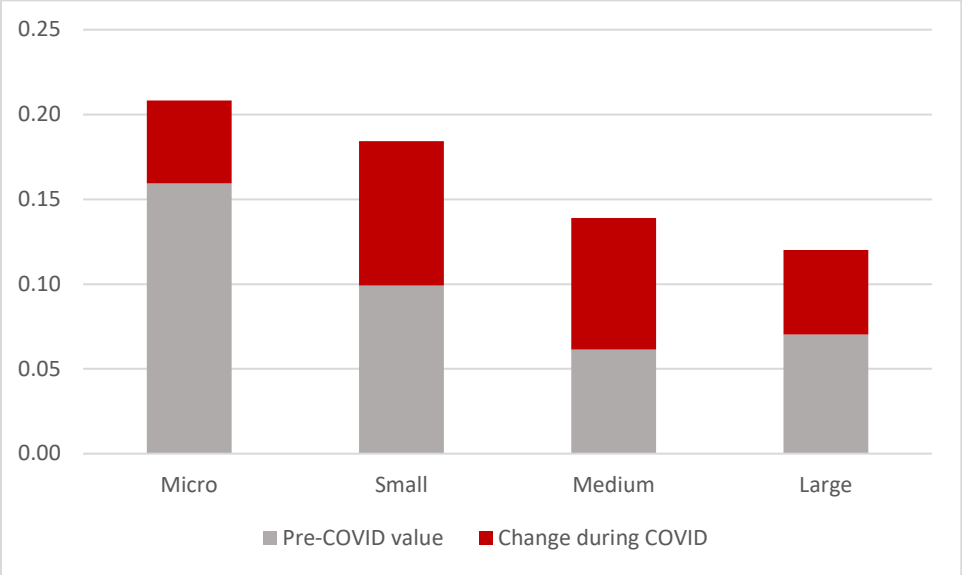
Figure 10 Share of firms in the risk of illiquidity (in %)



Source: Authors' calculations.

Simulated pandemic changes in the risk of insolvency are more homogenous. In line with the pre-COVID values, micro or small firms continue to show the highest risk of insolvency (potentially leading to bankruptcies) during the first wave of the COVID pandemic. In relative terms, the pandemic deteriorates mostly solvency of medium-size firms.

Figure 11 Share of firms in the risk of insolvency (in %)



Source: Authors' calculations.

Our estimates show that the government wage subsidies not only alleviate overall firm losses, but also mitigate increases in the risk of illiquidity or insolvency.

Table 6 The effect of support on the risk of illiquidity – estimated average marginal effects

VARIABLES	(1) Pre-pandemic	(2) Pandemic without support	(3) Pandemic with support	(4) Pandemic with support & potential credit capacity	(5) Pandemic with support, potential credit capacity & liabilities affiliated	(6) Pandemic with support, potential credit capacity & trade liabilities
Supported firm (dummy)	-0.0028	0.0263***	-0.0353***	-0.0390***	-0.0393***	-0.0262***
	(0.0028)	(0.0035)	(0.0036)	(0.0034)	(0.0034)	(0.0028)
Size classes:						
Small	-0.0157***	0.1247***	0.1147***	0.0419***	0.0253***	-0.0615***
	(0.0035)	(0.0054)	(0.0053)	(0.0047)	(0.0046)	(0.0026)
Medium	-0.0105	0.2450***	0.2385***	0.0752***	0.0015	-0.0791***
	(0.0071)	(0.0116)	(0.0115)	(0.0100)	(0.0086)	(0.0040)
Large	-0.0081	0.2890***	0.2774***	0.1472***	0.0106	-0.0675***
	(0.0148)	(0.0247)	(0.0243)	(0.0222)	(0.0176)	(0.0091)
Industries (ISIC):						
Mining	0.0174	-0.0221	-0.0042	0.1009**	0.0723*	0.0675*
	(0.0372)	(0.0396)	(0.0396)	(0.0411)	(0.0395)	(0.0396)
Food manufacturing	0.0521***	0.0608***	0.0644***	0.0923***	0.0941***	0.0583***
	(0.0144)	(0.0167)	(0.0164)	(0.0146)	(0.0147)	(0.0128)
Textiles	0.0023	0.0704***	0.0444**	0.0985***	0.0938***	0.0609***
	(0.0151)	(0.0193)	(0.0186)	(0.0172)	(0.0171)	(0.0148)
Wood	-0.0213**	0.0507***	0.0530***	0.0807***	0.0788***	0.0412***
	(0.0106)	(0.0140)	(0.0138)	(0.0120)	(0.0119)	(0.0096)
Chemicals	0.0040	-0.1592***	-0.1422***	-0.0424*	-0.0433*	-0.0205
	(0.0282)	(0.0224)	(0.0223)	(0.0224)	(0.0223)	(0.0198)
Pharmaceuticals	0.0229	-0.1674***	-0.1522***	-0.0171	-0.0345	0.0998
	(0.0845)	(0.0493)	(0.0487)	(0.0640)	(0.0624)	(0.1082)
Rubber and plastic	0.0111	0.1782***	0.1784***	0.2191***	0.1987***	0.0767***
	(0.0141)	(0.0186)	(0.0183)	(0.0171)	(0.0170)	(0.0146)
Basic metal	-0.0548***	-0.0081	-0.0074	0.0256**	0.0202**	0.0000
	(0.0092)	(0.0120)	(0.0118)	(0.0100)	(0.0098)	(0.0081)
Manuf. Of computer electronics	-0.0465***	0.0598**	0.0764***	0.1294***	0.1126***	0.0611***
	(0.0172)	(0.0264)	(0.0263)	(0.0246)	(0.0242)	(0.0196)
Manuf. Of electrical equipment	-0.0446***	0.1078***	0.1130***	0.1322***	0.1172***	0.0516***
	(0.0162)	(0.0249)	(0.0247)	(0.0226)	(0.0223)	(0.0185)
Machinery	-0.0579***	0.0373*	0.0239	0.0606***	0.0455**	0.0118
	(0.0143)	(0.0210)	(0.0203)	(0.0184)	(0.0182)	(0.0158)
Transport equipment	0.0537*	0.3577***	0.3862***	0.4936***	0.4258***	0.2559***
	(0.0282)	(0.0379)	(0.0367)	(0.0343)	(0.0345)	(0.0382)
Other manufacturing	-0.0378***	0.1192***	0.1151***	0.1620***	0.1588***	0.0646***
	(0.0115)	(0.0164)	(0.0162)	(0.0150)	(0.0149)	(0.0121)
Electricity and gas	0.0274	-0.0897***	-0.0821***	-0.0124	-0.0356*	-0.0262
	(0.0263)	(0.0238)	(0.0229)	(0.0214)	(0.0197)	(0.0179)
Water	0.0007	0.0562**	0.0626***	0.1277***	0.1166***	0.0540***
	(0.0173)	(0.0221)	(0.0218)	(0.0207)	(0.0204)	(0.0169)
Construction	-0.0488***	0.0093	0.0087	0.0513***	0.0518***	0.0215***
	(0.0080)	(0.0101)	(0.0099)	(0.0082)	(0.0081)	(0.0068)
Trade	-0.0044	0.0315***	0.0311***	0.0666***	0.0586***	0.0337***
	(0.0078)	(0.0095)	(0.0092)	(0.0076)	(0.0075)	(0.0064)

Transportation	0.0067	0.0951***	0.0970***	0.1277***	0.1251***	0.0509***
	(0.0092)	(0.0115)	(0.0112)	(0.0098)	(0.0097)	(0.0079)
Accommodation and food services	0.1032***	0.2032***	0.1773***	0.2258***	0.2258***	0.1490***
	(0.0112)	(0.0130)	(0.0128)	(0.0117)	(0.0116)	(0.0101)
Publishing	-0.0641***	-0.0952***	-0.0904***	-0.0170	-0.0141	0.0018
	(0.0121)	(0.0165)	(0.0160)	(0.0138)	(0.0137)	(0.0113)
Telecommunication	-0.0172	0.0492	0.0520	0.0939**	0.0970***	0.0662**
	(0.0299)	(0.0404)	(0.0395)	(0.0365)	(0.0368)	(0.0329)
IT	-0.0735***	-0.1444***	-0.1364***	-0.0515***	-0.0483***	-0.0282***
	(0.0085)	(0.0104)	(0.0101)	(0.0084)	(0.0083)	(0.0069)
Real estate	0.0011	-0.0863***	-0.0803***	0.0033	-0.0013	-0.0026
	(0.0092)	(0.0107)	(0.0104)	(0.0089)	(0.0087)	(0.0072)
Legal and accounting	-0.0634***	-0.1241***	-0.1189***	-0.0387***	-0.0381***	-0.0201***
	(0.0078)	(0.0095)	(0.0092)	(0.0076)	(0.0075)	(0.0063)
R&D	-0.0150	0.0603	0.0591	0.1475***	0.1186***	0.0277
	(0.0266)	(0.0370)	(0.0363)	(0.0354)	(0.0341)	(0.0244)
Other professional services	-0.0360***	0.0778***	0.0746***	0.1244***	0.1170***	0.0594***
	(0.0090)	(0.0121)	(0.0118)	(0.0104)	(0.0102)	(0.0082)
Health	-0.1118***	-0.2161***	-0.2048***	-0.1061***	-0.1030***	-0.0603***
	(0.0077)	(0.0092)	(0.0089)	(0.0073)	(0.0072)	(0.0061)
Art and recreation	0.0532***	0.1342***	0.1300***	0.1867***	0.1844***	0.1293***
	(0.0149)	(0.0182)	(0.0181)	(0.0170)	(0.0169)	(0.0144)
Control variables:						
Region	Yes	Yes	Yes	Yes	Yes	Yes
Age class	Yes	Yes	Yes	Yes	Yes	Yes
Observations	72,448	72,449	72,449	72,443	72,443	72,443

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms in the risk of illiquidity. A firm is in the risk of illiquidity when the sum of its net revenue, cash holdings and potential additional pandemic sources of liquidity is negative. Pandemic sources may include government wage subsidy (support), short-term bank loans (loans), current trade liabilities to affiliated entities (liabilities affiliated) and current trade liabilities (trade liabilities). Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Our logit regression results presented in Table 6 confirm positive and statistically significant effect of the COVID-19 wage subsidies on firm liquidity. Following the equation (5), a firm is considered to be illiquid and the dependent variable is equal 1, when firm does not have a sufficient amount of cash and cash equivalents to cover its loss. As shown in column 1, in the pre-pandemic time period there is not an economically or statistically significant difference between the supported and non-supported firms. During the pandemic (column 2) supported firms observe higher probability to be illiquid.[29] However, as documented in column 3, after receiving the government support that improves their simulated liquidity position, the supported firms become less prone to liquidity shortages. Further estimates (presented in columns 4-6) allowing firms to utilize their full pre-pandemic credit capacity suggest that credit lines or other additional short-term sources of liquidity can play even stronger role than the government support, especially in larger firms. As suggested by the coefficients for the size class dummy variables (in columns 5 and 6), large or medium firms facing strong pandemic liquidity shocks can improve their overall liquidity situation by exploiting their current trade liabilities or liabilities to affiliated entities far beyond the effect of the direct government support.

[29] From column (2) to column (6) we consider simulated profit (loss) calculated following the equations (2) to (4) when defining illiquid firms.

By narrowing down the focus on the group of supported firms, we may conclude that the wage support has relatively higher positive impact on the smaller than larger firms. In micro and small firms, it could reduce the pandemic increase in the share of firms facing illiquidity risk between 30% and 50%. At the same time, medium and large firms can potentially to much larger extent reduce their risk using additional credit-lines and additional short-term sources of liquidity.[30]

In line with unconditional picture presented in Figure 11, our logit regression results (in Table 7) confirm lower share of insolvency for larger firms in both pandemic and pre-pandemic period and show positive and statistically significant effect of the government subsidies on firm insolvency. As shown in column 2, the COVID-19 affects both supported and non-supported firms and the two groups do not differ in terms of probability to be insolvent during the first wave of the pandemic. Importantly, as documented further (in column 3), firms receiving pandemic wage subsidies show lower probability to be insolvent.

Table 7 The effect of support on the risk of insolvency – estimated average marginal effects

	(1)	(2)	(3)
VARIABLES	Pre-pandemic	Pandemic	Pandemic with support
Supported firm (dummy)	-0.0106***	-0.0008	-0.0348***
	(0.0032)	(0.0035)	(0.0036)
Size classes:			
Small	-0.0597***	-0.0279***	-0.0320***
	(0.0036)	(0.0046)	(0.0045)
Medium	-0.0941***	-0.0689***	-0.0668***
	(0.0061)	(0.0085)	(0.0085)
Large	-0.1230***	-0.0977***	-0.0937***
	(0.0095)	(0.0154)	(0.0155)
Industries (ISIC):			
Mining	0.0028	0.0289	0.0324
	(0.0385)	(0.0425)	(0.0423)
Food manufacturing	0.1119***	0.1228***	0.1192***
	(0.0160)	(0.0166)	(0.0165)
Textiles	0.0417**	0.1021***	0.0888***
	(0.0168)	(0.0188)	(0.0185)
Wood	0.0372***	0.0755***	0.0733***
	(0.0118)	(0.0131)	(0.0129)
Coke and petroleum	0.1024	0.0354	0.0434
	(0.1986)	(0.1765)	(0.1786)
Chemicals	0.0092	-0.0497*	-0.0449*
	(0.0297)	(0.0270)	(0.0270)
Rubber and plastic	0.0486***	0.1112***	0.1075***
	(0.0160)	(0.0175)	(0.0174)
Basic metal	-0.0244**	0.0038	-0.0026
	(0.0100)	(0.0112)	(0.0110)
Manuf. Of computer electronics	-0.0273	0.0594**	0.0600**
	(0.0187)	(0.0242)	(0.0241)
Manuf. Of electrical equipment	-0.0405**	0.0573**	0.0456**
	(0.0172)	(0.0228)	(0.0223)
Machinery	-0.0251	0.0277	0.0255
	(0.0174)	(0.0204)	(0.0203)
Transport equipment	0.0789**	0.3315***	0.3484***
	(0.0336)	(0.0356)	(0.0357)

[30] For further details, see Table G3 in Appendix.

Other manufacturing	0.0161	0.1142***	0.1075***
	(0.0132)	(0.0156)	(0.0154)
Electricity and gas	0.0366	-0.0022	-0.0016
	(0.0288)	(0.0278)	(0.0272)
Water	0.0217	0.0782***	0.0734***
	(0.0187)	(0.0214)	(0.0211)
Construction	0.0077	0.0614***	0.0563***
	(0.0086)	(0.0095)	(0.0093)
Trade	0.0507***	0.0709***	0.0696***
	(0.0082)	(0.0089)	(0.0087)
Transportation	0.0296***	0.0796***	0.0750***
	(0.0096)	(0.0106)	(0.0104)
Accommodation and food services	0.1714***	0.2552***	0.2418***
	(0.0117)	(0.0126)	(0.0125)
Publishing	-0.0292**	-0.0273*	-0.0326**
	(0.0134)	(0.0151)	(0.0146)
Telecommunication	-0.0037	0.0392	0.0370
	(0.0320)	(0.0378)	(0.0368)
IT	-0.0479***	-0.0601***	-0.0601***
	(0.0090)	(0.0097)	(0.0095)
Real estate	0.0365***	0.0181*	0.0174*
	(0.0097)	(0.0104)	(0.0102)
Legal and accounting	-0.0344***	-0.0425***	-0.0433***
	(0.0082)	(0.0089)	(0.0087)
R&D	-0.0191	0.0618*	0.0522
	(0.0259)	(0.0336)	(0.0326)
Other professional services	0.0066	0.0947***	0.0896***
	(0.0096)	(0.0112)	(0.0110)
Health	-0.0935***	-0.1181***	-0.1179***
	(0.0081)	(0.0087)	(0.0086)
Art and recreation	0.1022***	0.1758***	0.1664***
	(0.0157)	(0.0175)	(0.0174)
Control variables:			
Region	Yes	Yes	Yes
Age class	Yes	Yes	Yes
Observations	72,523	72,523	72,523

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms in the risk of insolvency. A firm is in the risk of insolvency when the sum of its net revenue, equity and government wage subsidy (support) is negative. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Conditional regression outputs for individual industries, in line with unconditional industry means, suggest strongest negative impact of the first wave of the pandemic on liquidity and solvency of selected groups of manufacturing firms (mostly manufacturing of transport equipment), followed by firms delivering accommodation or food services and services covering art and recreation. However, these firms record the highest or one of the highest illiquidity or insolvency even before the COVID-19 pandemic.

A closer look at the supported firms indicates that the government support in the form of wage subsidies can significantly mitigate estimated increase in illiquidity of the firms delivering services (including the firms from highly affected industries of Accommodation and food services or Art and recreation). Firms from manufacturing industries can potentially rely more on the credit line channel in order to withstand the temporarily heightened risk of illiquidity.[31]

[31] For further details, see Table G5 in Appendix.

Conclusion

Despite the relatively small scale of the COVID-19 related economic support in Slovakia, especially compared to the most advanced G20 countries, implemented wage subsidies should safeguard about one percentage point of jobs, or more.

The early availability of a detailed list of firms receiving wage subsidies – the most widely used direct fiscal measure to curb the economic consequences of the pandemic – gives us a unique opportunity to understand the distribution of the support to the recipients.

Our findings show that the quickly designed direct economic support was distributed efficiently as firms from the most adversely affected sectors received wage subsidies with higher probability. In addition, government financing reached more labour intensive, but at the same time more productive firms. Wage support did not substitute credit financing, as highly leveraged firms showed a lower probability of obtaining employment support.

Importantly, our results do not confirm the frequently discussed heightened risk of financially distressed – zombie firms or technologically outdated firms with a highly negative environmental impact. However, a firm's ex-ante experience in dealing with a state institution has a statistically significant impact on receiving the wage support. This indicates that some firms in real need but less organisational capacities could be left behind.

Our results also emphasize that a significant share of financially healthy and viable firms have been strongly affected by the sales drop during the crises. Many of the firms might survive the short-term liquidity shock owing to the effectively allocated government support. Despite the support, we may observe an increased share of firms for which equity is absorbed by their huge losses caused by sales drop. Beside the strong sectoral heterogeneity, insolvency risk decreases with firm size, the micro and small companies being the most exposed.

We show evidence that even relatively small-scale support can be effective in keeping employment and avoiding liquidity crises in the short term. Nevertheless, for the rebalancing of the firms' financial health, support might do less, while fast return to normal activity is crucial to avoid large scale bankruptcies. On top of that, some sectors might face additional challenge in returning to the pre-crisis normal activity and rather a "new-normal" should be achieved. From policy perspective, a careful monitoring and more targeted support will be needed to enable these firms to survive a longer period of crises and/or exceptional financing should be assured for investments that enable the transition to the new normal. Although the current crises might be an opportunity to accelerate strategic transformation towards green and digital economy, a careful balancing and policy design will be needed to avoid excessive conditionality on already struggling businesses.

Empirical findings of this paper fully support the policy recommendations of The Group of Thirty (2020) that highlights that damages of the crisis at the corporate level is worse than visible so far and there is a growing corporate solvency challenges. While broad support was effective in the short term, more efforts are needed in terms of mix of policy responses and tools for targeted measures. The presented evidence of heightened solvency risk, even after the allocated government support, emphasizes also the need of sequencing of policy responses described by

Revoltella et. al (2020) towards publicly funded equity-type instruments that should complement loans and guarantees in order to improve the capital base of the corporates.

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Appendices

Appendix A Variable descriptions

Table A1

Variable	Description
Efficiency variables	
Labour productivity	Value added divided by number of employees
Profit per employee	Operating profit divided by number of employees
Investment ratio	Annual change in fixed assets divided by fixed assets
Performance variables	
Return on equity	Net profit divided by shareholders' equity
Return on assets	Net profit divided by total assets
High growth firm (dummy)	Binary dummy for a firm with an annual growth of turnover more than 10% over a minimum three-year period and having at least 10 employees at the beginning of the growth period (following Ferrando et al. 2019)
Decline in sales (dummy)	Binary dummy equal 1 for a firm with a negative annual change in sales; 0 otherwise
Decline in value added (dummy)	Binary dummy equal 1 for a firm with a negative annual change in value added; 0 otherwise
Decline in employment (dummy)	Binary dummy equal 1 for a firm with a negative annual change in employment; 0 otherwise
Indebtedness variables	
Credit ratio	Bank loan divided by total assets
High indebtedness (dummy)	Binary dummy equal 1 for a firm with a credit ratio belonging to the last decile of the sample distribution; 0 otherwise
Interest coverage	Operating profit divided by interest expenses
Debt_service	Operating profit divided by loan debt
Reliability variables	
Tax evader (dummy)	Binary dummy equal 1 for a firm having tax arrears; 0 otherwise
Social security evader (dummy)	Binary dummy equal 1 for a firm having arrears on social security contributions; 0 otherwise
Loan defaulter (dummy)	Binary dummy equal 1 for a firm not paying instalments or interest on bank loans; 0 otherwise

Debt defaulter (dummy)	Binary dummy equal 1 for a firm not paying instalments or interest on bank loans and/or having tax arrears or arrears on social security contributions; 0 otherwise
Structural variables	
High labour share (dummy)	Binary dummy equal 1 for a firm with labour costs to value added ratio belonging to the last decile of the distribution; 0 otherwise
High material intensity (dummy)	Binary dummy equal 1 for a firm with material costs to value added ratio belonging to the last decile of the distribution; 0 otherwise
High input intensity (dummy)	Binary dummy equal 1 for a firm with input (material, service and labour) costs to value added ratio belonging to the last decile of the distribution; 0 otherwise
High fixed assets share (dummy)	Binary dummy equal 1 for a firm with fixed assets to total assets ratio belonging to the last decile of the distribution; 0 otherwise
Trade openness variables	
Exporter (dummy)	Binary dummy equal 1 for a firm having non-zero exports; 0 otherwise
Importer (dummy)	Binary dummy equal 1 for a firm having non-zero imports; 0 otherwise
Two-way trader (dummy)	Binary dummy equal 1 for a firm having non-zero imports and exports; 0 otherwise
Ownership variables	
Public firm (dummy)	Binary dummy equal 1 for a firm owned by public sector institutions; 0 otherwise
State firm (dummy)	Binary dummy equal 1 for a state firm (legal form); 0 otherwise
Foreign firm (dummy)	Binary dummy equal 1 for a firm owned by a foreigner owner; 0 otherwise
Legal form	Categorical variable for four legal forms: 1) Corporation or limited liability company; 2) Partnerships 3) Cooperative
Environmental impact variables	
Environmental impact	Value of Trucost score – S&P indicator taking into account risks related to climate change, natural resource constraints, and broader environmental, social, and governance factors
High enviro impact (dummy)	Binary dummy equal 1 for a firm with environmental impact belonging to the last decile of the distribution; 0 otherwise
Zombie variables	
Loss maker (dummy)	Binary dummy equal 1 for a firm making loss for three consecutive years; 0 otherwise
Distressed firm (dummy)	Binary dummy equal 1 for a firm not able to cover its interest costs for three consecutive years; 0 otherwise
Distressed firm 1 (dummy)	Binary dummy equal 1 for a firm not able to cover its interest costs for three consecutive years and at the same time creating negative value added and loss; 0 otherwise
Zombie (dummy)	Binary dummy equal 1 for a more than ten years old firm not able to cover its interest costs for three consecutive years; 0 otherwise
Zombie 1 (dummy)	Binary dummy equal 1 for a more than ten years old firm not able to cover its interest costs for three consecutive years and at the same time creating negative value added and loss; 0 otherwise
State connection variables	
Public sector supplier (dummy)	Binary dummy equal 1 for a firm listed as supplier in the Register of Public Sector Partners; 0 otherwise
Public sector procurer (dummy)	Binary dummy equal 1 for a firm listed as procurer in the Register of Public Sector Partners; 0 otherwise
Public sector partner (dummy)	Binary dummy equal 1 for a firm listed as partner in the Register of Public Sector Partners; 0 otherwise
Control variables	
Age	Firm age in number of years
Size class	0-2 employees 3-9 employees

	10-19 employees 20-49 employees 50-99 employees 100-249 employees 250 and more employees
Region	BA – Bratislava, TT – Trnava, TN – Trencin, NT – Nitra, ZA – Zilina, BB – Banska Bystrica, PO – Presov, KE – Kosice
Sector	A – Agriculture, B – Mining, CA – Food manufacturing, CB – Textiles, CC – Wood, CD – Coke and petroleum, CE – Chemicals, CF – Pharmaceuticals, CG – Rubber and plastic, CH – Basic metal, CI – Manuf. Of computer electronics, CJ – Manuf. Of electrical equipment, CK – Machinery, CL – Transport equipment, CM – Other manufacturing, D – Electricity and gas, E – Water, F – Construction, G – Trade, H – Transportation, I – Accommodation and food services, JA – Publishing, JB – Telecommunication, JC – IT, L – Real estate, MA – Legal and accounting services, MB – R&D, MS – Other professional services, Q – Health, R – Art and recreation.

Appendix B Estimated cost elasticities to sales

Table B1 Elasticities of costs to sales

NACE Rev.2	ISIC Code	Industry	Cost elasticity to sales (α_s)	Decline in sales
1-3	A	Agriculture	0.399	0.090
5-9	B	Mining	0.471	0.171
10-12	CA	Food manufacturing	0.519	0.122
13-15	CB	Textiles	0.586	0.247
16-18	CC	Wood	0.545	0.166
19	CD	Coke and petroleum	0.547	0.031
20	CE	Chemicals	0.521	-0.035
21	CF	Pharmaceuticals	0.419	-0.163
22-23	CG	Rubber and plastic	0.571	0.256
24-25	CH	Basic metal	0.614	0.191
26	CI	Manuf. Of computer electronics	0.542	0.304
27	CJ	Manuf. Of electrical equipment	0.607	0.310
28	CK	Machinery	0.603	0.219
29-30	CL	Transport equipment	0.524	0.459
31-33	CM	Other manufacturing	0.600	0.370
35	D	Electricity and gas	0.411	0.038
36-39	E	Water	0.521	0.202
41-43	F	Construction	0.503	0.167
45-47	G	Trade	0.492	0.115
49-53	H	Transportation	0.580	0.189
55-56	I	Accommodation and food services	0.527	0.267
58-60	JA	Publishing	0.436	0.127
61	JB	Telecommunication	0.463	0.169
62-63	JC	IT	0.519	0.095

68	L	Real estate	0.360	0.031
69-71	MA	Legal and accounting	0.452	0.091
72	MB	R&D	0.405	0.302
73-75	MS	Other professional services	0.486	0.293
86-88	Q	Health	0.559	0.070
90-93	R	Art and recreation	0.429	0.270

Note: Decline in sales represents change between Q2 2020 and Q2 2019. See section 3 Methodology for the details on the calculation of the elasticity.
Source: Author's calculations based on Orbis and Statistical office of the Slovak Republic.

Appendix C First Aid Package

The Government of the Slovak Republic introduced state aid to employers, employees and self-employed people in order to help them with the economic consequences of the new corona virus pandemic. There are four main measures. Measures 1 and 3 are aimed at employers who maintain jobs. Measure 2 is for self-employed individuals to compensate for their loss of income. Measure 4 is to support selected individuals with no income.

The first group measure is aimed at employers (including self-employed people who are employers) who maintain jobs in times of declared emergency, or state of emergency despite the obligation to interrupt or limit their operational activities based on the decision of the Public Health Office. Based on this measure an employer can be paid monthly wage compensation up to 80% of the employee's average earnings (up to EUR 1,100 per employee).

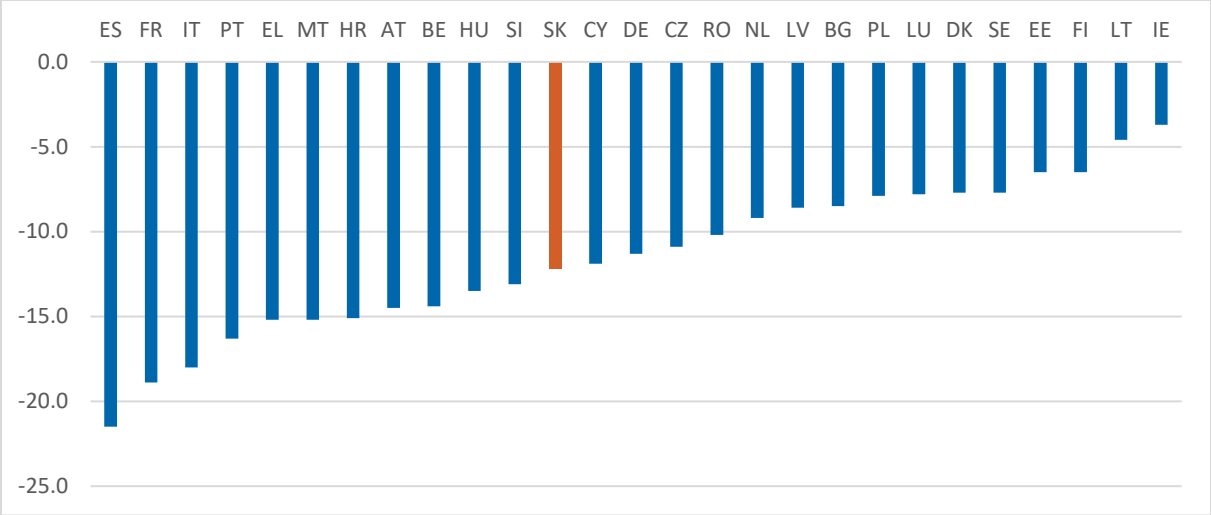
Measure 2 is intended for self-employed individuals who had to close their operations because of a decision of the Public Health Office of the Slovak Republic, or their sales decreased by at least 20%. There are certain eligibility conditions that need to be met (e.g. the self-employed individual pays its health insurance and pension contributions or was granted a deferral). The amount of subsidy for the loss of income for a self-employed individual is linked to the decrease in sales and it is limited to 540 EUR (270 EUR for March 2020) per month.

Measure 3 is for employers (including self-employed people who are employers) who retain jobs in the event of interruption or reduction of their activities during a declared emergency. An employer can choose one of two available alternatives for the entire period of the support. Measure 3A represents the payment of an employee's salary compensation up to a maximum of 80% of his average earnings (limited to 880 EUR per month) under the condition that the employer cannot assign work to the employee due to an obstacle on the side of the employer. Measure 3B is a flat-rate contribution to cover part of the wage costs of all employees depending on the decrease in sales up to a maximum of 540 EUR per month (270 EUR for March) per employee.

Measure 4 is designed for self-employed individuals and single-person limited liability companies. It is intended for applicants who have no income and interrupted their activities prior to the pandemic. They can receive a flat-rate monthly subsidy up to 210 EUR (270 EUR for March).

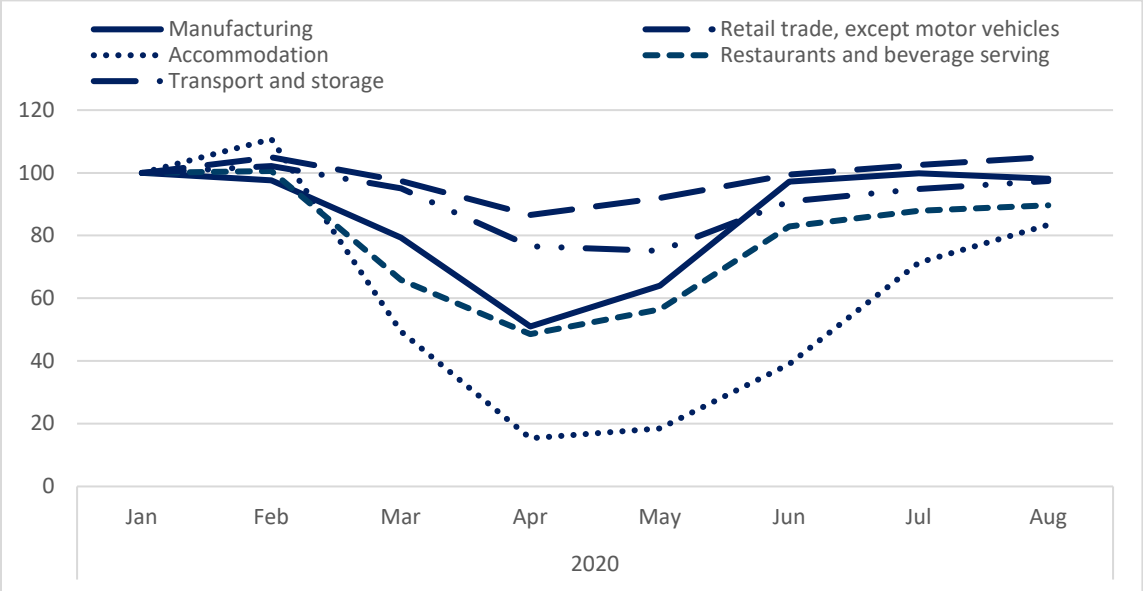
Appendix D Economic developments – 1st wave of the COVID-19 pandemic in Slovakia

Figure D1 Real GDP growth in Q2 2020



Note: chain linked volumes, percentage change compared to same period in previous year.
Source: Eurostat.

Figure D2 Revenue developments in selected sectors



Note: January 2020 = 100, constant prices.
Source: Statistical Office of the Slovak Republic.

Appendix E Robustness analysis - additional results for the baseline model

Table E1 Estimated coefficients of the baseline model – two year lagged explanatory variables

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Labour productivity	0.1194***	0.1068***	0.1197***	0.1242***	0.1154***	0.0532***
	(0.0100)	(0.0100)	(0.0100)	(0.0101)	(0.0100)	(0.0185)
Return on equity	-0.0247***	-0.0233***	-0.0249***	-0.0227***	-0.0248***	-0.0661***
	(0.0059)	(0.0059)	(0.0059)	(0.0060)	(0.0059)	(0.0092)
High indebtedness (dummy)	-0.2261***	-0.2050***	-0.2251***	-0.2264***	-0.2207***	-0.1348***
	(0.0205)	(0.0206)	(0.0205)	(0.0209)	(0.0205)	(0.0297)
High labour share (dummy)	0.3528***	0.3578***	0.3540***	0.3492***	0.3514***	0.2323***
	(0.0205)	(0.0206)	(0.0205)	(0.0211)	(0.0205)	(0.0334)
Age	0.0398***	0.0376***	0.0400***	0.0449***	0.0386***	0.0432***
	(0.0043)	(0.0043)	(0.0043)	(0.0044)	(0.0043)	(0.0075)
Age squared	-0.0010***	-0.0010***	-0.0010***	-0.0011***	-0.0010***	-0.0011***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Exporter (dummy)		0.2770***				
		(0.0251)				
Public ownership			-0.2638**			
			(0.1292)			
Environmental impact				-0.0779***		
				(0.0165)		
Public sector supplier (dummy)					0.1823***	
					(0.0345)	
Zombie (dummy)						-0.1590**
						(0.0683)
Constant	-5.5331***	-5.5134***	-5.5277***	-5.3916***	-5.4816***	-5.3014***
	(0.3031)	(0.3032)	(0.3031)	(0.3190)	(0.3032)	(0.6310)
Controls variables:						
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,141	69,141	69,141	67,120	69,141	24,253
Log likelihood	-37398	-37338	-37396	-35786	-37384	-14342
Pseudo R-squared	0.0634	0.0649	0.0635	0.0670	0.0638	0.0671

Note: The table shows coefficients of the logit regression for binary dummy representing firms that received COVID-19 government support from priority 1 or 3. Lagged explanatory variables from year 2018. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations based on firm-level datasets described in Section 2.

Table E2 Estimated average marginal effects for the baseline model – one year lagged explanatory variables

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Labour productivity	0.0225***	0.0198***	0.0225***	0.0228***	0.0216***	0.0030
	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0042)
Return on equity	-0.0009	-0.0003	-0.0009	-0.0005	-0.0009	-0.0097***
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0021)
High indebtedness (dummy)	-	-	-	-	-	-
High labour share (dummy)	0.0772***	0.0786***	0.0774***	0.0760***	0.0770***	0.0597***
	(0.0040)	(0.0040)	(0.0040)	(0.0041)	(0.0040)	(0.0073)
Age	0.0077***	0.0071***	0.0077***	0.0084***	0.0075***	0.0093***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0015)
Age squared	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Exporter (dummy)		0.0573***				
		(0.0051)				
Public ownership			-0.0391			
			(0.0238)			
Environmental impact				-0.0157***		
				(0.0032)		
Public sector supplier (dummy)					0.0332***	
					(0.0069)	
Zombie (dummy)						-0.0734***
						(0.0160)
Controls variables:						
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Observations	56,205	56,205	56,205	54,507	56,205	20,452

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from priority 1 or 3. Lagged explanatory variables from year 2019. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations based on firm-level datasets described in Section 2.

Table E3 Estimated coefficients of the baseline model – one year lagged explanatory variables

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Labour productivity	0.1250***	0.1103***	0.1252***	0.1295***	0.1204***	0.0148
	(0.0111)	(0.0112)	(0.0111)	(0.0113)	(0.0111)	(0.0206)
Return on equity	-0.0050	-0.0018	-0.0052	-0.0031	-0.0051	-0.0480***
	(0.0066)	(0.0066)	(0.0066)	(0.0067)	(0.0066)	(0.0102)
High indebtedness (dummy)	-	-	-	-	-	-
High labour share (dummy)	0.4297***	0.4386***	0.4309***	0.4316***	0.4288***	0.2957***
	(0.0226)	(0.0227)	(0.0227)	(0.0232)	(0.0226)	(0.0362)
Age	0.0430***	0.0395***	0.0431***	0.0476***	0.0417***	0.0459***
	(0.0044)	(0.0044)	(0.0044)	(0.0045)	(0.0044)	(0.0074)
Age squared	-0.0011***	-0.0010***	-0.0011***	-0.0012***	-0.0011***	-0.0011***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Exporter (dummy)		0.3197***				
		(0.0284)				
Public ownership			-0.2177			
			(0.1327)			
Environmental impact				-0.0893***		
				(0.0181)		
Public sector supplier (dummy)					0.1849***	
					(0.0385)	
Zombie (dummy)						-0.3638***
						(0.0797)
Constant	-4.0341***	-3.9818***	-4.0260***	-3.7973***	-3.9738***	-2.9259***
	(0.1407)	(0.1408)	(0.1407)	(0.1585)	(0.1411)	(0.2414)
Controls variables:						
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Observations	56,205	56,205	56,205	54,507	56,205	20,452
Log likelihood	-30395	-30333	-30394	-29022	-30384	-12068
Pseudo R-squared	0.0631	0.0650	0.0631	0.0670	0.0635	0.0665

Note: The table shows coefficients of the logit regression for binary dummy representing firms that received COVID-19 government support from priority 1 or 3. Lagged explanatory variables from year 2019. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations based on firm-level datasets described in Section 2.

Appendix F Robustness analysis - alternative explanatory variables

Reliability

In an ideal world public resources allocation should also take into account reliability or honesty of the support recipients. In reality we cannot entirely exclude firms that do not fulfill all their financial commitments to the state, employees or financial institutions.

By employing records on firms that do not pay their financial obligations, taxes, contributions to social security system or agreed instalments and interest to banks, we find that these non-reliable firms tend to have a much lower chance of being supported during the pandemic.

Table F1 Estimated average marginal effects for reliability variables

VARIABLES	(1)	(2)	(3)	(4)
Debt defaulter (dummy)	-0.0809***			
	(0.0034)			
Tax evader (dummy)		-0.1453***		
		(0.0060)		
Social security evader (dummy)			-0.1671***	
			(0.0054)	
Loan defaulter (dummy)				-0.0247
				(0.0637)
Controls variables:				
Sector	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Observations	69,141	69,141	69,141	69,141

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from measure 1 or 3. Lagged explanatory variables. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

Experience in dealing with the state

Following the Act on Register of Public Sector Partners adopted in Slovakia as part of the anti-money laundering and anti-letterbox company legislation, every firm entering into a contractual relationship with the public sector[32] needs to be listed in the Register of Public Sector Partners (and meet the set financial limits and other legal prerequisites).

This register represents a unique dataset enabling us to investigate to what extent an ex-ante firm-state relationship plays a role in the allocation of COVID-19 government subsidies. The dataset contains information on three different types of firms. There are partners, i.e. firms willing or planning to enter into a contractual relationship with the public institutions. Then, there are

[32] Represented mainly by state bodies, state companies, municipalities and other entities operating with public finances and properties.

suppliers, firms that have already supplied their goods or services to the public sector, and there are also procurers.

As shown in Table E2 all three types of firms listed in the register have a higher probability of obtaining pandemic support and the successful suppliers show the highest chance.

Table F2 Estimated average marginal effects for public sector partnership variables

VARIABLES	(1)	(2)	(3)
Public sector partner (dummy)	0.0133***		
	(0.0035)		
Public sector supplier (dummy)		0.0460***	
		(0.0049)	
Public sector procurer (dummy)			0.0308***
			(0.0078)
Controls variables:			
Sector	Yes	Yes	Yes
Size class	Yes	Yes	Yes
Region	Yes	Yes	Yes
Observations	69,141	69,141	69,141

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from measure 1 or 3. Lagged explanatory variables. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

Zombies and financial distress

Estimations employing broader definitions of financially distressed firms support our baseline finding that the implemented pandemic subsidy scheme does not overly promote the existence of so-called zombie firms. In Table E3 we can see that a firm continuously making a loss (i.e. three years in a row) has about a one percent lower probability of receiving government funding. And the probability further decreases for distressed or zombie firms. In the case of the strictest definition of zombie or distressed firms the probability of being supported is more than eight percent lower.[33]

Table F3 Estimated average marginal effects for financial distress variables

VARIABLES	(1)	(2)	(3)	(4)	(5)
Loss maker (dummy)	-0.0092**				
	(0.0042)				
Distressed (dummy)		-0.0301***			
		(0.0082)			
Distressed 1 (dummy)			-0.0868***		
			(0.0164)		
Zombie (dummy)				-0.0299***	

[33] Note that the strictest definition of a distressed or zombie firm assumes that the firm is not able to cover its interest costs for three consecutive years and at the same time it creates negative value added and loss. The only difference between the distressed and zombie firm is that the definition of the zombie firms applies only to firms older than ten years.

				(0.0082)	
Zombie 1 (dummy)					-0.0863***
					(0.0165)
Controls variables:					
Sector	Yes	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes
Observations	69,141	35,728	35,723	35,708	35,719

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from measure 1 or 3. Lagged explanatory variables. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

Environmental impact

Alternative versions of our continuous environmental impact variable confirm negative marginal effect for firms having a higher negative impact. Binary dummy identifying firms belonging to the top decile in terms of their environmental effect have a four percent lower probability of being supported. Based on another definition allocating firms into quartiles of the environmental variable's distribution, we may conclude that the relationship is non-linear. Firms from the second quartile have about a one percent higher probability of receiving wage subsidies and firms from the last quartile have more than a one percent higher chance of being supported compared to firms from the first quartile.

Table F4 Estimated average marginal effects for environmental impact variables

	(1)	(2)	(3)
VARIABLES			
Environmental impact	-0.0100***		
	(0.0020)		
High enviro impact (dummy)		-0.0389***	
		(0.0066)	
Enviro impact – 2nd quartile			0.0091*
			(0.0049)
Enviro impact – 3rd quartile			-0.0016
			(0.0051)
Enviro impact – 4th quartile			-0.0125**
			(0.0061)
Controls variables:			
Sector	Yes	Yes	Yes
Size class	Yes	Yes	Yes
Region	Yes	Yes	Yes
Observations	69,141	69,141	69,141

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from measure 1 or 3. Lagged explanatory variables. 1st quartile of the environmental impact used as base value for the categorical environmental variable. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

Ownership

Further investigation into the role of ownership structure confirms the higher chance of privately owned corporations or limited liability companies to receive the COVID-19 wage subsidies. Foreign owned firms tend to have a lower probability of receiving the support compared with domestic firms, but the coefficient for the marginal effect of the FDI dummy variable is very low.

Table F5 Estimated average marginal effects for ownership variables

VARIABLES	(1)	(2)	(3)	(4)
Public ownership (dummy)	-0.0306*			
	(0.0161)			
State firm (dummy)		0.1013		
		(0.1003)		
Foreign ownership (dummy)			-0.0073*	
			(0.0041)	
Legal form – partnership				-0.0012
				(0.0232)
Legal form – cooperative				-0.1166***
				(0.0108)
Legal form – state firm				0.0966
				(0.1217)
Controls variables:				
Sector	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Observations	69,141	69,141	69,141	67,120

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from measure 1 or 3. Lagged explanatory variables. Corporations and limited liability companies used as base value for legal form. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations based on firm-level datasets described in Section 2.

Trade openness

Baseline estimates shown above suggest a positive marginal effect for exporting firms. Taking advantage of having access to both outward and inward foreign trade flows, we construct and test more trade related variables. We find that not only exporters, but also importers or two-way traders, i.e. firms that export and import at the same time, have a higher probability of receiving wage subsidies during the COVID-19 pandemic. A comparison of different types of trading firms with respect to non-trading firms shows the highest effect for two-way traders, sometimes cited as proxies for global value chain participants, that are found to outperform other firms in many aspects (Seker 2012). However, we cannot say much about the role of trade intensity. Coefficients for relative values of exports or imports (with respect to revenue) are found to be statistically insignificant.

Table F6 Estimated average marginal effects for international trade variables

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Export ratio	-0.5045					
	(1.9839)					
Import ratio		-0.2138				
		(1.1543)				
Exporter (dummy)			0.0498***			
			(0.0045)			
Importer (dummy)				0.0703***		
				(0.0043)		
Two-way trader (dummy)					0.0536***	
					(0.0052)	
Trader - exporter						0.0780***
						(0.0060)
Trader - importer						0.0511***
						(0.0075)
Trader – two-way						0.0853***
						(0.0062)
Controls variables:						
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,141	69,141	69,141	67,120	69,141	69,141

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from measure 1 or 3. Lagged explanatory variables. Non-trader used as base value for trader categories. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

Structural variables

Table F7 Estimated average marginal effects for structural variables

VARIABLES	(1)	(2)	(3)	(4)
High fixed assets share (dummy)	-0.0268***			
	(0.0025)			
High material intensity (dummy)		-0.0160***		
		(0.0026)		
High labour share (dummy)			0.0237***	
			(0.0025)	
High input intensity (dummy)				-0.0351***
				(0.0025)
Controls variables:				
Sector	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Observations	69,141	69,141	69,141	69,141

Note: The table shows coefficients of the logit regression for binary dummy representing firms that received COVID-19 government support from priority 1 or 3. Lagged explanatory variables. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

Debt related variables

Table F8 Estimated average marginal effects for debt related variables

VARIABLES	(1)	(2)	(3)	(4)
Credit ratio	-0.0130**			
	(0.0064)			
Debt service		-0.0000		
		(0.0000)		
Interest coverage			0.0000	
			(0.0000)	
High indebtedness (dummy)				-0.0459***
				(0.0028)
Controls variables:				
Sector	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Observations	33,806	12,438	52,114	69,141

Note: The table shows coefficients of the logit regression for binary dummy representing firms that received COVID-19 government support from priority 1 or 3. Lagged explanatory variables. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

Performance variables

Table F9 Estimated average marginal effects for performance variables

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Return on equity	-0.0068***					
	(0.0009)					
Return on assets		-0.0097***				
		(0.0010)				
Decline in sales (dummy)			-0.0015			
			(0.0026)			
High growth firm (dummy)				0.0062		
				(0.0467)		
Decline in value added (dummy)					-0.0098***	
					(0.0025)	
Decline in employment (dummy)						0.0163***
						(0.0035)
Controls variables:						
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,141	69,141	69,141	69,141	69,141	69,141

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from priority 1 or 3. Lagged explanatory variables. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

Efficiency variables

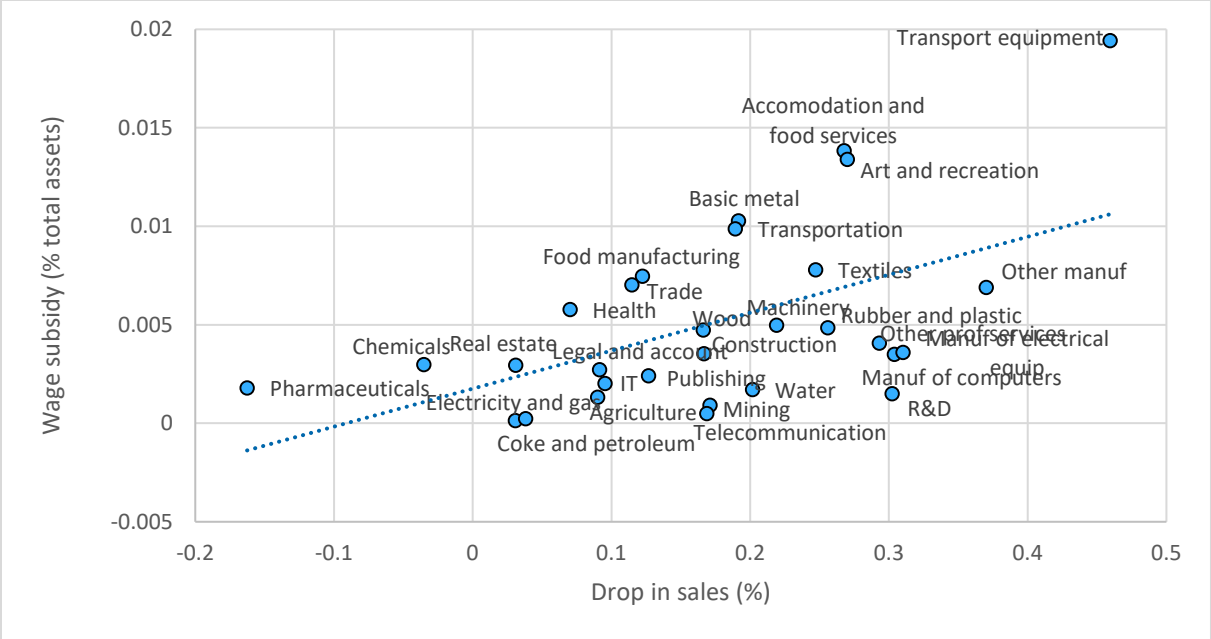
Table F10 Estimated average marginal effects for efficiency variables

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Labour productivity	0.0143***					
	(0.0013)					
Labour productivity – 2nd quartile (population based)		0.0723***				
		(0.0037)				
Labour productivity – 3rd quartile (population based)		0.0980***				
		(0.0039)				
Labour productivity – 4th quartile (population based)		0.0634***				
		(0.0039)				
Labour productivity – 2nd quartile (within sector)			0.0611***			
			(0.0037)			
Labour productivity – 3rd quartile (within sector)			0.0875***			
			(0.0038)			
Labour productivity – 4th quartile (within sector)			0.0550***			
			(0.0038)			
Profit per employee – 2nd quartile (population based)				0.0208***		
				(0.0038)		
Profit per employee – 3rd quartile (population based)				0.0386***		
				(0.0038)		
Profit per employee – 4th quartile (population based)				0.0067*		
				(0.0038)		
Profit per employee – 2nd quartile (within sector)					0.0180***	
					(0.0038)	
Profit per employee – 3rd quartile (within sector)					0.0355***	
					(0.0038)	
Profit per employee – 4th quartile (within sector)					0.0092**	
					(0.0038)	
Investment ratio						-0.0078***
						(0.0020)
Controls variables:						
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Size class	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,141	69,141	69,141	69,141	69,141	26,878

Note: The table shows average marginal effects from the logit regression for binary dummy representing firms that received COVID-19 government support from priority 1 or 3. Lagged explanatory variables. 1st quartile used as base value for categorical variables. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations based on firm-level datasets described in Section 2.

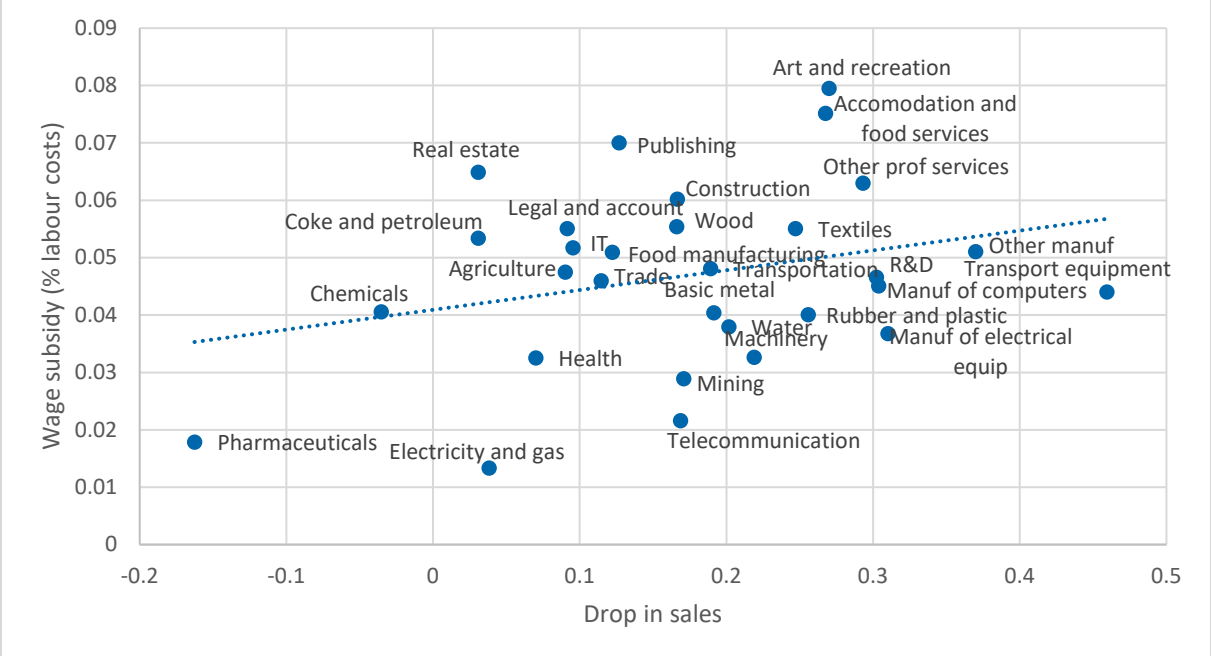
Appendix G Complementary output for the size and effect of the support

Figure G1 Mean wage subsidies (% total assets) and sales drops by industry



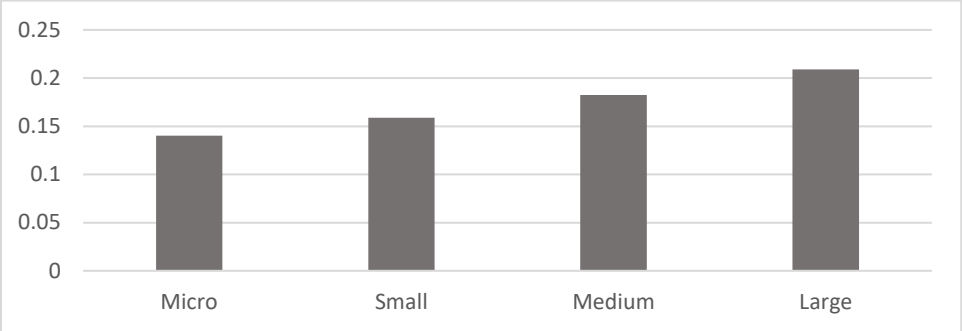
Note: Wage subsidy represents average relative firm subsidy from measures 1 and 3. Drop in sales represents average negative change in sectoral sales. Values of both variables refer to the period from March to June 2020.
Source: Authors' calculations.

Figure G2 Mean wage subsidies (% labour costs) and sales drops by industry



Note: Wage subsidy represents average relative firm subsidy from measures 1 and 3. Drop in sales represents average negative change in sectoral sales. Values of both variables refer to the period from March to June 2020.
Source: Authors' calculations.

Figure G3 Mean sales drop by size class (in %) – 1st wave of the pandemic



Source: Authors' calculations based on sectoral sales drop and firm characteristics.

Table G1 Composition of firms by size and industry in Slovakia (in %)

	Micro	Small	Medium	Large	All sizes
Agriculture	69.6	25.4	5.0	0.1	3.1
Mining	55.7	31.1	10.7	2.5	0.1
Food manufacturing	67.2	22.9	8.3	1.5	1.5
Textiles	68.4	20.6	9.0	2.0	1.0
Wood	83.0	14.0	2.4	0.6	2.4
Coke and petroleum	60.0	10.0	20.0	10.0	0.0
Chemicals	67.6	17.6	12.0	2.8	0.2
Pharmaceuticals	36.0	32.0	20.0	12.0	0.0
Rubber and plastic	59.3	24.4	12.9	3.5	1.2
Basic metal	72.5	19.9	6.7	0.9	3.3
Manuf. of computer electronics	76.7	13.4	6.9	3.0	0.4
Manuf. of electrical equipment	67.0	13.0	13.6	6.4	0.5
Machinery	55.7	24.7	13.8	5.9	0.7
Transport equipment	36.9	17.6	25.3	20.2	0.3
Other manufacturing	74.9	18.1	5.8	1.2	1.5
Electricity and gas	50.0	37.0	8.5	4.4	0.3
Water	73.0	18.8	6.4	1.9	0.6
Construction	85.9	12.3	1.7	0.2	10.3
Trade	87.1	10.9	1.7	0.3	26.5
Transportation	80.5	15.2	3.5	0.8	6.3
Accommodation and food services	80.2	17.9	1.8	0.1	5.1
Publishing	92.9	5.6	1.1	0.4	1.0
Telecommunication	71.7	16.4	8.2	3.8	0.2
IT	89.5	8.0	2.0	0.5	4.2
Real estate	90.2	8.6	1.2	0.0	4.5
Legal and accounting	93.0	6.0	0.9	0.1	12.5
R&D	82.6	13.2	4.1	0.0	0.2
Other professional services	92.2	7.0	0.7	0.1	4.5
Health	94.7	3.7	1.1	0.6	6.2
Art and recreation	87.7	8.9	2.7	0.7	1.3
All industries	85.0	11.8	2.6	0.6	100.0

Note: with respect to all firms in the industry, only firms with available information on size and industry.

Table G2 Relative firm-level support (median, % of total assets)

	Micro	Small	Medium	Large	All sizes
Agriculture	0.73	0.44	0.39	0.13	0.62
Mining	0.61	0.33	0.45	0.42	0.61
Food manufacturing	1.91	0.57	0.37	0.10	1.83
Textiles	1.70	2.02	1.80	1.40	2.36
Wood	1.58	0.86	0.63	0.25	1.45
Coke and petroleum	0.00	0.21	0.06	0.00	0.14
Chemicals	0.85	1.35	0.15	0.30	1.23
Pharmaceuticals	3.40	0.20	0.00	0.00	0.26
Rubber and plastic	1.08	0.80	0.81	0.71	1.03
Basic metal	1.29	0.87	0.75	0.52	1.13
Manuf. of computer electronics	1.19	1.08	0.73	0.40	1.20
Manuf. of electrical equipment	1.42	1.32	0.98	0.74	1.37
Machinery	1.10	0.94	1.00	0.49	0.99
Transport equipment	1.63	0.59	1.01	1.05	1.04
Other manufacturing	1.49	1.25	0.99	1.84	1.58
Electricity and gas	0.08	0.26	0.11	0.07	0.13
Water	0.65	0.58	0.41	0.06	0.78
Construction	1.42	1.05	0.79	0.54	1.53
Trade	0.82	0.55	0.52	0.50	0.93
Transportation	1.06	0.85	0.51	0.76	1.02
Accommodation and food services	1.96	1.58	1.38	0.00	3.82
Publishing	1.55	0.89	0.62	0.47	1.66
Telecommunication	0.83	0.87	0.00	0.00	0.74
IT	1.49	1.02	0.71	0.00	1.61
Real estate	0.90	0.26	0.44	0.00	0.99
Legal and accounting	1.42	1.04	0.90	7.19	1.68
R&D	1.71	1.73	0.52	0.00	1.63
Other professional services	1.45	1.09	1.47	0.00	1.79
Health	1.47	1.37	1.17	1.24	1.69
Art and recreation	1.49	0.89	0.74	1.18	1.75
All industries	1.58	1.05	0.86	0.85	1.31

Table G3 Share of firms in the risk of illiquidity (in %) - supported firms only

Firm size	Pre-COVID value	COVID value	Change	After support	Support effect	Including credit line	Credit line effect
Micro	0.11	0.25	0.13	0.19	-0.06	0.15	-0.04
Small	0.11	0.43	0.32	0.33	-0.10	0.21	-0.13
Medium	0.11	0.61	0.50	0.52	-0.08	0.29	-0.24
Large	0.14	0.70	0.56	0.62	-0.08	0.42	-0.20

Table G4 Share of firms in the risk of insolvency (in %) - supported firms only

Firm size	Pre-COVID value	COVID value	Change	After support	Support effect
Micro	0.16	0.22	0.06	0.18	-0.03
Small	0.10	0.19	0.09	0.15	-0.04
Medium	0.05	0.15	0.10	0.13	-0.02
Large	0.04	0.15	0.11	0.13	-0.02

Table G5 Share of firms in the risk of illiquidity (in %) - supported firms only

ISIC industry	Pre-COVID value	COVID value	Change	After support	Support effect	Including credit line	Credit line effect
Agriculture	0.11	0.25	0.14	0.17	-0.08	0.10	-0.07
Mining	0.13	0.30	0.17	0.30	0.00	0.26	-0.04
Food manufacturing	0.17	0.35	0.18	0.29	-0.07	0.17	-0.12
Textiles	0.14	0.47	0.33	0.31	-0.16	0.20	-0.11
Wood	0.08	0.32	0.24	0.25	-0.06	0.14	-0.11
Coke and petroleum	0.50	0.50	0.00	0.50	0.00	0.00	-0.50
Chemicals	0.12	0.10	-0.02	0.07	-0.02	0.07	0.00
Pharmaceuticals	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rubber and plastic	0.15	0.62	0.47	0.54	-0.08	0.40	-0.15
Basic metal	0.07	0.34	0.27	0.27	-0.08	0.12	-0.14
Manuf. of computer electronics	0.10	0.47	0.37	0.45	-0.02	0.38	-0.07
Manuf. of electrical equipment	0.12	0.56	0.44	0.50	-0.06	0.30	-0.20
Machinery	0.07	0.50	0.42	0.37	-0.12	0.22	-0.15
Transport equipment	0.21	0.87	0.67	0.86	-0.02	0.78	-0.08
Other manufacturing	0.09	0.48	0.39	0.38	-0.10	0.28	-0.10
Electricity and gas	0.15	0.27	0.12	0.23	-0.04	0.19	-0.04
Water	0.08	0.36	0.28	0.32	-0.04	0.24	-0.08
Construction	0.08	0.27	0.19	0.20	-0.07	0.12	-0.08
Trade	0.13	0.32	0.20	0.25	-0.07	0.17	-0.09
Transportation	0.13	0.43	0.30	0.36	-0.07	0.24	-0.12
Accommodation and food services	0.23	0.51	0.28	0.37	-0.14	0.31	-0.06
Publishing	0.04	0.12	0.08	0.08	-0.04	0.05	-0.03
Telecommunication	0.11	0.44	0.33	0.44	0.00	0.44	0.00
IT	0.06	0.13	0.06	0.09	-0.04	0.06	-0.03
Real estate	0.16	0.18	0.02	0.14	-0.04	0.13	-0.01
Legal and accounting	0.08	0.13	0.06	0.09	-0.04	0.08	-0.01
R&D	0.07	0.33	0.26	0.26	-0.07	0.26	0.00
Other professional services	0.09	0.38	0.29	0.30	-0.08	0.25	-0.05
Health	0.03	0.05	0.02	0.03	-0.02	0.03	0.00
Art and recreation	0.19	0.44	0.25	0.36	-0.09	0.30	-0.06

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