



Macroeconomics, Trade & Investment

MTI Practice Notes



The Impact of COVID-19 on Formal Firms: Evidence from Uganda

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SUMMARY

This note uses administrative tax data on firms to measure the direct impact of the lockdown on firms' profitability, employment and exit rates. It separates the economy in three sectors, which face different size shocks and considers two lockdown scenarios: one lasting three months and one lasting five months. It estimates losses to corporate income tax revenue, increases in firms' debt levels, cuts in payroll and their mitigation through wage subsidies, and aggregate output losses from firms' exit.

Overall, the impact on the economy is severe, with large falls in tax revenue, increases in debt and loss of employment. Under a three-month lockdown, we estimate that **51% of firms only remain profitable** and that about **26% of the firms in the highly-impacted sectors register losses**. **The corporate income tax revenue loss is severe and would equal 22% of its baseline in 2020**. In addition, **firms accumulate losses**

equivalent to 0.8% of GDP, suggesting that firms will need to substantially increase borrowing to survive. **Firms would cut 3.2% of total yearly payroll** - wage subsidies can save a substantial share of payroll in the medium-impact sector, but will not be able to save employment in the high-impact sector (tourism, transport, personal services), where firms can't pay their fixed costs.

This note faces important limitations: (i) it does not include the indirect impacts of the shocks which operate through firms' trade linkages, (ii) it only models a demand shock and as such firms have no issues obtaining inputs (materials, labor), (iii) Firms do not adapt to the crisis (for example by changing products, selling online etc.). Given these limitations, the numbers in this report should be considered as plausible lower bounds arising from direct effects, in partial equilibrium. Dynamic general equilibrium models of the economy, with linkages across sectors and firms, are needed to gauge longer term effects.

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The COVID19 (coronavirus) pandemic and associated containment measures are expected to cause far-reaching damage to economies around the world. Firms are suffering from reduced demand due to movement restrictions, from reduced labor supply and from constraints to sourcing material inputs. The breakup of otherwise healthy businesses in response to a temporary shock implies large social costs. Governments are therefore intent on designing emergency policies to keep businesses afloat.

We present simulations using firm-level tax records from Uganda, which vary the duration of the lockdown and the relative impact across sectors. In these simulated scenarios, demand shocks induce a loss in revenue which triggers a cut in profitability and possibly cuts in employment or even firm closure. We compare these simulations to a baseline (pre-COVID) situation, which corresponds to the last year of available administrative data. Our analysis relies on a few simple assumptions about the structure of firms' revenue and costs: we assume that firms aim to weather the shock such that they can scale their production capacity back up swiftly at the end of the lockdown. In this stylized world, firms can reduce their material costs proportionally to the drop-in demand, are reluc-

tant to reduce their labor costs as re-contracting is costly and cannot adjust their fixed costs. Finally, we assume that credit constraints prevent borrowing beyond existing loans used to cover predictable losses (i.e. losses unrelated to the shock).

We classify sectors into three impact categories - high, medium and low – depending on their expected loss in revenue during the shutdown, displayed in Table 1. This categories are based on a World Bank classification of sectors. In the high-impact category are sectors which can't operate at all during the lockdown and lose 100% of their revenue during that period. These include tourism, transportation, non-essential retail and entertainment. In the medium impact categories are sectors which operate at half capacity and lose 50% of their revenue. These include manufacturing and education. Finally, the low impact sector only loses 20% of its monthly revenue, in sectors such as essential retail, health, construction and agriculture. Naturally there is still a fair degree of heterogeneity of exposure within the categories, with some sub-sectors experiencing increased revenue. Table 2 shows the number of firms and economic weight of each of the three impact sectors: the high-impact sector contains 17% of the firms and 11% of the wage bill, the medium impact sector contains 60% of the firms and 57% of the wage bill, and the low-impact sector the remaining 23% of the firms and 33% of the wage bill.

Table 1: Sector Categories and Shocks

Categories	Sectors (e.g., detailed list of sectors in Appendix Table 4)	Expected Monthly Revenue Loss
High Impact	Accommodation and Food Service Activities, Transport, and other highly affected sectors	100%
Medium Impact	Non-essential Retail, Education and other moderately affected sectors	50%
Low Impact	Agriculture, Human Health and Social Work activities and other mildly affected sectors	20%

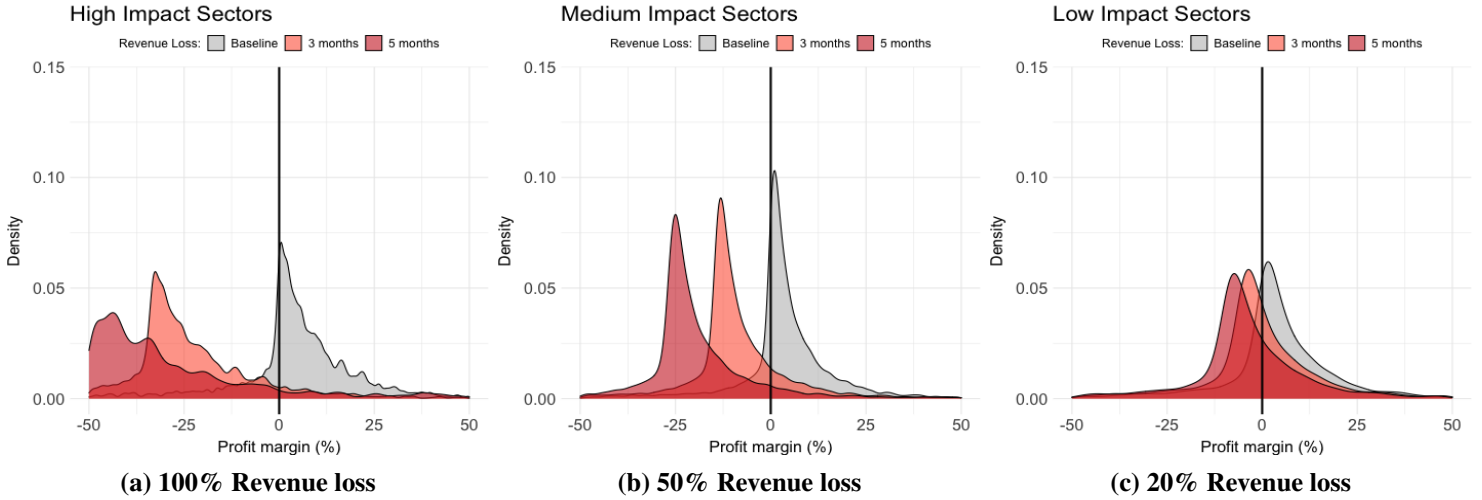
Table 2: Statistics for High, Medium and Low Impact Sectors

Categories	Aggregates				Averages				
	Number of firms	Share of firms	Revenue share	Wage bill share	Avg. size (LCU, in millions)	Avg. Profit margin	Labor costs (% total costs)	Material costs (% total costs)	Fixed costs (% total costs)
High impact	3403	17%	5%	11%	1,547	11%	15%	37%	47%
Medium impact	12093	60%	78%	57%	6,276	11%	9%	61%	26%
Low impact	4698	23%	17%	33%	3,420	9%	15%	40%	44%

In this section, we ask what share of firms becomes unprofitable, and could benefit from government support to “stay afloat” under a three-month and a five-month lockdown scenario. Assuming credit constraints, a rough indica-

tion for firms’ ability to stay afloat is a non-negative profit rate. We start by simulating scenarios where firms lose a share of their revenue, while all costs remain constant. The results are displayed in Figure 1, and show that in the high and medium impact sectors the vast majority of firms become unprofitable even under the three-month lockdown scenario.

Figure 1: Firm Profitability Under a Shock to Revenue, No Adjustment to Costs

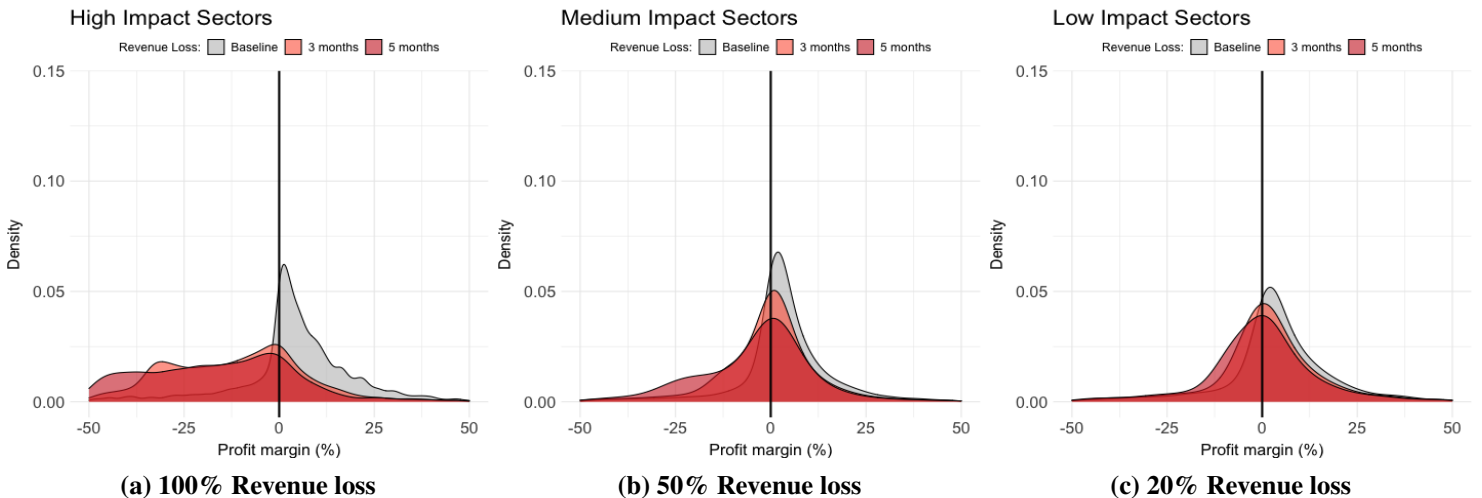


Note: These figures show the distribution of profitability, at baseline, and assuming that firms face a loss in revenue corresponding to either three or five months of loss in yearly revenue. They show the distributions holding all costs constant.

In addition to a pure revenue shock, we simulate a more realistic scenario where firms adjust their material costs proportionally to their revenue loss. The results are displayed in Figure 2: 72% of firms in the high-impact sector are profitable at baseline, a number which drops to 26% for the three-month lockdown scenario and to 16% under a five-month lockdown. The impact is less severe in the medium and low impact sectors, since the shock they face is less severe and since these sectors rely more heavily on material inputs than the

high impact sector. On aggregate, only 51% (43%) of all firms remain profitable under a three-month (five-month) lockdown. We also observe that the distribution becomes multi-modal for high impact firms: while firms using mainly material inputs and little labor or capital inputs can adjust to some extent and limit their losses, firms with a small share of material inputs in total cost have little margin to adjust and suffer much larger losses.

Figure 2: Firm Profitability Under a Shock to Revenue, Material Costs Adjust in Proportion

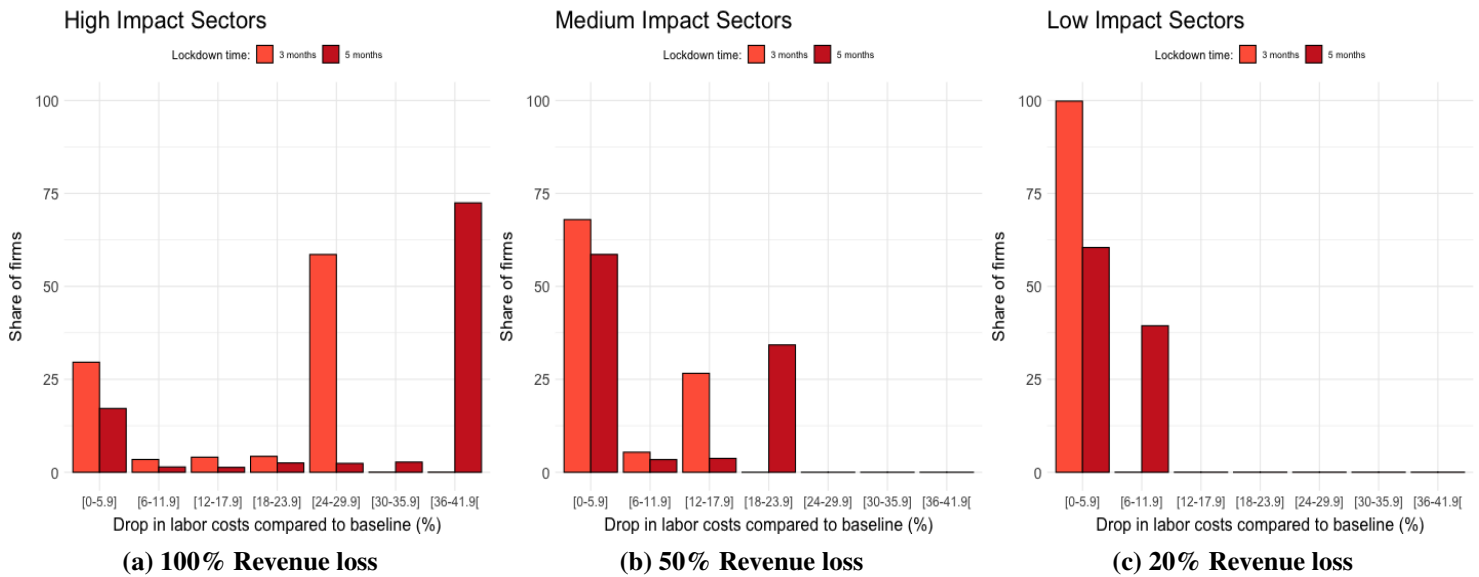


EFFECT ON EMPLOYMENT AND SIMULATIONS OF WAGE SUBSIDIES

In this section, we study by how much employers would need to slash their yearly wage bill in the absence of government support. We continue to assume that material inputs adjust first, and that firms only cut their wage bill if they are still unprofitable after the material inputs adjustment. Figure 3 shows the resulting distributions of the reduction in the yearly wage bill for a three or five month lockdown scenario. The figure is bi-modal: the first spike corresponds to firms which are sufficiently profitable at baseline: they absorb the shock and keep paying their workers. The second spike corresponds to

firms which have to cut their wage bill proportionally to the shock in an attempt to stay afloat. In the middle of the distribution, a share of firms reduces their wage bill somewhat (but less than proportionally to the shock) and achieves zero profit (or retains to pre-shock projected losses): providing even modest wage subsidies to these firms has the potential to save jobs. On aggregate, weighting by firms' yearly wage bill, this would lead to a cut in payroll of 3.2% (resp. 6.9%) of the formal economy's total yearly wage bill in the three-month lockdown [resp. five-month]. The payroll loss is of course concentrated in the high-impact sectors which would cut 16.6% (resp. 34.6%) of payroll under the three-month lockdown (resp. five-month).

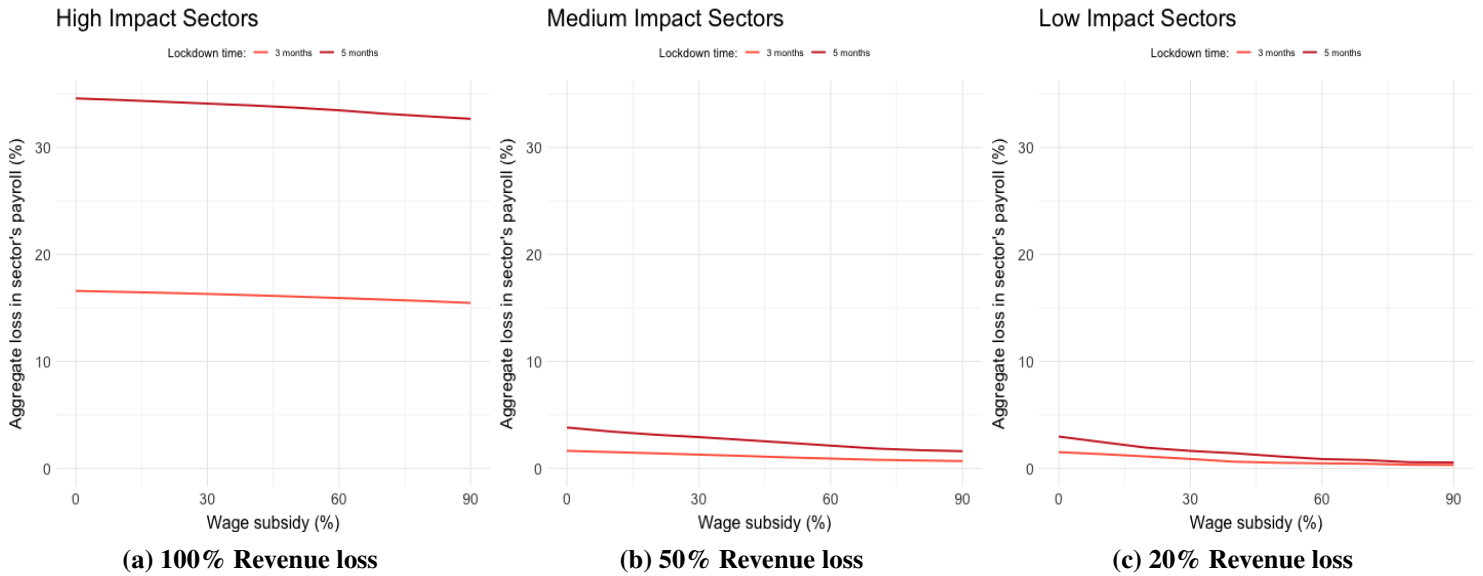
Figure 3: Wage Bill Reduction from a Revenue Shock, Material Costs Adjust Proportionally



To counteract these payroll losses and destruction of jobs, the government might consider offering wage subsidies to firms, in order to protect formal employment. Figure 4 shows each sector's aggregate payroll losses when varying the size of the wage subsidy, measured as the share of firms' payroll paid by the government. In the case of a zero-wage subsidy the loss in payroll corresponds to the numbers mentioned above. As the wage subsidy increases the loss in payroll decreases, as some firms now return to zero profits (or to their baseline losses). The impact on payroll loss is however very different across the three impact sectors: On the one hand, for the high impact sectors (Figure 3a), the loss in revenue is too severe to be compensated by wage subsidies and these firms are forced to cut employment, even for large wage subsidies.

To understand this, note that we assume that these firms still have to pay their fixed costs (e.g. rent) and a reduction in labor costs is not sufficient to counteract the revenue loss. On the other hand, wage subsidies can save payroll for the low, and especially the medium-impact sector: in the latter sector, a 60% wage subsidy over the lockdown period would roughly halve the sector's payroll loss. On aggregate, applying a 50% wage subsidy across all sectors would reduce the yearly payroll loss from 3.2% to 2.5% (three-month lockdown) or from 6.9% to 5.4% (five-month lockdown). It would take a substantial subsidy to save more payrolls: even with a 90% wage subsidy the loss in yearly payroll would be reduced to 2.2% (three-month lockdown) or to 4.7% (five-month lockdown).

Figure 4: Aggregate Sector Loss in Payroll as a function of the Size of the Wage Subsidy



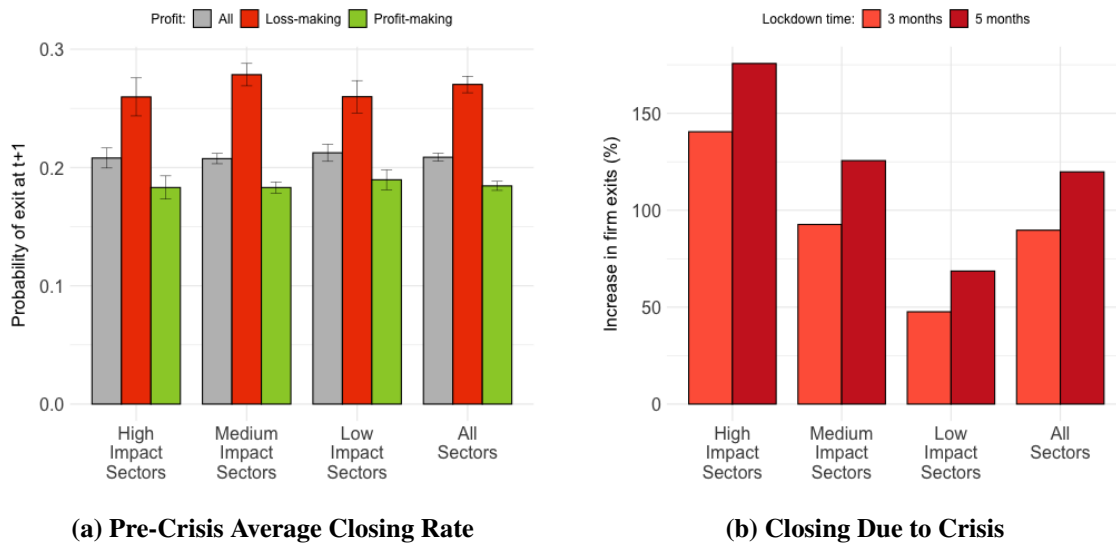
Note: These figures show to what extent a government wage subsidy for the retained labor force can absorb the aggregate loss in payroll, if the lockdown lasts three or five months. Firms readjust their decision after receiving a wage subsidy: they first adjust their material costs, and then their wage bill. It is still assumed that the drop-in wage bill can't be more than proportional to the revenue fall and that due to re-contracting costs, firms keep paying wages as long as they remain profitable.

SHARE OF FIRMS CLOSING INDUCED BY THE REVENUE SHOCK

Here we predict the increase in firms closing due to the different lockdown scenarios. We use the panel dimension of the data to measure the excess share of closing firms in pre-crisis years separately for negative and positive profit firms (and in each of the three impact sectors). Figure 5 (a) shows these shares in regular times: on average 21% of firms close in any given year; however firms which had losses in the previ-

ous year have an exit rate which is almost 10 percentage points higher than firms which had positive profits. In our previous analysis, we estimated the share of firms which have negative profits due to the crisis, for each impact sector. We thus combine these results to measure the percentage increase in closing firms induced by the crisis, by multiplying the share of newly loss-making firms with their excess exit rate. We show the results for the three and five month lockdown scenario in 5 (b): under a three (five) month lockdown scenario, the share of closing firms from the formal economy increase by 90% (120%).

Figure 5: Share of Closing Firms



Note: Panel (a) shows the average exit probability for all firms, and then for loss-making and profit-making firms, using panel data before the crisis. Panel (b) shows the percentage increase of firms' exit induced by a three or five month output loss, compared to baseline levels.

AGGREGATE NUMBERS AND IMPACTS ON THE ECONOMY

The impact on the overall economy is severe, with large falls in tax revenue, increases in debt and loss of employment. Table 3 summarizes the key numbers for the three and five months lockdown scenarios and the aggregate impact on the economy. 51% or less of firms remain profitable after the shock, and almost all firms in the highly impacted sectors register losses. The Corporate income tax revenue loss is severe, reaching 22% overall in the three-month shock scenario and 35% in the five-month shock scenario. In the high-impact sectors, almost all CIT revenue is lost. This is because, despite the temporary nature of the shock, the shock generates large losses which are counted against the profits made during the remainder of the year. The absolute increase in losses is 0.8% [1.7%] with the three-month shock [five-month shock], sug-

gesting that firms will need to substantially increase borrowing. Payroll losses are also substantial, ranging between 3.2% and 6.9% of the annual wage bill - wage subsidies can safeguard some employment, especially in the medium-impact sectors: a 50% wage subsidy would reduce the payroll losses from 1.6 to 1.0% [3.8% to 2.4%] in the three [five] months lockdown scenario. Increases in firm exit are relatively small, meaning that associated output and payroll losses are also small, but this is likely an under-estimate: Our panel data features only a smaller number of firms that experience large revenue losses and hence allow us to estimate the effect, presumably because most such firms exit the panel. Our estimates mean that the size of government rescue packages for firms and workers needs to be large, and the budget support from donors to lower-income countries even larger, to compensate for the massive loss in tax revenue.

Table 3: Aggregate Impacts by Lockdown Duration and by Impact sectors

		High Impact		Medium Impact		Low Impact		All Sectors		
		3 months	5 months	3 months	5 months	3 months	5 months	3 months	5 months	
1	Share of firms profitable at baseline	71.7		77.9		71.9		75.5		
2	Share of firms still profitable (materials adj.)	26.4	15.8	55.8	48.1	54.4	47.8	50.5	42.6	
3	CIT revenue loss relative to baseline (%)	55.4	73.5	23.5	38.0	11.8	19.0	22.2	35.0	
4	Absolute losses increase (% GDP)	0.4	0.8	0.2	0.5	0.2	0.3	0.8	1.7	
5	Payroll Loss	No wage subsidy	16.6	34.6	1.6	3.8	1.5	3.0	3.2	6.9
		50% wage subsidy	16.1	33.7	1.0	2.4	0.5	1.1	2.5	5.4
		90% wage subsidy	15.5	32.7	0.7	1.6	0.3	0.5	2.2	4.7
6	Percentage increase in firms' exit relative to baseline	140.5	175.7	92.6	125.6	47.6	68.6	89.7	119.8	
7	Permanent output loss from firm exit (% GDP)	0.1	0.1	0.3	0.4	0.1	0.1	0.5	0.6	
8	Permanent payroll loss from firm exit (% GDP)	0.8	1.0	5.9	8.0	0.8	1.2	7.4	10.1	

Table 4: Sectors and Impact Categories

SECTORS (ISIC Rev 4 code)	High - Medium - Low Impact
A AGRICULTURE, FORESTRY AND FISHING	Low Impact
B MINING AND QUARRYING	Low Impact
C MANUFACTURING	Medium Impact
D ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	Medium Impact
E WATER SUPPLY, SEWERAGE, WASTE MANAGEMENT	Medium Impact
F CONSTRUCTION	Medium Impact
G WHOLESALE AND RETAIL TRADE	Medium Impact
H TRANSPORTATION AND STORAGE	High Impact
I ACCOMMODATION AND FOOD SERVICE ACTIVITIES	High Impact
J INFORMATION AND COMMUNICATION	Low Impact
K FINANCIAL AND INSURANCE ACTIVITIES	Medium Impact
L REAL ESTATE ACTIVITIES	Medium Impact
M PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	Low Impact
N ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	Low Impact
O PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	Low Impact
P EDUCATION	Medium Impact
Q HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	Low Impact
R ARTS, ENTERTAINMENT AND RECREATION	High Impact
S OTHER SERVICE ACTIVITIES	High Impact

Calculation details for Table 3

Each figure is calculated for a specific Impact category (High, Medium, Low impact and All sectors) and for a specific lockdown scenario (three and five months):

1. Share of firms profitable at baseline: (1) number of firms with positive profit margin before output shock, divided by (2) total number of firms, expressed as percentage.
2. Share of firms still profitable (materials adj.): (1) number of firms with positive profit margin, after material costs adjustment proportional to the shock, divided by (2) total number of firms, expressed as percentage.
3. CIT revenue loss relative to baseline: (1) sum of all firms' profits at baseline multiplied by the corporate income tax rate minus (2) sum of all firms' profits after lockdown multiplied by the corporate income tax rate, divided by (1) and expressed as percentage.
4. Absolute losses increase (% GDP): (1) absolute value of the sum of all firms' losses after lockdown minus (2) absolute value of the sum of all firms' losses at baseline, divided by (3) GDP (current LCU of the same year), expressed as percentage.
5. Payroll Loss, at different wage subsidy rate: (1) sum of all firms' new labor costs under lockdown, divided by (2) the sum of all firms' labor costs at baseline, expressed as percentage.
6. Percentage increase in firms' exit relative to baseline: (1) exit rate of firms after lockdown minus (2) exit rate of firms at baseline, divided by (2) and expressed as percentage.
7. Permanent output loss from firm exit (% GDP): (1) additional exit rate relative to baseline multiplied by (2) the sum of all firms' turnover at baseline, divided by (3) GDP (current LCU of the same year), expressed as percentage.
8. Permanent payroll loss from firm exit (% GDP): (1) additional exit rate relative to baseline multiplied by (2) the sum of all firms' labor costs at baseline, divided by (3) GDP (current LCU of the same year), expressed as percentage.