



Macroeconomics, Trade & Investment

MTI Practice Notes



Simulating the Impact of COVID-19 on Formal Firms in South Africa

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SUMMARY

This note uses administrative tax data for formal firms to measure the direct impact of lockdown restrictions on firms' profitability, employment, and exit rates. We separate the economy into three categories, according to the size of the shock experienced, and consider two lockdown scenarios: one lasting three months and one lasting five months. These scenarios are clearly stylised and they do not necessarily reflect the reality of any particular country. They are, however, not too distant from the South African reality, where an initial strict lockdown was imposed for two months, followed by several months of easing restrictions and reduced economic activity. We estimate losses to corporate income tax (CIT) revenue, increases in firms' debt levels, cuts in employment and their mitigation through wage subsidies, and aggregate output losses from firms' exit.

Overall, the estimated impact on the South African economy is severe, with large falls in tax revenue, increases in the number of loss-making firms, and declines in employment. Under a three-month lockdown scenario, we estimate

that only 32.8% of firms remain profitable, compared to the 54% of firms which were profitable pre-COVID.⁴ Total CIT collections are estimated to fall by 35% after a three-month lockdown. This is in line with adjustments to CIT forecasts made by South African government in the recent Medium Term Budget Policy Statement, where CIT forecasts were revised downwards by 30% relative to pre-COVID Budget predictions.⁵ Under the assumption of a longer lockdown, we may see losses up to 53%. In addition, the simulations show that firms might accumulate losses equivalent to 8.5% of GDP, indicating that many firms will need to increase borrowing to survive the pandemic. After adjusting their material costs in proportion to revenue losses, on average, firms would still need to cut at least 2.5% of their total yearly wage bill to try to regain profitability. We also estimate an increase in the firm exit rate, relative to the pre-COVID baseline, of 35%, which implies a permanent payroll loss equivalent to 0.7% of GDP and a permanent turnover loss equivalent to 11.5% of GDP.

Using administrative tax data to model the macroeconomic impacts of a shock offers several advantages. These

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³We thank Hayley Reynolds and Aalia Cassim (National Treasury, South Africa), and Pierre Bachas, Anne Brockmeyer, and Camille Semelet (World Bank) for their substantial inputs. The findings and conclusions are those of the authors; they do not represent the views of the International Centre for Tax and Development or the World Bank, their member countries or the countries mentioned in this study. We are grateful to the National Treasury in South Africa for facilitating access to the data used in this study. We thankfully acknowledge funding by the World Bank through the Knowledge of Change Trust Fund and the Fiscal Policy and Sustainable Growth Unit.

⁴For this analysis, we exclude firms that identify as dormant on their tax return. A firm is considered to be "dormant" if it is registered for tax, but is not actively trading and/or did not receive any income or incur any expenses in the year of assessment.

⁵National Treasury, 2020: pg. 27

data often contain the most recent information on firms' balance sheets, they include the largest firms which might be missed in survey data, and tax data are typically the only panel of firms containing the entire population of firms that are registered with the revenue authority. While this is only a portion of the firms that are active in the economy (some are fully informal), it is a relevant group to study, especially when estimating revenue implications.

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 are assumed to have no issues obtaining inputs (materials, labour), (iii) the model is static, so firms do not adapt to the crisis (for example by changing products, selling online etc.), (iv) profits in administrative tax data may be under-reported for tax minimisation purposes, so that firms in our data would exhibit artificially

low profitability in the pre-COVID baseline,⁶ and (v) we do not account for the effect of policies (other than fictitious wage subsidies) which might also be introduced to support firms (for example, deferred tax payments, tax exemptions for highly-impacted sectors, or special tax deductions). In addition, when calculating the tax base for firms, we have excluded losses carried forward from previous years. In South Africa, assessed losses can be carried forward indefinitely. We exclude these from taxable income to allow comparability across countries, as the treatment of losses varies substantially between different jurisdictions. Taking into account caveats (i)-(vi), the numbers in this report could under- (or over-) estimate the direct impact on tax revenues, without taking into account the full set of government support policies. Dynamic general equilibrium models of the economy, with linkages across sectors and firms, are needed to gauge longer term effects.

⁶We do not observe potential under-reporting directly, and thus use the administrative tax data as is.

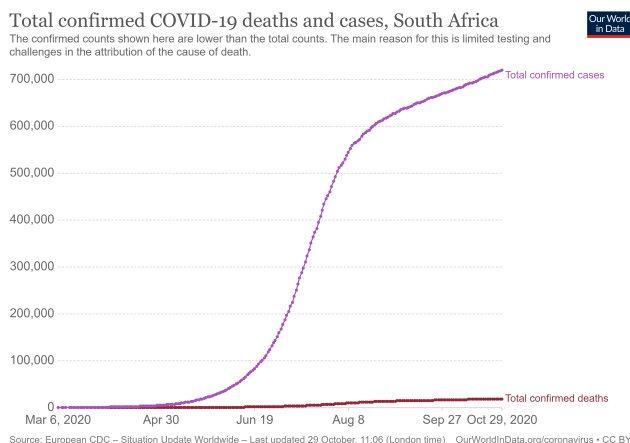
1 COVID-19 AND SOUTH AFRICA

South Africa confirmed its first case of COVID-19 on 5 March 2020 and a nationwide lockdown was introduced from 26 March. Initial containment measures included social distancing, partial travel bans, school closures, and screening at ports of entry. From midnight on March 26, all industries except those deemed essential to maintain the supply of food, medicine, and key services were closed. Public gatherings, outdoor exercise, and the sale of cigarettes and alcohol were banned. From May 1 a phased easing of the lockdown began and by June 1 most economic activities were allowed to reopen, subject to strict health and social distancing practices (alcohol and cigarette sales remained prohibited until August). Restrictions on domestic and international travel have gradually been lifted since August, and since November 11 international travel has been open to all countries, subject to the presentation of a negative COVID-19 test result. The government have assisted citizens affected by COVID-related job losses and shut-downs through the Unemployment Insurance Fund, temporarily higher social grant amounts, and a temporary new grant created to support those who do not receive other benefits. Relief funds were made available for SMEs facing distress, especially in the tourism and hospitality sectors. Four main tax measures have been introduced: (1) an employee tax subsidy for those earning below R6500 (US\$ 395) per month; (2) increased frequency of tax incentive reimbursements; (3) SMEs are automatically permitted to defer part of their PAYE and corporate tax liabilities without incurring penalties;⁷ and (4) additional tax

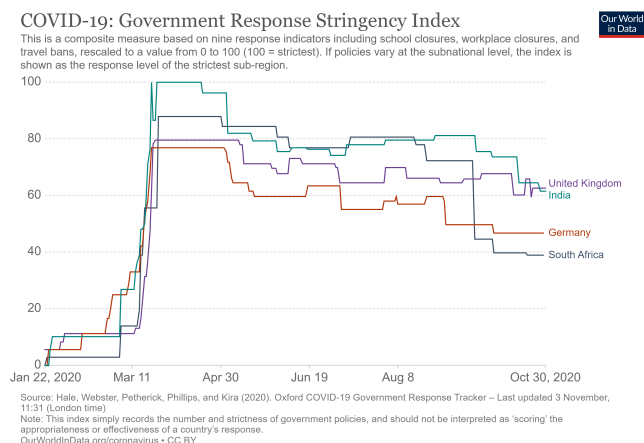
deductions for donations to COVID-19 relief organisations.

Prior to the outbreak of COVID-19, South Africa's economy was already in a delicate position. GDP growth was slow, reaching just 0.2% in 2019, as a severe drought stifled agricultural output and electricity shortages curbed manufacturing and mining activity. Gross government debt amounted to 63.3% of GDP in the 2019/20 financial year, and has rapidly risen to 82% in the current financial year. Steep currency depreciation and sovereign credit downgrades have further knocked the wind out of South Africa's sails. The Medium Term Budget Policy Statement indicated that South Africa experienced its worst recorded contraction over the second quarter. Real GDP declined by an annualised 51%, with output declining in all major sectors, except agriculture which seemed relatively unaffected.⁸ Overall, the National Treasury has forecast a contraction in GDP of 7.8% for 2020, recovering to real GDP growth of approximately 3% in 2021.⁹ Declining household and business income, along with restrictions on movement, have resulted in the loss of 2.2 million jobs, on top of already high unemployment. These losses will disproportionately affect poorer citizens, many of whom already live hand-to-mouth and cannot work from home. Although the economy has begun to recover from the initial hard lockdown, the National Treasury expect gross tax revenue to be 17.9% lower than collections in 2019/20, or R313 billion (US\$ 19 billion) lower than pre-COVID projections. Further, the tax-to-GDP ratio is expected to decline, from 26.3% in 2019 to 22.9%.¹⁰

Figure 1: COVID-19 Spread and Response in South Africa



(a) COVID-19 Spread



(b) Stringency of Government Response

Note: The purple line in panel (a) shows the cumulative number of confirmed COVID-19 cases and the red line shows the total confirmed deaths, until October 29 2020. Panel (b) shows how the governmental response has changed over time according to the Government Stringency Index – a composite measure of the strictness of policy responses. This includes school and workplace closures, restrictions on public gatherings, transport restrictions, and stay-at-home requirements. A higher score indicates a stricter response (i.e. 100 = strictest response).

⁷Larger businesses can request the same treatment from the South African Revenue Service, but permission is not automatically granted.

⁸Stats SA, 2020

⁹National Treasury, Medium Term Budget Policy Statement, 2020

¹⁰National Treasury, 2020

2 MODELLING ASSUMPTIONS AND CATEGORISATION OF SECTORS BY IMPACT

The COVID-19 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 labour 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 South Africa, varying the duration of the lockdown and the relative impact across sectors. In these simulated scenarios, demand shocks induce a loss in sales revenue, in turn triggering a reduction in profitability, and possible cuts in employment or even firm closure. We compare these simulations to a baseline (pre-COVID) situation, using administrative data from 2017 (the last year of full available data). We assume that firms produce a unit of output with fixed proportions of capital, material, and labour inputs. We further 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 stylised world, firms are assumed to reduce their material costs proportionally to the drop in demand, but are reluctant to reduce their labour costs as re-contracting is costly. Thus, labour costs are only adjusted to the extent that it is necessary to avoid making losses. Firms which can absorb the demand shock without becoming unprofitable therefore do not lay off workers, even if their profits decrease compared to the pre-COVID scenario. We finally assume that fixed costs are non-adjustable, to capture the idea that firms need to continue to pay rent and have to honour debt payments.

We use information on firms' economic sector to assign firms to three categories - high, medium, and low – which we assume face a 100%, 50% or 20% drop in

demand respectively during the lockdown period. These classifications, displayed in Table 1, largely follow the taxonomy by Vavra (2020), with some modifications reflecting idiosyncrasies of the COVID-19 regulations in force in South Africa. In our simulations, we assume that firms in high impact sectors (e.g. tourism, entertainment, and tobacco manufacture) experience a 100% loss in sales revenue during the lockdown. Firms in medium impact sectors (e.g. education, certain retail activities) are assumed to operate at half their capacity, thus losing 50% of sales. Finally, the low impact sector is assumed to lose just 20% of its monthly sales, which is applied to sectors such as essential retail, health services, and agriculture. Naturally, there is still a fair degree of heterogeneity of exposure within the categories, with certain sub-sectors even experiencing increased revenue. However, since we use annual corporate tax data, this way of modelling affords a lot of flexibility and does not have to correspond to the exact length of the lockdown. For instance, the five-month lockdown scenario could also reflect a three-month “strict” lockdown, followed by a longer period of partial lockdown with lighter containment measures. South Africa’s strict lockdown was only in place for two months, and the latest GDP data has indicated that certain sectors are close to pre-COVID production levels. The five-month scenario that we model is therefore unlikely to transpire.

Table 2 shows the distribution of firms and their relative economic weight for each of the three impact categories. The high impact category accounts for 15% of firms and 9% of the wage bill, the medium impact category accounts for 59% of firms and 53% of the wage bill, and the low impact category the remaining 31% of the firms and 38% of the wage bill. While the medium impact category accounts for the bulk of sales revenue, larger firms tend to be in the lower-impact sectors. Average profit margins are relatively slim at just over 12% for all sectors. This indicates that (formal) South African firms would not be able to sustain reduced sales revenue for a significant period of time without incurring losses.

Table 1: Sector Categories and Shocks

Categories	Sectors Examples (detailed list of sectors in Appendix Table 4)	Expected Monthly Sales Revenue Loss
High impact	Accommodation, transportation, tourism, and other highly affected sectors	100%
Moderate impact	Manufacturing activities, education, construction and other moderately affected sectors	50%
Low impact	Human health, social services, administrative and support services and other mildly affected sectors	20%

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

	Number of firms	Share of firms	Sales revenue share	Wage bill share	Avg. size (ZAR, in millions)	Avg. profit margin	Labour costs (% total costs)	Material costs (% total costs)	Other costs (% total costs)
High impact	61,486	15%	6.5%	9.3%	22.75	11.0%	22.5%	20.3%	56.0%
Medium impact	245,129	59%	62.5%	52.9%	54.83	11.9%	16.0%	25.7%	57.6%
Low impact	108,666	26%	31%	37.8%	61.24	14.3%	24.7%	11.8%	62.1%
All sectors	415,282	100%	100%	100%	51.76	12.4%	19.2%	21.2%	58.6%

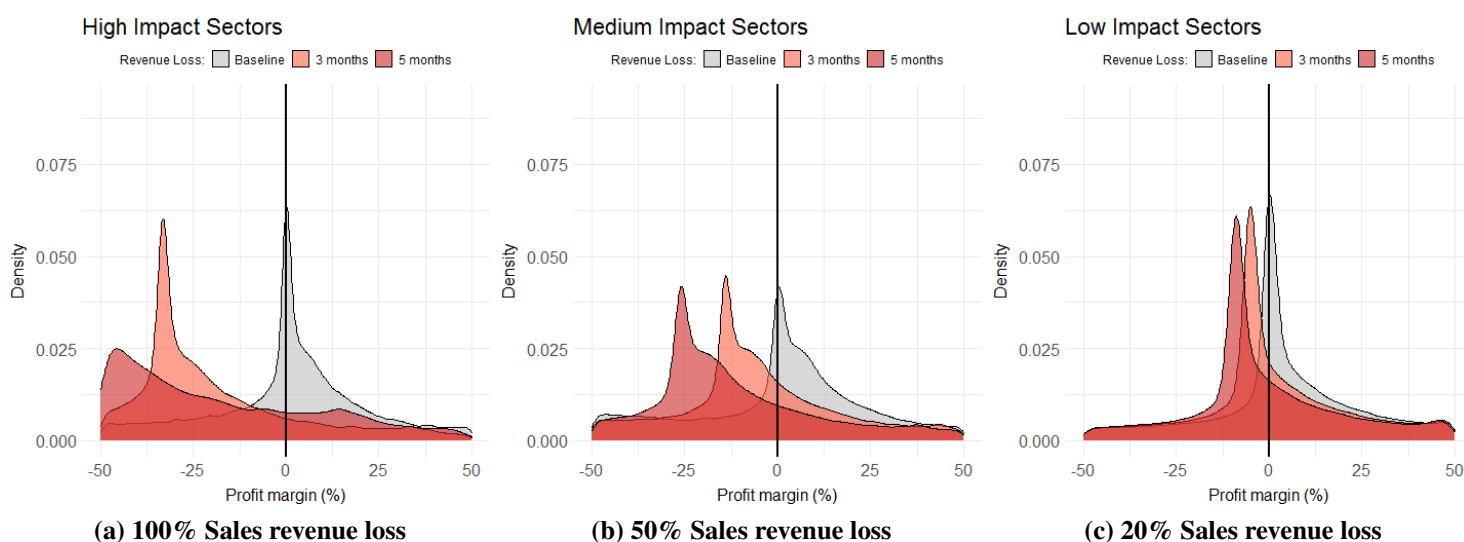
Note: Other costs is a residual category, which we assume largely reflects fixed costs, however this may include variable costs other than material and labour input costs.

3 EFFECT ON FIRMS' PROFITABILITY

We first examine how the lockdown-triggered sales revenue might impact firms' profitability, and the adjustments firms might make to absorb the shock. Assuming credit constraints, a rough indication for firms' ability to stay afloat is a non-negative profit rate. We start by simulating scenarios where firms lose a share of their sales revenue, while all costs remain constant. The results are displayed in Figure 2, and show that in all sectors the vast majority of firms become unprofitable even under the three-month lockdown scenario. Across all sectors, on average 54% of all firms are profitable at the baseline, which declines to 28.8%

after a three-month lockdown, or 22.3% after five months. Unsurprisingly, these effects are most pronounced for high impact sectors - while 52.6% of these firms are profitable at the baseline, just 15.2% (9.1%) remain profitable after three (five) months of no sales. The grey bars in Figure 2 indicate that, across all sectors, there is a high degree of bunching around near-zero profit margins at the baseline (Table 2 also indicates relatively small average profit margins across all three impact sectors). Narrow profit margins pre-COVID suggest that many South African firms are highly vulnerable to demand shocks, and so even small reductions in sales revenue push many firms into a loss-making position.

Figure 2: Firm Profitability After a Shock to Sales Revenue, No Adjustment to Costs



Note: These figures show the distribution of profitability, at the baseline, and assuming that firms face a loss in revenue corresponding to either 3 or 5 months of loss in yearly revenue. All costs constant are held constant.

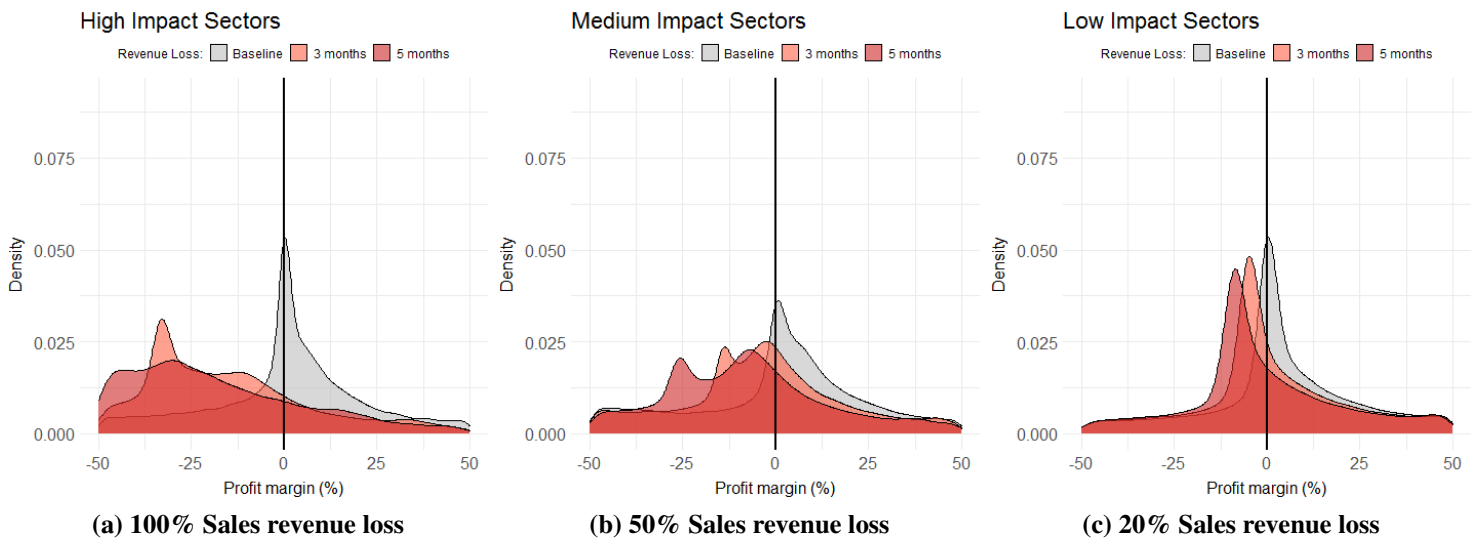
In addition to a pure demand shock, we simulate a more realistic scenario under which firms adjust their material costs proportionally to their sales revenue loss. We allow firms to adjust their material costs in proportion to the size of the shock - for instance, if annual revenues

fall by 12.5%, as in the medium-impact category for the three-month lockdown scenario, then firms can reduce the material costs by 12.5% as well. The results are displayed in Figure 3: relative to the baseline share of 54% of profitable firms, once firms adjust material costs, 32.4% of firms

are profitable under the three-month lockdown scenario and 26% under the five-month scenario. The impact on profitability remains most severe for firms in the high impact sectors, which display a higher proportion of other costs at the baseline (where other costs are assumed to reflect largely fixed costs, see Table 2). Profitability among these firms this drops from 52.5% to just 18.7% (11.3%) after three (five) months of lockdown, after accounting for proportional material cost adjustments. The medium impact sector is best able to cushion the shock through material cost adjustments, with profitabil-

ity dropping by 18 percentage points after three months of lockdown (32.3% of firms remain profitable, against 50.5% of firms at the baseline). This is largely due to the higher share of material costs in total costs for medium impact firms - 25.7% of total costs, against 20.3% for high impact firms and 11.8% for low impact firms (see Table 2). Despite these adjustments, between 60 and 80% of firms are still incurring losses, with especially thick left tails for the high and medium impact sectors (see Figure 3), illustrating that these losses are substantial.

Figure 3: Firm Profitability After a Shock to Sales Revenue, Material Costs Adjust in Proportion



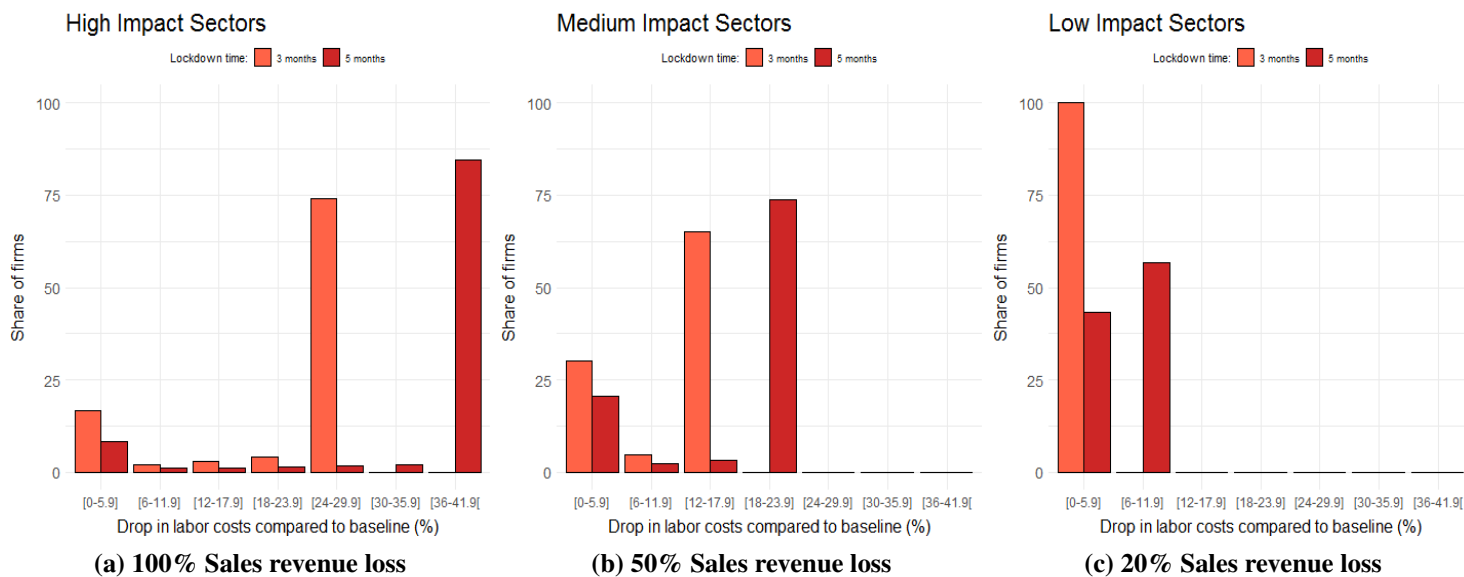
Note: We allow firms to adjust their material costs in proportion to the shock, but hold labour and other costs constant.

4 EFFECT ON EMPLOYMENT AND WAGE SUBSIDIES SIMULATIONS

Firms that continue to make losses after adjusting their material costs will need to reduce their payroll, either by laying off formal employees or decreasing wages. We assume that firms only cut labour costs if they are still unprofitable after adjusting their material inputs. The mechanics of the simulation are similar, with one modification: we assume that firms reduce their payroll *at most* in proportion to the revenue shock, and adjust until they obtain either zero profits (if they previously made profits) or the baseline level of losses (for previously loss-making firms). We simulate an adjustment to the total payroll, rather than number of employees (see Figure 4). This ensures that the methodology is comparable across countries, as not all countries capture employment numbers in their tax data. Thus, our estimates might represent a lower bound for the percentage loss in the number of jobs if lower-paid employees are more likely to be laid off.

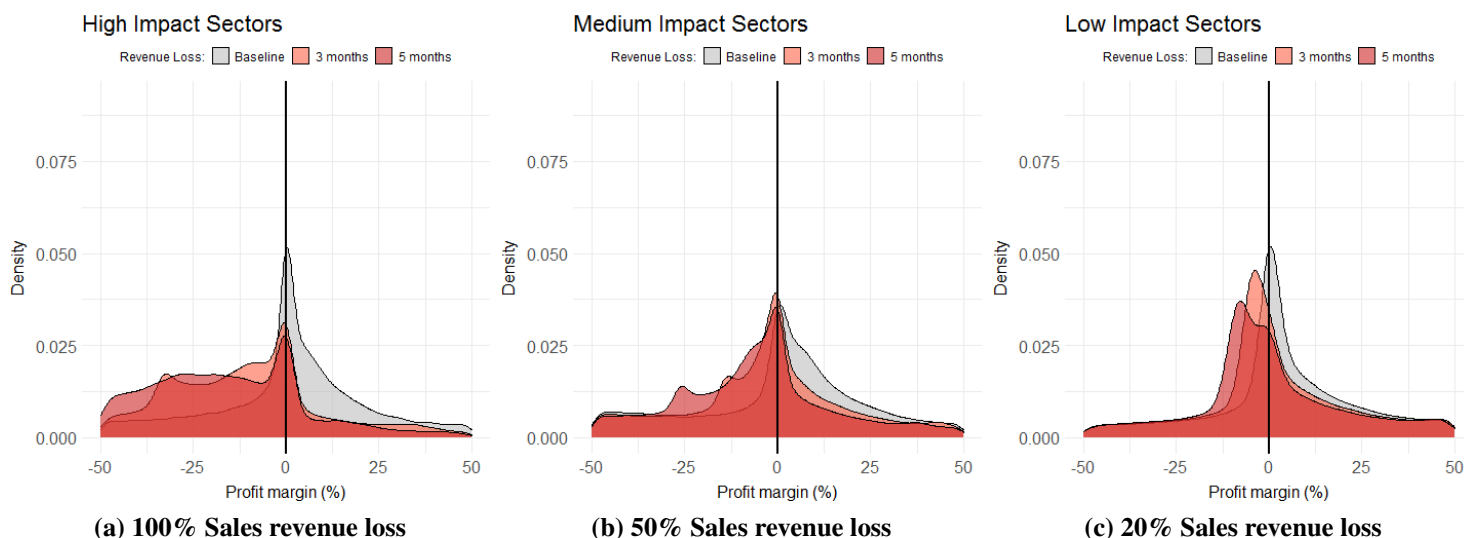
After a three-month lockdown, we find that the average firm would need to cut 2.5% of their annual wage bill. The effect is most dramatic for high impact sectors, where firms would need to substantially reduce their wage bills to regain profitability - the average payroll cut required is 8.4% (20%) under the three-month (five-month) lockdown scenario. In contrast, on average, firms in low impact sectors can absorb the shock by reducing their wage bill by just 0.7% (1.3%) on average for a three-month (five-month) lockdown. Figure 5 shows the distributions of firm profitability once these labour cost adjustments have been made. On average, across all sectors, 36.3% (30%) of firms are still profitable under the three-month (five-month) lockdown scenario. This is an improvement of 4 percentage points against the scenario where only material costs are adjusted. Since we assume that firms cannot adjust their fixed costs (captured as a residual in our model), a large number of firms cannot regain profitability, even after fully adjusting material and labour costs. This reflects the fact that South African firms have a fairly high share of fixed costs in total costs - 58.6% on average (see Table 2).

Figure 4: Wage Bill Reduction Needed in Absence of Government Support to Absorb Shock (Material Costs Adjust Proportionally)



Note: These figures show the extent to which firms would reduce their wage bill to stay afloat, after already adjusting their material costs proportionally to the shock. It is assumed that the drop in wage bill cannot be more than proportional to the sales revenue fall and that due to re-contracting costs, firms keep paying wages as long as they remain profitable.

Figure 5: Firm Profitability After a Shock to Sales Revenue, Material and Labour Costs Adjust



Note: We allow firms to adjust their material and labour costs to compensate for the shock, but hold other costs constant.

WAGE SUBSIDY SIZE AND EMPLOYMENT EFFECTS

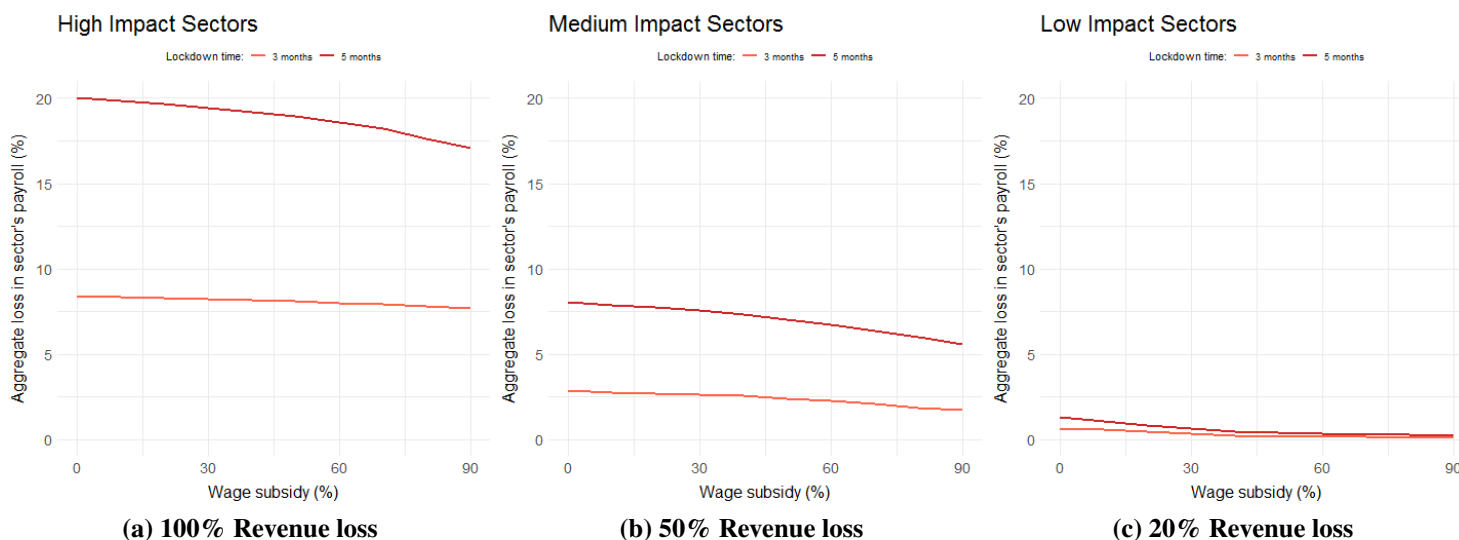
To counteract payroll losses and job destruction, we model the effect of a (fictitious) government-sponsored wage subsidy to protect formal employment. The simulated subsidy ranges from 0% (no subsidy) to 90% of salaries paid for by the government for the lockdown period. Figure 6 shows each sector's aggregate payroll losses while varying the size of the wage subsidy, measured as the share of a firm's payroll paid by the government over the lockdown period. In the case of no wage subsidy (at the extreme left of the graphs), the loss in payroll corresponds to the numbers above. As the wage subsidy increases, the loss in payroll de-

creases, as some firms now return to zero profits (or to their baseline losses). For the worst-affected, high impact sectors, a 50% wage subsidy for three (five) months reduces payroll losses by 0.3 (1.1) percentage points relative to payroll reductions in the absence of a subsidy. A 90% wage subsidy performs slightly better, reducing payroll losses by 0.7 (or 2.9) percentage points. The muted effect of even substantial wage subsidies is explained by the fact that we assume that firms must still pay their other costs (such as rent and debt repayments), and so the loss in revenue is too severe to be compensated for by reduced labour costs. Across all sectors, even a 90% wage subsidy for three (five) months only

reduces payroll losses from 2.5% to 1.7% (6.6% to 4.6%). This limited impact reflects the relatively small contribution that (declared) labour costs makes to total costs for formal South African firms – on average, the share of labour costs in

total costs is 19.2% (see Table 2). This broadly aligns with results seen in other countries where we have modelled the same scenarios, for instance in [Rwanda](#) and [Eswatini](#).

Figure 6: Aggregate Loss in Employment as a Function of Wage Subsidy Size, By Sector



Note: These figures show to what extent a government wage subsidy for the retained labour force can absorb the aggregate loss in payroll, if the lockdown lasts 3 or 5 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 cannot 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.

5 FIRMS' EXIT RATES INDUCED BY THE REVENUE SHOCK

We now estimate the potential increase in exit rates for firms, since despite adjusting material and labour costs, some firms remain unprofitable (or are more unprofitable) following the lockdown. This would especially apply to firms with high fixed costs and those receiving a large revenue shock, particularly if their pre-COVID profitability was low. Exits are primarily thought of as firms closing their operations and filing for bankruptcy, but could also refer to firms leaving the formal sector and thus disappearing from corporate tax data. We exploit the panel dimension of the data to measure the exit rate in pre-crisis years. We calculate the average exit rate for both loss-making and profit-making firms prior to 2020, as well as the overall average exit rate, for each of the impact categories.

At the baseline, the probability of the average firm exiting is 11.1%. Figure 7 (a) shows that, pre-COVID, profit-making firms have a slightly lower probability of exiting than loss-making firms - 10.4% against 11.9%, on average.¹¹ We then apply the exit rates for loss-making and profit-making firms respectively, after shifting the profitability distribution through the coronavirus-induced revenue shock and labour and material cost adjustments, to obtain the overall share of firms now exiting. The results for the three- and five-month

lockdown scenarios are shown in Figure 7 (b): under a three-month (five-month) lockdown scenario, firm exits from the formal economy increase by 34.7% (48.3%). This loss of firms is particularly acute for the high impact sector, with percentage increases in firm exits of 58.8% (73.4%) compared to the average pre-crisis year.

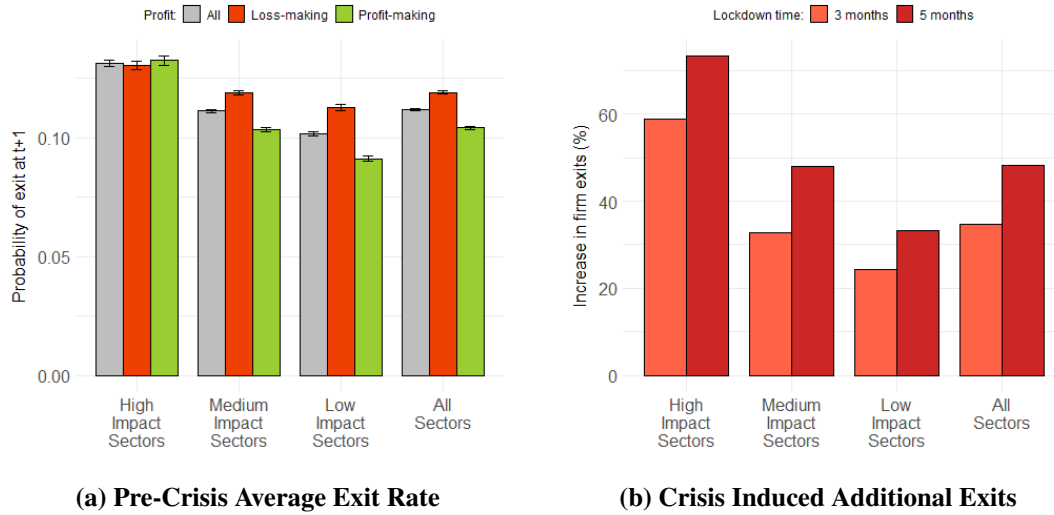
6 AGGREGATE NUMBERS AND IMPACTS ON THE ECONOMY

Reductions in firms' profitability and employment will put significant pressure on the government's public finances. Table 3 summarises the key results for the three-month and five-month lockdown scenarios and the aggregate impact on the economy. From the 54% profitable firms at the pre-COVID baseline, only 32.8% of all firms remain profitable after the shock, once adjustments to material costs are made. The resulting increase in losses equates to 8.5% of GDP for the three-month shock, a 63.2% increase in losses relative to the baseline. This suggests that firms will need to substantially increase borrowing. The associated CIT revenue loss is substantial, reaching 35% across all sectors in the three-month lockdown scenario, and over 52% in the more severe five-month scenario. In 2018, CIT accounted for 17% of total tax revenue (equivalent to 5% of GDP).¹² A 35% decline in CIT revenues would thus have a significant impact on the resources available to the South African government, adding to significant existing fiscal pressures.

¹¹We assume here that any firm that fails to file a declaration or files a nil declaration has "exited". As a result, "exits" might capture firm behaviour other than true exits, such as strategic nil-filing or changes of TIN number.

¹²UNU-WIDER/ICTD Government Revenue Dataset

Figure 7: Firms' Exit Rate



Note: Panel (a) shows the average exit probability for all firms, and then for loss-making and profit-making firms, using panel data from before the crisis. Panel (b) shows the percentage increase of firm exits induced by a 3 or 5 month output loss, compared to baseline levels.

Employment losses are also substantial and wage subsidies are limited in their effectiveness. Annual simulated wage bill losses range between 0.7% and 20%, depending on the sector and lockdown length. A small response to wage subsidies is observed across the three impact sectors. Nonetheless, even under the assumption of a 90% wage subsidy, payroll losses across all sectors would only be reduced by 0.8 (2) percentage points for a three-month (five-month) lockdown. This indicates that a wage subsidy is unlikely to “rescue” firms, as on average, the share of labour costs in total costs is relatively small, and the loss in revenue is too severe to be compensated for by reducing labour costs.

Increases in firm exits are substantial, but not as severe as in other countries, meaning that associated output and payroll losses are also small, although this is likely to be an under-estimate. Across all sectors, the simulations estimate that firm exits increase by 34% (48%) after a three-month (five-month) lockdown. This corresponds to an increase in the average probability of exits from 11.1% pre-COVID to 14.9%. These additional exits, in the three-

month lockdown scenario, lead to a permanent payroll loss equivalent to 0.7% of GDP, and a permanent turnover loss equivalent to 11.5% of GDP. However, since we define “exits” as firms which fail to file a return from one year to the next, we may be over-estimating the true exit rate (as non-filing might reflect behaviour other than permanently closing a business).

In summary, our simulations suggest that the pandemic, and the associated measures to contain its spread, will have a significant impact on the South African economy. While the latest GDP data indicates that the economy has begun to recover, the growth outlook remains muted. The predicted reduction in firms’ profitability and employment will increase the pressure on South Africa’s public finances. Firms accumulate substantial losses, even under the three-month shock scenario. These increased losses imply large drops in CIT revenue for future years, especially considering South Africa’s generous loss carry-forward provisions. Our simulated CIT revenue loss is broadly in line with downward revisions to CIT revenue made by [the National Treasury](#).

Table 3: Aggregate Impacts by Lockdown Duration and Impact Sectors

		High Impact		Medium Impact		Low Impact		All Sectors	
		3mo	5mo	3mo	5mo	3mo	5mo	3mo	5mo
Share of firms profitable at baseline		52.6%		50.5%		62.8%		54.0%	
Share of firms still profitable (materials adj.)		18.7%	11.3%	32.3%	24.5%	42.0%	37.6%	32.8%	26.0%
CIT revenue loss, relative to baseline (%)		57.5%	85.4%	45.8%	66.5%	14.9%	24.2%	35.4%	52.6%
Absolute losses increase (% GDP)		1.7%	3.9%	5.1%	13.9%	1.7%	3.1%	8.5%	21.0%
Absolute losses increase (% of baseline)		151.0%	347.1%	58.5%	161.4%	47.0%	85.0%	63.2%	156.6%
Payroll Loss	No wage subsidy	8.4%	20.0%	2.8%	8.0%	0.7%	1.3%	2.5%	6.6%
	50% wage subsidy	8.1%	18.9%	2.4%	7.0%	0.2%	0.4%	2.1%	5.6%
	90% wage subsidy	7.7%	17.1%	1.7%	5.6%	0.1%	0.2%	1.7%	4.6%
Additional exit rate, relative to baseline		58.8%	73.4%	32.8%	48.1%	24.3%	33.1%	34.7%	48.3%
Permanent payroll loss from firm exits (% GDP)		0.1%	0.2%	0.4%	0.6%	0.2%	0.2%	0.7%	0.97%
Permanent turnover loss from firm exits (% GDP)		1.5%	1.9%	7.5%	11.0%	2.4%	3.3%	11.5%	16.2%

DETAILED SECTOR CLASSIFICATIONS

SECTORS (2-digit ISIC codes)	IMPACT CATEGORY
A AGRICULTURE, FORESTRY AND FISHING	Low
B MINING AND QUARRYING	
Mining of metal ores; other mining and quarrying; mining support service activities	Medium
Mining of coal and lignite; extraction of crude petroleum and natural gas	Low
C MANUFACTURING	
Manufacture of tobacco products	High
Manufacture of beverages; textiles; wearing apparel; leather and related products; wood and products of wood and cork, except furniture; articles of straw and plaiting materials; paper and paper products; printing and reproduction of recorded media; coke and refined petroleum products; chemicals and chemical products; rubber and plastics products; other non-metallic mineral products; basic metals; fabricated metal products, except machinery and equipment; computer, electronic and optical products; electrical equipment; machinery and equipment; motor vehicles, trailers and semi-trailers; other transport equipment; furniture; other manufacturing; repair and installation of machinery and equipment	Medium
Manufacture of food products; basic pharmaceutical products and pharmaceutical preparations	Low
D ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	Medium
E WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	Medium
F CONSTRUCTION	Medium
G WHOLESALE AND RETAIL TRADE	Medium
H TRANSPORTATION AND STORAGE	
Land transport and transport via pipelines; postal and courier services	Medium
Water transport; air transport; warehousing and support activities for transportation	High
I ACCOMMODATION AND FOOD SERVICE ACTIVITIES	
Accommodation	High
Food and beverage service activities	Medium
J INFORMATION AND COMMUNICATION	
Motion picture, video and television programme production, sound recording and music publishing activities	Medium

Continued on next page

7.1 Detailed sector classifications

Publishing activities; programming and broadcasting activities; telecommunications; computer programming, consultancy and related activities; information service activities	Low
K FINANCIAL AND INSURANCE ACTIVITIES	Low
L REAL ESTATE ACTIVITIES	Medium
M PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	
Travel agency, tour operator, reservation service and related activities	High
Architectural and engineering activities; technical testing and analysis; advertising and market research; rental and leasing activities	Medium
Legal and accounting activities; Activities of head offices; management consultancy activities; scientific research and development; other professional, scientific and technical activities; veterinary activities	Low
N ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	Low
O PUBLIC ADMINISTRATION AND DEFENCE, COMPULSORY SOCIAL SECURITY	Low
P EDUCATION	Medium
Q HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	Low
R ARTS, ENTERTAINMENT AND RECREATION	
Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities; sports activities and amusement and recreation activities	High
Activities of membership organisations	Medium
S OTHER SERVICE ACTIVITIES	
Other personal service activities; activities of households as employers of domestic personnel; activities of extraterritorial organisations and bodies	High
Repair of computers and personal and household goods; undifferentiated goods- and services-producing activities of private households for own use	Medium

DETAILS ON VARIABLE CONSTRUCTION

This project used administrative tax data from 2013-2017 from the South African Revenue Service, reflecting what firms report on the ITR14 tax return. The following variables were constructed for this analysis from this returns data.

1. Turnover: total gross income, including domestic and foreign sales (where applicable), and other income, such as income from dividends, debt recovery, royalties, real estate investment, and interest income
2. Cost of sales: the sum of total purchases (foreign and domestic, where applicable) and opening stock, less closing stock
3. Labour costs: the way firms report their employee expenses differs by company type. For micro firms, share block companies, and body corporate this reflects salaries and wages, including directors' or members' remuneration. In addition to salaries, wages, and other remuneration, small firms report medical, pension and provident fund contributions, which are added to the total labour costs. In the case of medium to large firms, the total labour cost includes salaries and wages, directors' or members' remuneration, as well as contributions to the Unemployment Insurance Fund, other insurances, pensions, medical aid, professional body memberships, and training costs.
4. Taxable income: accounting profit before tax (EBT) - debit adjustments + credit adjustments (excluding assessed losses)

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 (3 and 5 months):

1. Share of firms still profitable (materials adj.): (1) number of firms with strictly positive profit margin, after material costs adjustment proportional to the shock, divided by (2) total number of firms, expressed as percentage.
2. 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.
3. 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.
4. Payroll Loss, at different wage subsidy rate: (1) sum of all firms' new labour costs under lockdown, divided by (2) the sum of all firms' labour costs at baseline, expressed as percentage.
5. Additional exit rate, 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.
6. Permanent payroll loss from firm exit (% GDP): (1) additional exit rate relative to baseline multiplied by (2) the sum of all firms' labour costs at baseline, divided by (3) GDP (current LCU of the same year), expressed as percentage.
7. Permanent turnover 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.