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The dynamics of formal employment during and after the COVID-19 pandemic in Uganda

Kyle McNabb,[1] Tina Kaidu,[2] and Susan Kavuma[3]

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Abstract: This paper studies the impact of the COVID-19 pandemic on formal sector employment in Uganda. Utilizing employee-level administrative tax data from the Uganda Revenue Authority, we describe the dynamics of employment as the pandemic evolved, seeking to better understand the various coping strategies undertaken by firms in the face of reduced sales and business activity. We find that over one in ten formally employed workers fully lost their incomes in the immediate aftermath of the onset of the pandemic and associated lockdown restrictions. Of those that remained employed, some 14% saw their salaries fall in the short term (to June 2020), and by March 2021 (a full year after the onset of the pandemic) over 9% of the formal workforce were still earning less than pre-pandemic. We subsequently match these pay-as-you-earn records with firms' income tax returns to better understand how characteristics such as firm size, sector, and profitability affected the likelihood that different coping strategies were undertaken. We find that firms which were larger and more profitable pre-pandemic were more likely to retain their workforce and less likely to cut salaries throughout the course of the pandemic.

Key words: COVID-19, Uganda, formal sector employment, administrative tax data

JEL classification: D22, J21, J23, O12

Note: This study has received ethical approval by the Joint Ethical Review Board of the United Nations University (Ref No. 202104/01) on 11 May 2021.

[1]ODI, London, UK, corresponding author k.mcnabb@odi.org.uk [2]Uganda Revenue Authority Kampala, Uganda, [3]Makerere University, Kampala, Uganda

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Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

The slowdown in economic activity because of the COVID-19 pandemic has exacerbated poverty and income inequality in the world's emerging economies. In Uganda specifically, the economy grew at an average of 4.5% for financial years 2019–20 to 2021–22, which was below the projected 6.0%, with the lowest growth of 3.1% registered in financial year 2019–20. As a result of the nationwide lockdown and standard operating procedures adopted, many households experienced sizeable income losses, and businesses (especially small and medium enterprises) had to lay off employees (or suspend jobs for a time) due to lower sales. According to the Uganda Business Impact Survey 2020, the most affected sectors, with more than 75% of enterprises reporting the absence of above 30% of the total workforce, included accommodation and food service activities, construction, arts, entertainment and recreation, and education.

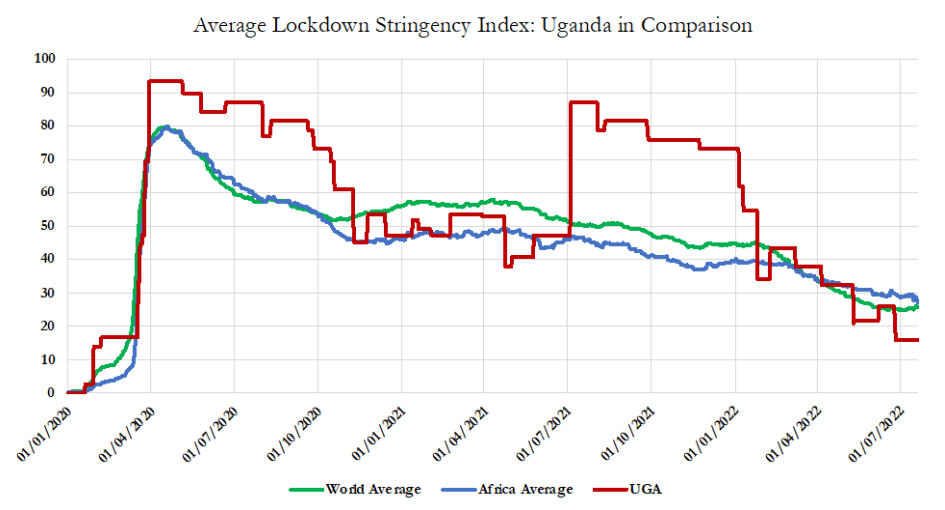
This paper studies the impact of the pandemic on formal sector employment in Uganda. We define a formal sector worker as one for whom pay-as-you-earn (PAYE) is filed by their employer (however, we acknowledge that different definitions of formality exist globally). Utilizing the Uganda Revenue Authority (URA) monthly PAYE returns at the employee level, we describe the dynamics of employment as the pandemic evolved, seeking to better understand the various coping strategies undertaken by firms in the face of reduced sales and business activity. We find that over one in ten formally employed workers fully lost their incomes in the immediate aftermath of the onset of the pandemic and associated lockdown restrictions. Of those that remained employed some 14% saw their salaries fall in the short term (to June 2020), and by March 2021 (a full year after the onset of the pandemic) over 9% of the formal workforce were still earning less than pre-pandemic. We subsequently match these PAYE records with firms' income tax returns to better understand how characteristics such as firm size, sector, and profitability affected the likelihood that different coping strategies were undertaken.

This paper proceeds as follows. Section 2 describes the evolution of pandemic-related restrictions in Uganda and discusses the various fiscal policy responses undertaken. Section 3 provides a literature review of similar work on low- and middle-income countries (LMICs). In section 4 we describe the data used in this study. Section 5 incorporates the main body of the analysis undertaken. Section 6 concludes.

2 The COVID-19 pandemic in Uganda: fiscal policy responses

Uganda imposed some of the most strict and prolonged lockdown measures in both the initial March 2020 pandemic wave and the subsequent 'Delta' wave in June 2021. The measures included night curfew from 19:00hrs to 05:30hrs, suspension of various forms of public transport, restricted movement of people (including a ban on the use of private vehicles), closure of schools and other institutions of learning, suspension of all forms of public gatherings, and closure of national borders. While these measures were relatively effective in containing the spread of the virus, combined with the sudden fall in domestic economic activity, exports, and tourism, they greatly hampered individuals' labour market prospects. Large sectors of the Ugandan economy—e.g., hospitality, tourism, education—were unable to function at anywhere near full capacity for long periods of time. Figure 1 illustrates the 'lockdown stringency index' (Hale et al. 2021) for Uganda plotted against the world and African averages. As can be seen the lockdown measures undertaken in Uganda were, for prolonged periods of time, stricter than in many other parts of the world.

Figure 1: Average lockdown stringency index: Uganda in comparison



Source: authors' elaboration based on data from Oxford Covid Government Response Tracker (2022) and Hale et al. (2021).

While businesses and individuals in many high-income countries (HICs) were able to benefit from generous government support and fiscal stimulus packages to dampen the economic shock caused by the COVID-19 pandemic and associated 'lockdowns', such support was often conspicuously absent in LMICs despite stringent lockdown measures. Uganda represents one such case where government support to business during the initial and subsequent lockdown periods was limited. In particular the fiscal policy responses were purely administrative in nature, aside from exemptions (value-added tax (VAT), customs and excise duty) on the import of items required to locally manufacture hand sanitizer and other personal protective equipment such as face masks. Otherwise there were no specific tax policy measures such as reduced rates to support business and consumers. There were also no specific interventions targeted at employment retention, such as the government funded 'furlough' schemes seen in some HICs. The administrative interventions were undertaken to address the short-term liquidity requirements of businesses and subsequently provide relief to their cash-flows, and to ensure a degree of business continuity. These measures included the extension of payment deadlines, deferral of tax payments, waiver of interest on tax arrears, allowable deductions on donations to government to combat the COVID-19 pandemic, extension to debt payment plans, and expedition of VAT refunds. The specifics of these measures, as described in the budget speech for financial year 2020-21 (Ministry of Finance, Planning and Economic Development, 2020), were as follows:

- Deferment of payment of corporate income tax (CIT) or presumptive tax for corporations and small and medium enterprises (SMEs) until September 2020. This applied to payment of CIT and presumptive tax due from 1 April to 30 June 2020 for tax compliant businesses with a turnover of less than UGX500 million per annum. Furthermore, no interest or penalties would accumulate on these amounts during that period. This was aimed at benefiting companies and SMEs especially in tourism, manufacturing, horticulture, and floriculture. The number of taxpayers who benefited from this measure, for whom CIT was applicable, was 10,140 and the deferred tax was estimated to be UGX12.5 billion. In addition the number of taxpayers who benefited from the presumptive tax measure was 23,892, and the deferred tax was estimated to be UGX1.38 billion;

- Deferment until September 2020 of payment of PAYE due from 1 April 2020 to 30 June 2020 for tax compliant Ugandan businesses facing hardship as a result of the COVID-19 pandemic. No interest would accumulate on tax due during that period. An estimated UGX65.35 billion

due from PAYE for the manufacturing and tourism sectors was being deferred. For the floriculture sector the expected PAYE deferral was UGX0.237 billion;

- Waiver of interest and penalties on tax arrears accumulated before 1 July 2020 to lessen the tax liability of businesses which voluntarily complied with their tax obligations;

- Provision for tax deductibility of donations that the private sector made towards the Corona Virus Response; and

- Expedition of payment of outstanding VAT refunds due to businesses accompanied by measures to limit fraud.

3 Literature review

There is a growing literature on the impact of COVID-19 on business and employment outcomes in low- and middle-income contexts. We focus here on briefly reviewing those studies that specifically focus on better understanding the impact on employment. These studies utilize either survey or administrative tax data to analyse the impact of the pandemic on firm performance with regard to sales and/or employment. Some scholars such as Hoy et al. (2022) combine both forms of data to investigate the impact of the pandemic on firm performance in Zambia. The two data sources carry distinct advantages: surveys can provide extensive, more targeted, timely data on the operations of firms but might be limited by sample size, while tax administrative data covers a large number of firms but is restricted to the information collected via the tax returns and might only be collected annually (e.g. income tax returns). It might also be the case that in order to gain a complete picture of firm operations using administrative data, it is necessary to merge data from a number of sources (e.g., VAT, PAYE, CIT, and customs).

Studies have established that the impact of COVID-19 was greater on sales than employment, as the impact on sales was a primary effect, while the impact on employment was a secondary effect in response to changes in sales (Ardiyono 2022; Hoy et al. 2022). Ardiyono (2022) found that firms in Indonesia and Vietnam responded to revenue shocks by reducing employment with an elasticity of 0.10, implying that a 10% decrease in revenue resulted in a 1% decrease in the workforce. Hoy et al. (2022) associated the decline in sales to structural factors such as type of business activity, while changes in employment in Zambia were associated with firm-specific factors such as level of experience of the top manager. Using phone surveys across 39 countries, Khamis et al. (2021) found that an average of 34% of respondents reported that work had stopped, 20% reported that wages had not been paid for work done, and over 60% of respondents reported a loss in income during the pandemic. Apedo-Amah et al. (2020), in studying over 100,000 firms across 51 countries, found that the changes in employment were most often along the intensive margin (leave of absence and a reduction in number of hours worked), with a smaller share of the firms laying off workers (extensive margins). Firms that experienced a larger decline in sales were associated with greater job losses. Bachas et al. (2020) and Fairlie (2020) noted that the impact of the pandemic on employment varied by sector. Bachas et al. (2020), while analysing the likely impact of the pandemic on firms in Uganda, categorized sectors based on the extent to which they remained open during the lockdowns into high- (tourism, transport, and personal services), medium- (education and manufacturing), and low-impact (agriculture, health, retail, and construction) sectors. Their predictions suggest that the initial three-month lockdown in Uganda led firms to cut wage bills by around 3.2%. Finally, for the context of Uganda, Lastunen et al. (2021) utilized the UGAMOD tax-benefit microsimulation model to find a modest increase in poverty (from 21.6% to 22.5%) but virtually no effect on income inequality, noting that the tax-

benefit system in Uganda had a negligible effect on cushioning the economic shock of the pandemic.

Evidence from the USA (Bartik et al. 2020) shows that, full- and part-time employment fell by 17% and 34%, respectively, in the immediate aftermath of business closures, while Chetty et al. (2020) found that low-wage employees were more likely to lose their jobs due to the nature of their employment (e.g. were relatively more likely to work in 'contact intensive' roles such as hospitality).

Regarding recovery Hoy et al. (2022) noted that a year later firms exhibited a complete recovery in sales, while the share of firms that reported a decline in employment had doubled in Zambia. The examination by Kugler et al. (2023) of the impact of COVID-19 on employment in 39 LMICs using data from the World Bank High Frequency Survey, showed that employment remained moderately below the pre-pandemic levels in the short term in around 30 countries. Fairlie (2020) also noted a partial bounce-back of firms in the short term regarding revenue, profits, and employment of small businesses in the USA in 2020.

4 Data

The data for the present study comes from the URA administrative tax records. As the focus of our investigation is on the effect of the pandemic on formal employment, we primarily rely on the universe of monthly PAYE returns from before, during, and after the pandemic. We complement this data by matching firms' PAYE returns with their CIT returns, according to an anonymized identifier. All of the data was accessed in person at the URA's secure research lab in Kampala, Uganda. The individual-level, anonymized, monthly PAYE returns include details of an individual's gross salary, allowable deductions, taxable salary, and employer, while the firms' CIT returns include all of the information related to their profit and loss, balance sheet, and tax calculation. The CIT panel is described in detail in McNabb et al. (2022).

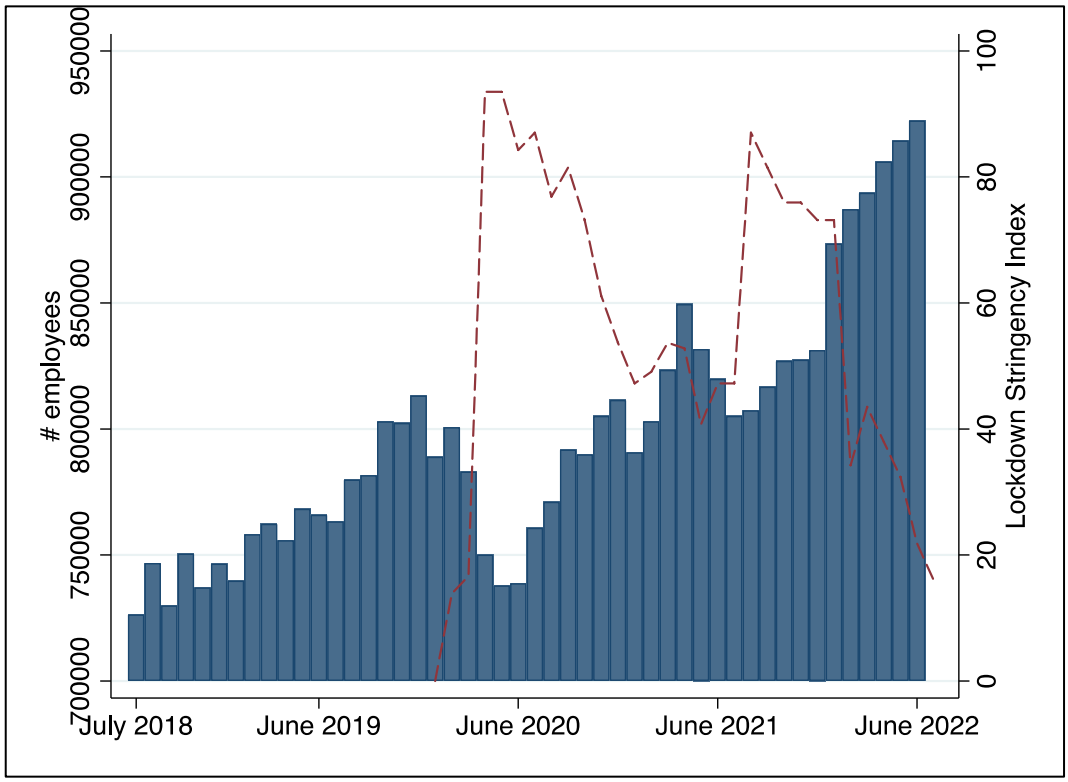
The financial (fiscal) year in Uganda runs from 1 July to 30 June, and we focus our analysis of PAYE returns on four financial years, 2018–19 to 2021–22. This encompasses around 20 months of pre-pandemic data and runs to the most recently available month in the URA research lab.

5 Empirical investigation

5.1 The dynamics of formal employment during the COVID-19 pandemic

In this section we analyse in depth the dynamics of formal employment during the pandemic in Uganda. Throughout the analysis which follows we consider outcomes in employment over the short, medium, and long term. These points are identified as June 2020, September 2020, March 2021, and March 2022, pertaining to 3, 6, 12, and 24 months since the onset of restrictions in March of 2020. These outcomes are compared with outcomes in the last pre-pandemic month, namely March 2020. We refer to this month as the 'baseline' for our analysis. As a starting point for this investigation, we analyse changes in total employment. Figure 2 plots the number of monthly PAYE returns between July 2018 and June 2022, with the lockdown stringency index (as described above) overlaid to provide some context of how the pandemic was evolving over time. It should be noted that PAYE returns lag 'work done' by one month: for example, the PAYE returns of our baseline month (March 2020) reflect work carried out in February.

Figure 2: Total formal employment (# of PAYE returns)



Source: authors' calculations from URA and Hale et al. (2021).

As can be seen in Figure 2, PAYE filings dropped precipitously in the short term. Between March and June 2020 formal employment fell from around 783,000 workers in March (reflecting February 2020 employment levels) to 738,000 in June. This represents a reduction of around 45,000 workers, or roughly 6% of the formal workforce. The shock to employment was, however, relatively short lived: by September 2020 employment had returned to around 792,000 jobs. A natural follow-up question is to better understand *where* in the economy these layoffs occurred. To do this we break down the trends in employment by sector. Table 1 shows the change in PAYE filings between March and June. Employment decreased in every sector aside from public administration and defence, which pertains to government jobs. The largest job losses in terms of numbers are seen in the education sector (17,216), undoubtedly due to the closure of schools, followed by accommodation and food service activities (8,795) and manufacturing (4,228). However, in terms of relative change, taking March 2020 as a baseline, the largest job losses are seen in arts, entertainment, and recreation (-36.9%), accommodation and food service activities (-37.1%), and education (19.3%).[1]

[1] We ignore the 'unknown' category. This pertains to employers that cannot be matched with registration data from the firm registration data. Employees in this sector are likely to be employed in any of the other sectors. Just 0.33% of employee-level PAYE data is unclassified in this manner.

Table 1: Changes in employment by sector (March 2020–June 2020)

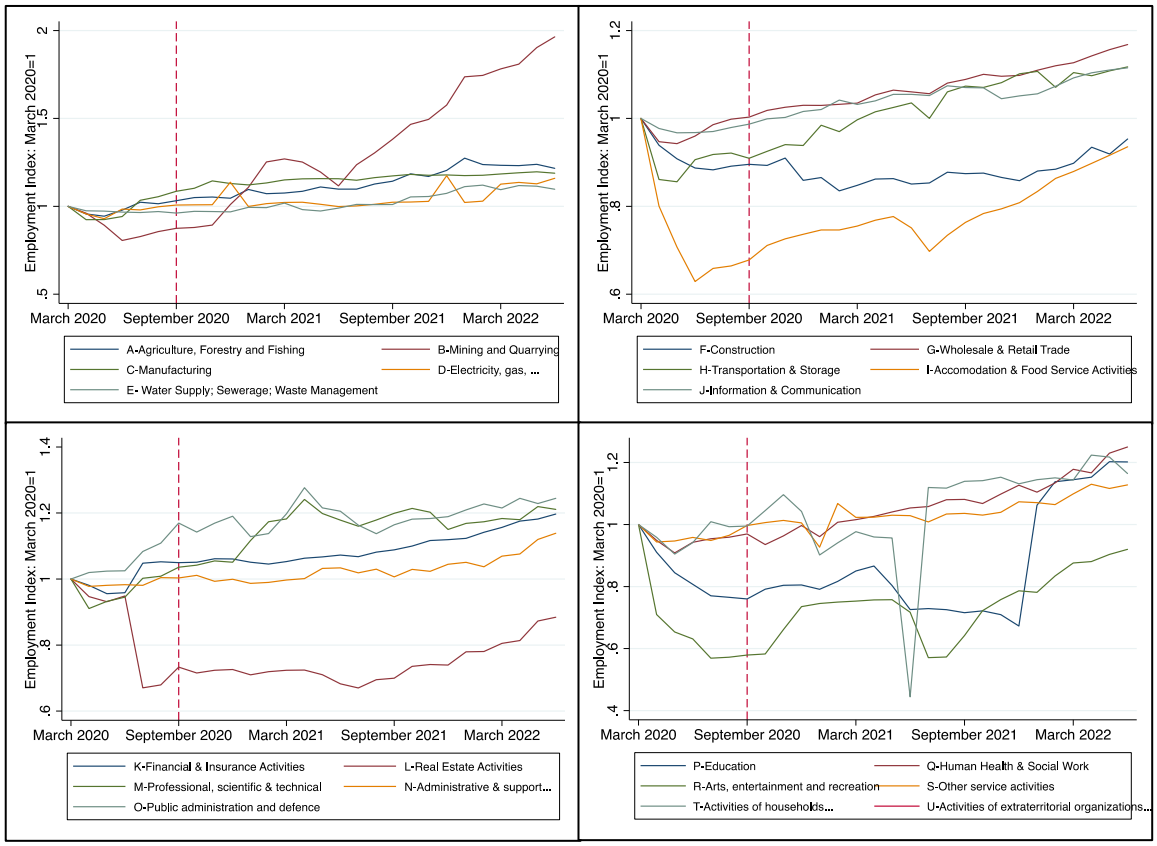
Sector	Δ Employment (March 2020–June 2020)	%Δ Employment (March 2020–June 2020)
A-Agriculture, forestry, and fishing	-561	-2.2%
B-Mining and quarrying	-288	-19.4%
C-Manufacturing	-4,228	-5.8%
D-Electricity, gas, steam, and air conditioning supply	-94	-1.6%
E-Water supply; sewerage etc.	-191	-3.3%
F-Construction	-3,226	-11.3%
G-Wholesale and retail trade	-2,148	-4.0%
H-Transportation and storage	-999	-9.4%
I-Accommodation and food service activities	-8,795	-37.1%
J-Information and communication	-336	-3.2%
K-Financial and insurance activities	-1,399	-4.1%
L-Real estate activities	-534	-5.1%
M-Professional, scientific, and technical activities	-820	-5.5%
N-Administrative and support service activities	-676	-1.7%
O-Public administration and defence	6,219	2.5%
P-Education	-17,216	-19.3%
Q-Human health and social work activities	-3,035	-5.7%
R-Arts, entertainment, and recreation	-4,137	-36.9%
S-Other service activities	-1,297	-4.2%
T-Activities of households as employers	-58	-5.8%
U-Activities of extraterritorial organizations and bodies	101	1.4%
Unknown	-596	-23.5%
Total	-44, 314	

Source: authors' calculations from URA data.

As Figure 2 depicts, the total number of formal jobs in the economy recovered to pre-lockdown levels by September 2020. The next trend that we wish to better understand is whether the *same* jobs returned to the formal economy or there was any sort of structural shift in employment. This is a particularly relevant question to ask as, despite partial reopening of the economy by late 2020, restrictions on the opening hours of bars and restaurants due to the nationwide curfew, in addition to a complete closure of schools, remained until early 2022.

In Figure 3, we plot an index of employment by sector, setting March 2020 employment =1. Thus any line below 1 shows a sector where employment has not yet recovered to full baseline (pre-pandemic) levels. The charts are divided into four quadrants with five or six sectors in each for ease of interpretation. A dashed line is plotted in September 2020 as we observed in Figure 2 that formal employment levels had returned to pre-pandemic levels in this month.

Figure 3: Evolution of employment, by sector



Source: authors' calculations from URA data.

A number of interesting takeaways emerge from Figure 3.

Firstly, in nine sectors (out of 21), employment in September 2020 had not returned to pre-pandemic levels, while in five it was higher and in the remainder it was almost exactly the same (close to 1).

Secondly, data for the most recent period available (June 2022) shows that formal employment in four sectors (construction; accommodation and food service activities; real estate activities; arts, entertainment, and recreation) had still not returned to pre-pandemic levels some 27 months later. This is despite the full reopening of the economy (including lifting of the curfews that had greatly curtailed the ability of bars, restaurants, and entertainment venues to operate) that occurred in early 2022.

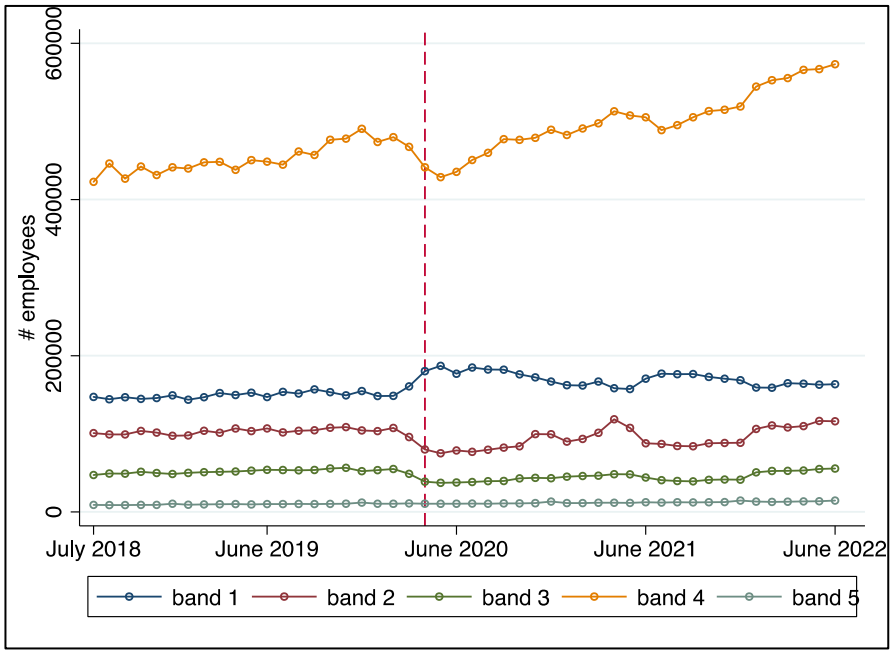
These findings suggest that, while a lot of jobs may have been suspended during the COVID-19 period but were reinstated soon after (note that at this stage we do not determine whether the jobs came back to the same or a different employee), there has also been a structural shift in formal employment across sectors since 2020.[2] It might also be the case that some workers *were* re-hired after initially being laid off but on less formal contracts or terms, which would result in there being no PAYE filed on their behalf.

A further question is to examine whether employees who *kept* their jobs during the most severe lockdown periods saw their salaries decrease. We firstly examine this possibility by examining the

[2] There is, of course, natural growth in employment and the PAYE register over time, and below we control for the extent to which this can explain our findings.

number of all employees with a monthly salary who fall into one of the five PAYE bands.[3] This is shown in Figure 4. Again, there are a few interesting findings.

Figure 4: Evolution of employment, by wage class



Source: authors' calculations from URA data.

Firstly, employment for those with incomes in the fifth PAYE band (those earning more than UGX10 million per month) is virtually unaffected in the short term: between March and June 2020 it fell by just 2.8%, which is not outside the normal range of employment dynamics observed across the period considered. Secondly, employment figures for those with incomes in the second to fourth bands decreases between March and June by 18.0%, 22.7%, and 6.9% for bands 2, 3, and 4 respectively. Finally, the number of PAYE filings in band 1 *increases* at the onset of the pandemic by 10.2% between March and June. A more in-depth look at these short-term trends between March and June 2020 is provided in Table 2.

Table 2: Employment by band, March–June 2020.

			Band 1		Band 2	Band 3	Band 4	Band 5
Year	Month	Total	Salary = 0	Salary > 0				
2020	March (baseline)	160,578	31,106	129,472	95,743	48,671	467,334	10,787
2020	April	180,103	68,346	111,757	79,798	38,558	441,256	10,484
2020	May	177,525	76,428	101,097	75,029	37,177	428,627	10,288
2020	June	176,780	72,716	104,064	78,545	37,633	435,373	10,468
Δ (March–June)		16,202	41,610	-25,408	-17,198	-11,038	-31,961	-319

Source: authors' calculations from URA data.

The total drop in employment in bands 2 to 5 is just over 60,500, and this is offset by an increase of around 16,200 in band 1 (leading to the net fall of ~44,000, as depicted above in Figure 2). Table 2, however, also breaks down the number of employees in band 1 according to whether their employers were still paying them a positive amount as the lockdown unfolded or they

[3] The monthly PAYE rate structure for residents is as shown in Table A1 in the Appendix.

continued to file PAYE but did not pay any salary. We see that the number of employees in band 1 that earned a positive amount of income falls from 129,472 to 104,064 (a reduction of around 19.6%—in line with the reductions in other bands as described above). However, there is a drastic *increase* of 41,610 or 134% in the number of employees for whom a nil amount is filed.

Thus it appears that in addition to the roughly 44,000 formal sector workers who were laid off during the immediate onset of the pandemic, there was a similar number that officially kept their jobs but received a salary of zero. In Table 3 we break this down by sector.

Table 3: 'Zero earners' by sector

Sector	March zero earners	June zero earners	Δ zero earners (March to June 2020)	%Δ zero earners (March to June 2020)
A-Agriculture, forestry, and fishing	440	752	312	71%
B-Mining and quarrying	237	32	(205)	-86%
C-Manufacturing	394	1,444	1,050	266%
D-Electricity, gas, steam, and air conditioning supply	51	52	1	2%
E-Water supply; sewerage etc.	45	31	(14)	-31%
F-Construction	470	809	339	72%
G-Wholesale and retail trade	1,255	1,983	728	58%
H-Transportation and storage	446	760	314	70%
I-Accommodation and food service activities	1,116	3,750	2,634	236%
J-Information and communication	236	402	166	70%
K-Financial and insurance activities	348	759	411	118%
L-Real estate activities	739	1,273	534	72%
M-Professional, scientific, and technical activities	473	740	267	56%
N-Administrative and support service activities	387	736	349	90%
O-Public administration and defence	3,564	2,211	(1,353)	-38%
P-Education	17,687	50,280	32,593	184%
Q-Human health and social work activities	931	1,473	542	58%
R-Arts, entertainment, and recreation	801	2,923	2,122	265%
S-Other service activities	900	1,485	585	65%
T-Activities of households as employers	14	25	11	79%
U-Activities of extraterritorial organizations and bodies	180	201	21	12%
Unknown	392	595	203	52%
Total	31,106	72,716	41,610	

Source: authors' calculations from URA data.

The findings presented in Table 3 show that the bulk of the increase in workers earning a zero salary were teachers (i.e. concentrated in the education sector) as a result of school closures during the lockdown period. However, large proportional increases in this practice were also seen in the accommodation and food service activities and the arts, entertainment, and recreation sector.

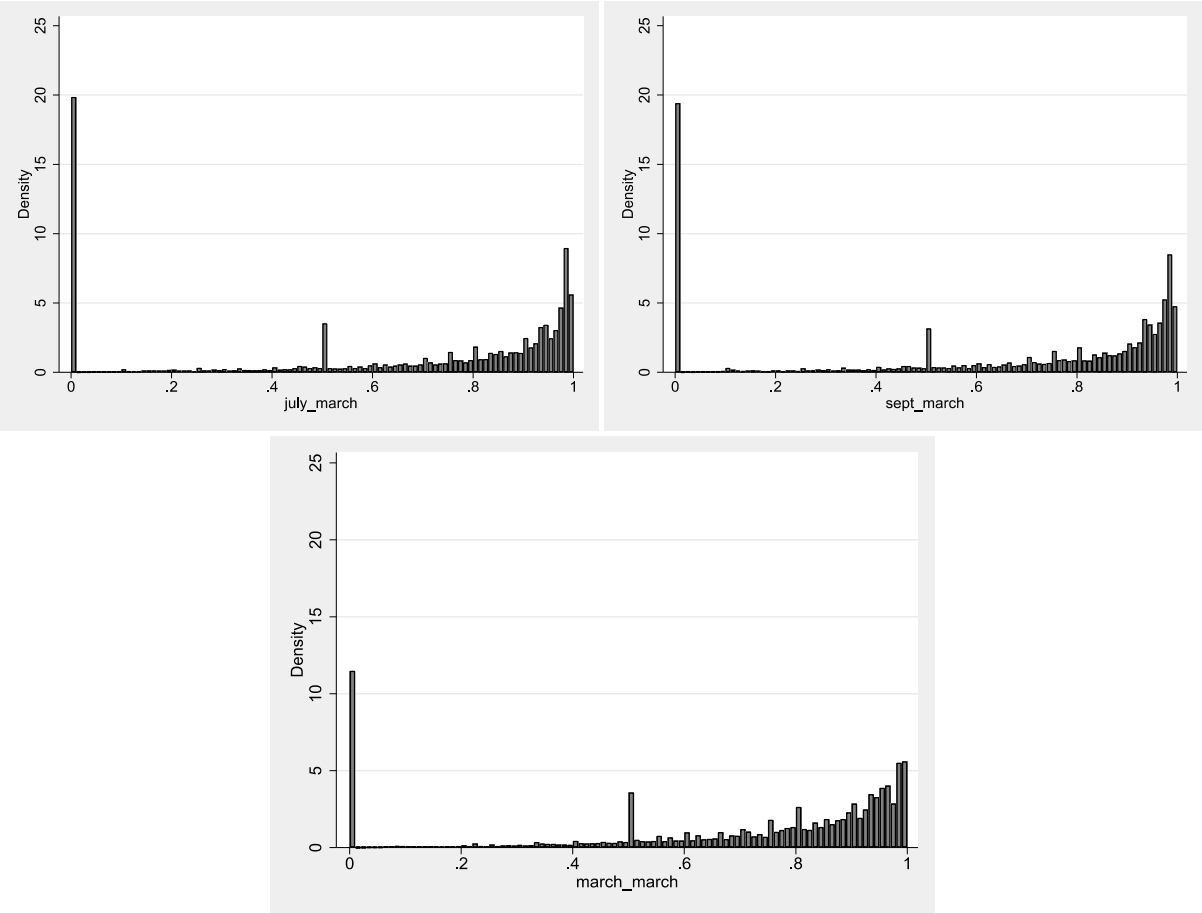
A final set of employees kept their jobs but received a reduced but non-zero salary. We next examine this latter group. For the months of June 2020, September 2020, and March 2021, we consider employees that remained employed *with the same employer* for this whole period and express their salaries as a share of their March 2020 (baseline). The results are shown in Table 4, while histograms of those earning between 0% and 99.99% of March earnings are shown in Figure 5.

Table 4: Distribution of reduced earnings in short and medium term

	June 2020	September 2020	March 2021
0	3.9%	3.9%	1.3%
0–0.1	0.1%	0.1%	0.1%
0.1–0.2	0.2%	0.3%	0.1%
0.2–0.3	0.3%	0.3%	0.2%
0.3–0.4	0.3%	0.4%	0.2%
0.4–0.5	1.2%	1.2%	0.7%
0.5–0.6	0.7%	0.8%	0.5%
0.6–0.7	1.1%	1.1%	0.8%
0.7–0.8	1.5%	1.6%	1.1%
0.8–0.9	2.6%	2.5%	1.9%
0.9–0.99	6.7%	7.0%	3.7%
1	35.4%	34.0%	25.1%
>1	46.0%	46.9%	64.2%

Source: authors' calculations from URA data.

Figure 5: Distribution of those earning between 0% and 99% of their pre-pandemic salary



Source: authors' calculations from URA data.

Throughout the period from June to September 2020, around 4% of employees remained 'employed' but received no salary. This number falls to 1.3% by the following March, likely reflective of the fact that many lockdown restrictions had eased by then and employers could, again, afford to pay their staff full (or at least partial) salaries. A further 14.7% of employees received a salary >0, up to 99% of their March 2020 salary in June 2020. This number grows to

15.2% in September, before falling to 9.4% by the following March. In June 2020 around 81% of employees retained their jobs and earned at least the same salary as they had in March. This figure remains fairly constant through September 2020, before increasing to around 89% in March 2021. Notably, some 64.2% of employees who remained with their 'baseline' employer had a higher salary by March 2021.[4]

In Figure 5 we observe a large spike at 0.5, suggesting that a significant number of employees saw their salaries cut to exactly half of baseline. There is a similar, yet smaller, spike at around 80% of baseline earnings.

The above analyses depict a number of different responses to the onset of the pandemic and associated restrictions with respect to formal employment in the short term. Firstly, around 44,000 formal sector workers were made unemployed during the immediate onset of the pandemic (March–June). These losses differed from sector to sector, but over one in three workers in (i) accommodation and food service activities and (ii) the arts, entertainment, and recreation sectors were laid off. Secondly, a further 41,000 remained employed (i.e. their employers filed PAYE) but earned a zero salary during the same period. Taken together, 85,000 workers were 'furloughed' and saw their employment incomes fall to zero as a result of the pandemic. This represents roughly 10.9% of the baseline formal workforce. Thirdly, as of June 2020, a further 105,000 workers, who had remained with the same employer throughout the 12 months following the onset of pandemic restrictions, were taking home a lower salary than in March 2020. Overall this represents some 190,000 formally employed workers or just shy of 25% of the baseline formal workforce.

In the following section we attempt to quantify the scale of 'lost' earnings and tax revenue during the pandemic.

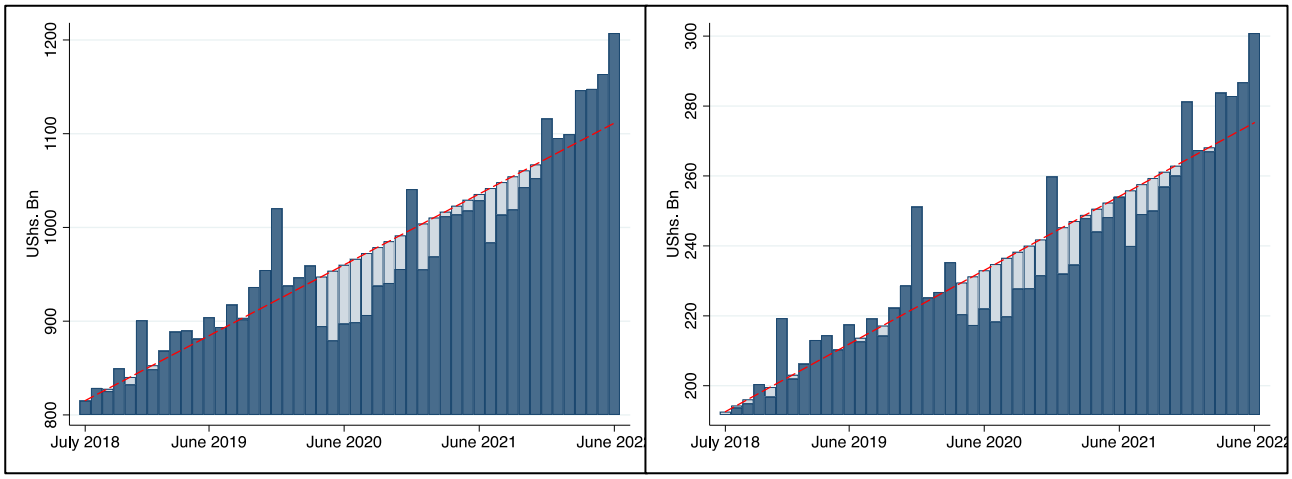
5.2 Lost earnings and tax revenue during the COVID-19 pandemic

In order to shed light on the question of lost incomes and tax revenue during the pandemic, we examine the trends in earnings and PAYE over time against a simple linear prediction. This is depicted in the left and right panels of Figure 6, respectively.

As can be seen, both incomes earned and PAYE collected lie well below the linear trend for most periods between April 2020 and November 2021. A summation of these gaps shows that across this period, there were around UGX730 billion lost formal sector incomes and UGX179 billion in lost PAYE collections. This equates to around US$200 million and US$49 million respectively. These losses are spread over three financial years, as shown in Table 5. As a share of actual PAYE collected, we estimate that the lost revenue equates to 1.05%, 3.86%, and 0.69% for the years 2019–20, 2020–21 and 2021–22 respectively.

[4] This may be as a result of either natural growth in salaries or compensation for lower earnings during the pandemic. It is not, unfortunately, possible to disentangle these effects.

Figure 6: Income and PAYE collected vs. linear prediction



Source: authors' calculations' from URA data.

Table 5: Income and PAYE collected vs. linear prediction

	Incomes vs prediction (UGX bn)	PAYE vs prediction (UGX bn)	Actual PAYE collected	Lost PAYE as % of actual
2019–20	-190.1	-34.0	3,234.7	1.05%
2020–21	-437.1	-119.9	3,109.1	3.86%
2021–22	-103.1	-25.1	3,634.3	0.69%
Total	**-730.3**	**-178.9**		

Source: authors' calculations from URA data.

Clearly, if one were to account, for example, for spending multipliers throughout the economy, the true effect of job losses or salary reductions on gross domestic product and tax collections would be much higher.

5.3 Firm characteristics and employment outcomes

In this section we seek to better understand the characteristics of firms that were more (or less) likely to (i) retain or lay off their staff and (ii) reduce spending on employee wages during the pandemic in Uganda. To investigate these questions we turn to regression analysis.

We first estimate an ordinary least squares (OLS) regression as follows:

$$Y_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 \boldsymbol{X}_{i\,t-1} + \lambda_i + \pi_i + \varepsilon_{it} \quad (1)$$

where Y_{it} is the measure of employee retention, as depicted in (2):

$$Y_{it} = \frac{\#\,Employees_{it}}{\#\,Employees_{i\,March2020}} \quad (2)$$

Y_{it} is measured in the short, medium, and long term over the course of the pandemic, namely June 2020, September 2020, March 2021, and March 2022. Subscript t represents the month in which Y is measured and subscript i represents the firm. These periods pertain, roughly, to 3, 6, 12, and 24 months since the onset of pandemic restrictions. We express the number of employees as a share of baseline employment, as this captures the extent to which firms were able to retain staff at pre-pandemic levels. E is the number of employees at firm i at baseline (March 2020). $\boldsymbol{X}$ is a

vector of firm-specific characteristics, λ_{it} represents industry fixed effects (manufacturing is the omitted category), π_{it} is location (district) fixed effects, and ε_{it} is the error term. The firm-specific characteristics (the inverse hyperbolic sine of fixed assets and gross profit) are drawn from administrative CIT returns; as these are submitted annually, we measure these characteristics at the end of the financial year 2018–19 (denoted as t-1), the last year prior to the pandemic.[5] To use information on firms from 2019–20 would not be appropriate as the pandemic would have affected business activity for at least the last quarter of that financial year. A table of summary statistics is provided in Table A2 in the Appendix. The sample is restricted only to firms that existed in March 2020. In total it was possible to match some 22,194 firms that filed PAYE in March of 2020 with their CIT returns from 2018–19.

The regression output of equation (1) is shown in Table 6. A number of interesting takeaways emerge. Firstly, firm size, as proxied by pre-pandemic asset base, is positive and significantly related to the dependent variable in the short, medium, and long term (columns 1, 3, 5, and 7). There is some evidence that the coefficient grows in magnitude over time, suggesting that baseline firm size was more important for recovery and employee retention as the pandemic evolved. The gross profit variable is negatively related to the dependent variable in all periods, suggesting some evidence that more profitable firms (at baseline) had lower employment outcomes in the short, medium, and long term. However, the coefficient is only statistically significantly different from zero at the 10% level in some periods and not significantly different at all in the medium term. A further control variable—firms' debt to equity ratio—was also incorporated, but it neither significantly related to the outcome variable nor changed the existing results.[6]

One concern with these findings is that, despite pandemic restrictions, firms or organizations may have exhibited either (i) natural growth in their labour force or (ii) improvements in compliance during the period under investigation. Figure 3 highlighted that in some sectors employment *increased* over the short term following the onset of restrictions. It might also be that firms were encouraged by the URA to improve PAYE compliance in order to shore up revenue collections that were threatened due to the pandemic restrictions. This would upwardly bias the value of our dependent variable. While it is somewhat difficult to entirely disentangle natural growth in the labour force with employee retention, we attempt to do so by re-estimating equation (1) , restricting the sample to firms where $Y_{it} \leq 1$. This restriction captures cases where employment recovered to baseline levels *but did not grow any further*. It should thus be viewed as a lower-bound estimate of recovery in employment. The results are shown in Table 7.

These results paint a fairly similar picture of the effect of firm size and profitability on employment recovery. Again, we see that the coefficient estimate of fixed assets increases over time and it is significantly related to employee retention in most specifications. However, the baseline level of gross profitability is not significantly related to the level of employment.

[5] We also tested alternative measures of firm size (total assets) and profitability (EBIDTA—earnings before interest, taxes, depreciation, and amortization). However, as the results were very similar and based on a larger R^2, we prefer the variables included here. The inverse hyperbolic sine transformation is preferred to the natural logarithm in order to better deal with zero values.

[6] These results are not shown but are available upon request from the authors.

Table 6: OLS regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	Jun:Mar20		Sept:Mar20		Mar21:Mar20		Mar22:Mar20	
# employees March 2020	-0.0912***	-0.0895***	-0.107***	-0.105***	-0.219***	-0.218***	-0.374***	-0.369***
	(0.0107)	(0.0103)	(0.0115)	(0.0111)	(0.0254)	(0.0256)	(0.0384)	(0.0386)
Fixed assets	0.00353***	0.00431***	0.00258*	0.00352**	0.00850***	0.00919***	0.0128***	0.0153***
	(0.00133)	(0.00155)	(0.00138)	(0.00167)	(0.00268)	(0.00274)	(0.00419)	(0.00443)
Gross profit		-0.00218*		-0.00248*		-0.00181		-0.00722**
		(0.00120)		(0.00141)		(0.00206)		(0.00362)
Constant	1.213***	1.226***	1.290***	1.305***	1.521***	1.533***	1.558***	1.608***
	(0.0342)	(0.0354)	(0.0308)	(0.0333)	(0.0860)	(0.0850)	(0.132)	(0.135)
Observations	15,614	15,585	15,532	15,503	15,261	15,232	14,690	14,663
R-squared	0.045	0.046	0.020	0.020	0.032	0.032	0.038	0.039
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The top 1% of observations, as measured by the dependent variable, are dropped as they represent extreme outliers. Industry and district fixed effects not shown but included in the estimation.

Source: authors' calculations from URA data.

Table 7: OLS regression results, restricted sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	Jun:Mar20		Sept:Mar20		Mar21:Mar20		Mar22:Mar20	
# employees March 2020	-0.0378***	-0.0378***	-0.0403***	-0.0404***	-0.0506***	-0.0505***	-0.0620***	-0.0622***
	(0.00139)	(0.00140)	(0.00144)	(0.00145)	(0.00168)	(0.00170)	(0.00211)	(0.00213)
Fixed assets	0.000555***	0.000561***	0.000503**	0.000466**	0.000696***	0.000723***	0.00114***	0.000952***
	(0.000198)	(0.000207)	(0.000206)	(0.000218)	(0.000242)	(0.000255)	(0.000298)	(0.000316)
Gross profit		1.23e-05		0.000105		-0.000103		0.000404
		(0.000171)		(0.000182)		(0.000219)		(0.000279)
Constant	1.080***	1.080***	0.996***	0.996***	1.048***	1.048***	0.650***	0.646***
	(0.00988)	(0.01000)	(0.00669)	(0.00679)	(0.0141)	(0.0142)	(0.0173)	(0.0175)
Observations	13,879	13,854	13,243	13,220	12,045	12,025	10,365	10,345
R-squared	0.134	0.133	0.121	0.120	0.151	0.151	0.129	0.129
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Industry and district fixed effects not shown but included in the estimation.

Source: authors' calculations from URA data.

Overall these findings show that larger firms were more likely to retain their workforce even in the face of potentially lower levels of economic activity throughout the medium and long term. The importance of size at baseline appears to increase as the pandemic evolved, with larger firms appearing to retain (or rehire) a larger share of their baseline workforce throughout the short to medium and long term. The evidence on baseline profitability is somewhat more mixed, with some evidence that more profitable firms were *less* likely to rehire or retain their staff during the course of the pandemic.

However, as explored in depth above, simply understanding the characteristics of firms that are associated with higher *levels* of employment might be potentially misleading, as a significant number of firms kept staff employed during the pandemic but reduced their salaries either to zero or some fraction of their baseline salary. Thus, it is also pertinent to examine *how much* firms were paying to their staff at different points during the evolution of the pandemic. To do this, we estimate a regression model according to equation (3):

$$Y_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 \boldsymbol{X}_{i\,t-1} + \lambda_i + \pi_i + \varepsilon_{it} \quad (3)$$

where the dependent variable is specified as follows:

$$Y_{it} \begin{cases} =1 \text{ if } W_{it} < W_{i\,March2020} \\ =0 \text{ if } W_{it} \geq W_{i\,March2020} \end{cases} \quad (4)$$

Thus, for each month/period of interest, *t*, it takes the value of 1 if the firm *i* had a lower total monthly wage bill than it had in March 2020 (baseline). E_{it} represents the number of employees at firm *i* in month *t* and $\boldsymbol{X}_{i\,t-1}$ again includes firm size (as proxied by the fixed asset base) and profitability (gross profits) at baseline (2018–19 financial year). λ_{it} represents industry fixed effects, π_{it} is location (district) fixed effects, and ε_{it} is the error term.

We again examine the outcome in June 2020, September 2020, March 2021, and March 2022. The results are shown in in Table 8 and suggest a number of interesting findings. Firstly, in June and September of 2020, the number of employees is positive and significantly related to the likelihood that the firm has a lower total wage bill. This suggests a confirmation of the finding above that a not insignificant number of firms might have kept employees on the payroll at a lower or zero salary in the short term. Secondly, when we consider the size of fixed assets at baseline as the sole independent variable of interest (columns 1, 3, 5, and 7), it is positively and significantly related to the outcome variable in 2020, suggesting that larger firms at baseline were more likely to have a lower wage bill in the short term. However, in the long term this coefficient turns negative, suggesting that two years after the onset of the pandemic larger firms at baseline had *higher* wage bills, which likely highlights their ability to recover.

Table 8: OLS regression results: lower wage bills

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	Lower wage bill in June 2020		Lower wage bill in Sept. 2020		Lower wage bill in March 2021		Lower wage bill in March 2022	
# employees	0.0777***	0.0772***	0.0469***	0.0463***	0.00433	0.00392	-0.0583***	-0.0581***
	(0.00304)	(0.00306)	(0.00310)	(0.00311)	(0.00310)	(0.00312)	(0.00297)	(0.00298)
Fixed assets	0.0018***	0.00138***	0.00112**	0.000839*	0.000123	0.0000	-0.00153***	-0.00138***
	(0.0004)	(0.000465)	(0.000455)	(0.000483)	(0.000462)	(0.000491)	(0.000447)	(0.000481)
Gross profit		0.000966**		0.000792*		0.000394		-0.000320
		(0.000407)		(0.000422)		(0.000425)		(0.000426)
Constant	0.788***	0.782***	-0.169***	-0.173***	1.003***	1.001***	1.167***	1.169***
	(0.0267)	(0.0268)	(0.0279)	(0.0281)	(0.0281)	(0.0282)	(0.0269)	(0.0271)
Observations	16,286	16,254	16,432	16,400	16,794	16,762	17,618	17,580
	0.116	0.117	0.085	0.085	0.043	0.043	0.046	0.046
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: industry and district fixed effects not shown but included in the estimation.

Source: authors' calculations from URA data.

Table 9: OLS regression: share of zero-salary employees

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	% employees zero salary June 2020		% employees zero salary September 2020		% employees zero salary March 2021		% employees zero salary March 2022	
# employees	-0.0441***	-0.0431***	-0.0395***	-0.0385***	-0.0497***	-0.0484***	-0.0565***	-0.0555***
	(0.00208)	(0.00207)	(0.00198)	(0.00197)	(0.00185)	(0.00185)	(0.00189)	(0.00189)
Fixed assets	-0.00284***	-0.00227***	-0.00268***	-0.00204***	-0.00249***	-0.00163***	-0.00229***	-0.00158***
	(0.000351)	(0.000362)	(0.000334)	(0.000343)	(0.000295)	(0.000301)	(0.000283)	(0.000298)
Gross profit		-0.00140***		-0.00156***		-0.00210***		-0.00171***
		(0.000299)		(0.000290)		(0.000263)		(0.000259)
Accommodation and food service activities	0.136***	0.141***	0.0898***	0.0953***	0.0272**	0.0332***	-0.0134	-0.00896
	(0.0160)	(0.0161)	(0.0146)	(0.0146)	(0.0124)	(0.0124)	(0.0114)	(0.0114)
Education	0.528***	0.530***	0.534***	0.536***	0.183***	0.185***	0.0186*	0.0200**
	(0.0162)	(0.0163)	(0.0159)	(0.0160)	(0.0133)	(0.0133)	(0.00997)	(0.00999)
Arts, entertainment, and recreation	0.265***	0.270***	0.199***	0.197***	0.0689**	0.0669**	-0.00401	-0.00118
	(0.0401)	(0.0404)	(0.0375)	(0.0376)	(0.0292)	(0.0290)	(0.0251)	(0.0254)
Constant	0.136***	0.141***	0.0898***	0.0953***	0.0272**	0.0332***	0.189***	0.202***
	(0.0160)	(0.0161)	(0.0146)	(0.0146)	(0.0124)	(0.0124)	(0.0158)	(0.0160)
Observations	16,286	16,254	16,432	16,400	16,794	16,762	17,618	17,580
R^2	0.195	0.197	0.215	0.216	0.099	0.103	0.095	0.098
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Industry and all district fixed effects not shown but included in the estimation.

Source: authors' calculations from URA data.

The final relationship that we seek to better understand in a linear regression framework is that of firm characteristics and the likelihood of retaining workers but paying them a zero salary. To do this, we estimate via OLS the following regression:

$$Y_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 \boldsymbol{X}_{i\,t-1} + \lambda_i + \pi_i + \varepsilon_{it} \quad (5)$$

Where Y_{it} is defined as follows:

$$Y_{it} = \frac{\#\,Employees\;Zero\text{-}Salary_{it}}{\#\,Employees_{it}} \quad (6)$$

The results of this estimation are shown in Table 9, which also includes the coefficient estimates for the three industries where the practice of reporting a zero salary was most pervasive. The results depicted in Table 9 show that larger firms at baseline were less likely to 'pay' a smaller share of their employees a zero salary. The same result holds for more profitable firms. There is, however, an interesting relationship between the sector dummy variables and the dependent variable. In the interests of space we display the coefficients and standard errors only from the sectors where the practice of paying zero salary was most pervasive. But we see that through to March 2021, the coefficient is positive and significant for all, while in March 2022 it was only so for the education sector. Again, the coefficient estimate falls as time passes, suggesting that these industries were less likely to engage in this behaviour as the pandemic unfolded and restrictions began to ease.

5.4 Did firms use the pandemic as an opportunity to cut labour costs in the medium and long term?

The results shown in Table 6 suggested some evidence that a firm which was profitable at baseline was positively associated with the likelihood that it had a lower wage bill at various points throughout the evolution of the pandemic in Uganda. To more thoroughly investigate whether more profitable firms were likely to use the pandemic as an opportunity to cut labour costs going forward, we estimate the following model via probit:

$$Y_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 \boldsymbol{D}_{i\,t-1} + \lambda_i + \pi_i + \varepsilon_{it} \quad (7)$$

where the dependent variable is specified as follows:

$$Y_{it} \begin{cases} =1 \text{ if } W_{it} < W_{i\,March2020} \\ =0 \text{ if } W_{it} \geq W_{i\,March2020} \end{cases} \quad (8)$$

We measure W in March 2021 and March 2022 as above. $\boldsymbol{D}$ is a vector of firm-specific characteristics, namely size (turnover) and profitability (gross profits), but, unlike the estimations above, it captures firms that in the financial year 2020–21 had turnover or profits *at least as high* as in 2018–19. Thus there are two dummy variables (for turnover and profitability respectively) which are each equal to 1 if the firms' outcomes in 2020–21 were at least as high as in 2018–19.[7] If firms were using the pandemic as an opportunity to cut costs, we would likely see a positive coefficient on each of these variables, suggesting that levels of business were equally as good as pre-pandemic but wage costs and employment levels were lower. The results of this estimation are shown in Table 10.

[7] The turnover and gross profit variables were adjusted in order to account for the effects of inflation between 2018–19 and 2020–21. Thus, any increase in business activity or profitability can be interpreted as a 'real' increase.

Table 10: Probit regression results

	(1)	(2)	(3)	(4)
	Lower wage bill in March 2021		Lower wage bill in March 2022	
# employees	0.0310***	0.0336***	-0.152***	-0.149***
	(0.00961)	(0.00964)	(0.00979)	(0.00981)
=1 if turnover 2020–21 ≥ 2018–19	-0.309***	-0.236***	-0.256***	-0.166***
	(0.0254)	(0.0325)	(0.0243)	(0.0313)
=1 if gross profits 2020–21 ≥ 2018–19		-0.116***		-0.142***
		(0.0324)		(0.0311)
Constant	0.272	0.319	1.044	1.101
	(0.623)	(0.615)	(0.695)	(0.694)
Observations	11,609	11,595	12,232	12,216
District fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes

Note: robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<01. Industry and district fixed effects not shown but included.

Source: authors' estimates from URA data.

The results strongly show that there is no evidence of larger or more profitable firms engaging in this cost-cutting behaviour. Firms that were at least as large or profitable in 2020–21 as they were in 2018–19 were significantly *less* likely to have a lower wage bill in either of March 2021 or March 2022.

6 Conclusion

This paper utilized administrative tax data from Uganda, a low-income country, to better understand the dynamics of formal employment over the course of the COVID-19 pandemic. It is just one of a handful of studies to use administrative tax data from a low-income country to do so. We uncovered a number of interesting trends. Firstly, the short-term effects of the pandemic on formal employment saw around one in four workers receiving a reduced salary, while around 11% of the formal workforce saw their jobs lost or suspended (i.e. received a salary of zero). However, throughout the medium and long term we saw signs of recovery in formal employment: by September 2020, just six months after the initial imposition of lockdown measures, the number of formally employed individuals had returned to pre-pandemic levels. Yet the pandemic induced a shift in the structure of formal employment in Uganda: despite aggregate employment recovering quite quickly, jobs in many sectors did not return for some time. Indeed, according to the most recently available data considered (June 2022), formal employment in four sectors was still below pre-pandemic levels. Of those that did retain their jobs through the course of the pandemic, we found that a large share were paid a reduced amount (many were paid nothing) but that this share recovered gradually over time.

Our regression analysis attempted to better understand the characteristics and types of firms that were more or less likely to engage in the aforementioned coping strategies (i.e. laying off workers or keeping them employed on a lower (even zero) salary). Specifically, we focused on the question of whether pre-pandemic firm size or profitability had a role to play. We found that larger firms were less likely to lay off workers and that this seemed to matter more as time passed. In other words these firms were more likely to be able to weather the economic shock of the pandemic and return their workforce to pre-pandemic levels in the medium and long term. However, we also found some mixed evidence that more profitable firms at baseline were more likely to have a lower total wage bill. But we found no evidence over the medium and long term that this behaviour

persisted; firms that were at least as profitable in 2020–21 as they were in 2018–19 (pre-pandemic) were significantly less likely to have cut their wage bills as the pandemic evolved. Thus, further investigation may be warranted to better pinpoint the exact causes of the different coping strategies observed.

Finally, we also made some back-of-the-envelope calculations with respect to lost incomes and PAYE revenues. Our estimates suggest that these stood at around UGX730 billion and UGX189 billion, respectively, over the course of 2019–20 to 2021–22.

These results showcase a potentially useful tool for future economic shocks: administrative tax data can be used to better predict where government support might best be targeted. Thus, should governments prioritize supporting employment in the case of a future shock, the results presented herein point to certain key sectors and to smaller, less profitable firms that may be most in need of such support.

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Appendix

Table A1: PAYE marginal rate structure in Uganda

Monthly chargeable income (UGX)		
From	To	%
0	235,000	0%
235,001	335,000	10%
335,001	410,000	20%
410,001	10,000,000	30%
10,000,001		40%

Source: authors' illustration based on Uganda Revenue Authority (2023).

Table A2: Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
# Employees June 2020 : March 2020	16,565	1.051	2.794	0	334
# Employees Sept 2020 : March 2020	16,442	1.078	2.819	0	334
# Employees March 2021 : March 2020	16,050	1.184	5.285	0	630
# Employees March 2022 : March 2020	15,345	1.352	4.113	0	344
Lower wage bill June 2020	22,194	0.281	0.450	0	1
Lower wage bill September 2020	22,194	0.303	0.460	0	1
Lower wage bill March 2021	22,194	0.331	0.470	0	1
Lower wage bill March 2022	22,194	0.383	0.486	0	1
Total assets 2018–19	22,194	13.526	9.014	-18.481	30.216
Log gross profits 2018–19	22,136	13.689	10.047	-26.528	28.852
Share of employees earning zero June 2020	17,291	0.171	0.370	0	1
Share of employees earning zero September 2020	17,404	0.153	0.352	0	1
Share of employees earning zero March 2021	17,668	0.106	0.106	0	1
Share of employees earning zero March 2022	18,447	0.952	0.095	0	1

Source: authors' calculations based on data from URA.