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ORIGINAL ARTICLE

The COVID-19 pandemic and polarisation of income distribution in South Africa

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Abstract

A number of reports have shown that workers with certain characteristics are disproportionately affected by the COVID-19 pandemic. Since these characteristics are associated with vulnerable workers, we hypothesise that the income distribution in the pandemic era will be polarised compared to the pre-pandemic period. This article compares the pre-COVID income distribution (February 2020) with the one that prevailed just after the hard lockdown (April 2020). Consistent with the hypothesis, the result shows evidence of polarisation. Disaggregating the analysis by worker characteristics, we find that the polarisation was stronger in vulnerable groups. Our decomposition result suggests that, apart from job losses, returns to gender and job characteristics explain the location and shape differences in the COVID-19 era income distribution. Although this analysis only looks at the short-term effect of the pandemic on income distribution, the result suggests that the structure of labour markets in developing countries is not conducive to a future of work where disruptions (or pandemics) may become more frequent.

Keywords: COVID-19; decomposition analysis; gender income gap; inequality; polarisation; South Africa

JEL Codes: D63; E24; J61

Introduction

The disruption caused by COVID-19 affected many facets of life. One concern is the impact of the pandemic and the associated lockdown on jobs and livelihood. Specifically, a number of authors have noted that the pandemic is likely to increase income inequality, with some authors suggesting that this will result in higher levels of polarisation, especially in developing countries (Darvas, 2021; Agarwal, et al., 2022; Bundervoet, et al., 2022; Deaton, 2021). The thesis of polarisation is based on the differential impact of the pandemic on job and income loss, especially in developing countries (International Labour Organization [ILO], 2020). Specifically, the size of the informal sector in developing countries suggests inequality in ability to work from home will disproportionately affected vulnerable workers (Nwosu, et al., 2022). This article argues that the nonuniform effect of the pandemic will result in a predictable change in the income distribution (at least in the short run).

In the case of South Africa, the country declared a State of National Disaster on 15 March and went into a total lockdown on 26 March – designated Level 5 restrictions – with only essential travel and services allowed. As a result, there was a significant drop in

economic activities. Like other countries, the forced labour-market disengagement resulted in significant economic cost for workers, especially vulnerable workers. Before the pandemic, the disparity in labour-market income was a major driver of aggregate inequality (Leibbrandt, et al., 2012). This is because labour-market income is characterised by a wide dispersion in wages and by the existence of a substantial fraction of individuals who earn no income (Leibbrandt, et al., 2001). Therefore, during the pandemic, the notion that the pandemic will exacerbate existing inequality is particularly relevant in the case of South Africa.

According to Ranchhod and Daniels (2020), one in three of those who earned an income in February 2020 did not earn an income in April 2020, due to job losses and furloughs. Furthermore, job losses were disproportionately concentrated among already disadvantaged groups in the labour market (Rogan and Skinner, 2020). For example, women, manual workers, and those at the bottom half of the income distribution suffered disproportionately higher rates of job loss (Jain, et al., 2020). In particular, groups who have always been more vulnerable – such as women, African/Blacks, youth, and less educated groups – have been disproportionately negatively affected (Ranchhod and Daniels, 2020). Lastly, Ranchhod and Daniels (2020) noted that:

In comparison with formal workers, those in the informal economy have been disproportionately impacted by the pandemic. A larger share of the informal economy (relative to formal employment) was locked out of employment during the month of April. Moreover, for the typical informal worker who was employed in both February and April the hours worked per week decreased by as much as 50%. Decreases in typical working hours were particularly large for women and workers in self-employment and for informal casual workers.

There are two important concepts that are important in understanding how the pandemic and associated lockdown have affected the income distribution in South Africa. Given that South Africa is one of the most unequal countries in the world, one may expect the pandemic to increase income inequality. On the other hand, the effect may be more in the form of the polarisation of the income distribution (note that one does not preclude the other). Although related, inequality and polarisation are distinct concepts. Inequality refers to the dispersion of the income distribution, that is, it is related to the deviation of the income distribution from the egalitarian distribution (Panek and Zwierzchowski, 2020). Polarisation, as distinct from inequality, refers to the tendency of mass shifting away from the centre of the income distribution to its tails, that is, a hollowing-out of the middle class (Clementi, et al., 2020). It is important to note that changes in polarisation may be different from, and even opposite to, changes in inequality.

The findings of Ranchhod and Daniels (2020), Roger and Skinner (2020), and Jain, et al., (2020) described above paint a picture of the hollowing out of the middle of the income distribution relative to the pre-pandemic income distribution. This is because vulnerable workers are less likely to be observed at the upper deciles of the income distribution and are also less likely to be able to perform work tasks from home (under the hard lockdown) (Nwosu, et al., 2022). Therefore, one can imagine the effect of the pandemic manifesting as a shift in mass (due to job losses, reduction in hours worked, and furlough) from the middle and lower deciles to the bottom decile of the income distribution. This movement is likely to create a (more) polarised income distribution relative to the pre-pandemic situation. It has been shown that the level of income polarisation in South Africa increased between 1993 and 2008, while from 2008 to 2014, there has been a decline in the level of income polarisation (Machema, 2019). Polarisation of the income distribution due to the pandemic suggests that the gains that have been recorded between 2008 and 2014 may have been reversed.

Furthermore, the description of the effect of the pandemic predicts a particular kind of polarisation, referred to as 'the downgrading' of the income distribution. Downgrading is defined as movement of mass into the lower tail of the income distribution (Alderson,

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et al., 2005). Therefore, pandemic-induced polarisation is expected to be one-sided. Related to this is the notion that as the economy re-opens, the effect of polarisation will dissipate. However, the recovery is expected to be slow and uneven (Lee, et al., 2021).

Under reasonable assumptions, we provide evidence that the effect of the pandemic-induced labour market shock is in the form of the polarisation of the income distribution (at least within the first few months of the pandemic). Our analysis is based on the relative distribution method introduced by Handcock and Morris (1998, 2006). This method allows for the isolation of location and shape differences between two distributions. Location effects refer to a situation where the difference between two distributions F_1 and F_2 can be captured by a scalar c, that is, $F_1(x) = F(x)$ *and* $F_2(x) = F(x + c)$. Differences that remain net of location adjustment are differences in shape. These include scale, skew, and other distributional characteristics like polarisation (Handcock and Morris, 1998). Furthermore, following existing literature (Clementi, et al., 2018), the location and shape differences are decomposed to identify variables that explain the observed changes in income distribution.

Using a nationally representative survey from South Africa, we compare the distribution of income just before and immediately after the pandemic-induced lockdown. Income distribution for various groups is also compared to see if indeed some groups are disproportionately affected. The result shows that net of the location (median) difference between income distributions, the income distribution just after the pandemic (April 2020), was more polarised than the distribution that prevailed just before the pandemic (February 2020). The result also shows that polarisation is stronger for vulnerable groups (young workers, women, and Black people) under the pandemic compared to the less vulnerable groups. Furthermore, decomposition of the April income distribution by gender shows that, apart from job and income losses, factors related to job characteristics explain both the location and shape differences in the income distribution by gender groupings.

The rest of the article is organised as follows: the next three sections briefly review the literature and discuss the data and methods. This is followed by the presentation of results. The last section discusses the results and concludes.

Brief review

Evidence that has come to light (mostly for developed countries) suggests that the impact of the COVID-19 crisis is large and unequal within and across countries (Adams-Prassl, et al., 2020). For example, evidence suggests that the shock has been much smaller for German workers compared to workers in the United States and the United Kingdom. Furthermore, there are within-country variations in the impact depending on job type, worker characteristics, sector (formal or informal), and occupation type. Specifically, workers who are able to perform work tasks from home, have permanent employment contracts, and in salaried jobs are substantially less likely to lose their job due to the crisis.

This pattern has serious implications for developing countries where the workforce is disproportionately informal[1] (International Labour Organization [ILO], 2020). Some estimates show that as much as 90% of workers in developing countries rely on the informal economy (Bonnet, et al., 2019). Some of these workers are engaged in jobs like street vending, waste picking, domestic jobs, and other low-wage jobs that rely on in-person interaction. As a result, informal workers often live from 'hand-to-mouth' and are not benefitting from social security systems, which are largely absent in developing countries. The implication of the lockdown for informal workers is therefore a loss of livelihoods.

Specifically in the case of South Africa, it has been shown that socioeconomic inequality in the ability to work from home favours those with higher socioeconomic status (Nwosu, et al., 2022). Since jobs that are amenable to working from home pay more, one will expect the effect of reduced income to disproportionately affect the lower part of the income

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distribution. This suggests a change in shape of the income distribution that will see mass move from the middle to the bottom deciles.

It is argued that the polarising effect is likely to be similar in other developing countries in sub-Saharan Africa because of the similarity in the structure of the economy. This is important because it not only predicts greater inequality as the pandemic lingers on, but the polarising effect is likely to present a challenge in terms of the cost of government intervention that will be needed to mitigate the effect of the crisis. Furthermore, the polarisation of the income distribution may imply social segregation, which may lead to social tensions (Li, et al., 2019).

Data and approach

Data description

The analysis is based on the first wave of the National Income Dynamic Study – Coronavirus Rapid Mobile Survey (NIDS-CRAM) data.[2] This dataset is a follow-up survey of a preexisting nationally representative household survey, that is, the National Income Dynamic Study (NIDS). The first wave of NIDS-CRAM ran from the 7 May to 27 June, 2020 and used 50 call centre agents to survey a representative subsample of 7000 adult respondents from Wave 5 of NIDS (conducted in 2017). Wave 1 contains information about income in February and April 2020. Note that the unit of observation in both surveys is the individual, although household-related questions were asked. The 20-minute survey asked respondents about their current and retrospective employment, demographic information, household welfare, COVID-19 risk perceptions, and knowledge and behaviour, among other questions. It is important to note that NIDS-CRAM data are sampled such that they are representative of the NIDS 2017 adult sample and not necessarily the 2020 population of South Africa.[3] A detailed description of NIDS and the NIDS-CRAM sampling process is presented elsewhere (Brophy, et al., 2018; Ingle, et al., 2020; Kerr, et al., 2020).

The Wave 1 questionnaire asked respondents about their employment status in February and April 2020. This is important because the lockdown started on 26 March, which implies that February represents the pre-pandemic period, while April represents the pandemic period. Our focus is on reported income from the labour market in these 2 months. Weighted estimates from Wave 1 NIDS-CRAM data show that 3 million fewer people were employed in April compared to February, an 18% decline. The 95% confidence interval of the decline in the number of people employed from February to April is between 2.5 and 3.6 million people (Spaull, et al., 2020).

It is important to note that there is a difference in the way information on income in February and April was collected. February income was collected as total income for the month, while for April respondents were asked how often they were paid (daily, weekly, every 2 weeks, or monthly). The implication is that deriving monthly income for April involves the implicit assumption that those who reported having some income for some part of the month actually worked for the entire month. For example, monthly income for a person who reported being paid weekly involves multiplying reported income by the number of weeks in April. However, since labour-market activities were generally lower due to the pandemic and the lockdown, this may not be the case. Furthermore, those who did not report monthly payments in April were more likely to be working in the informal sector, so it is not guaranteed that they worked for the entire month of April. Therefore, income in April may be overestimated so that the finding of this article can be regarded to be the lower bound of the impact of the pandemic on the income distribution. As a robustness check, we restrict the analysis to individuals who report only monthly income in both months. The results (presented in Table S1 of the Supplementary file) suggest that our substantive results are valid in this subsample.

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Another important point to note is that, since we are interested in how the pandemic and associated lockdown affect the income distribution, we restrict the estimation sample to individuals who reported being employed in February. To be clear, this means the income distribution in April contains a higher number of zeros. These are people who were employed and had an income in February but were unemployed or furloughed in April.

Method

The relative distribution

To ascertain if the description of the effects of the pandemic as described by Jain, et al., (2020), Ranchhod and Daniels (2020), and Rogan and Skinner (2020) is consistent with polarisation of the income distribution, the relative density methodology (Handcock and Morris, 1998, 2006) is used to compare the income distribution just before and during the pandemic. The importance of this methodology over other methodologies is that it is very granular, that is, it can indicate precisely where the polarisation is concentrated (Clementi, et al., 2018, 2020). Furthermore, this approach allows for the separate estimation of the effects attributable to changes in location of the income distribution and those that are due to changes in the shape of the income distribution. Our main focus in this study is the shape component because it reveals (net of the location difference) how polarised a distribution is relative to another. Specifically, we are interested in how polarised the April income distribution is relative to the February distribution net of the difference in the median of the two distributions. Following the exposition in Clementi, et al. (2020), a brief review of the method is provided in the appendix (section S2 of the supplementary file). Here, we summarise the main points.

To compare two distributions, our implementation of the relative density approach divides the two distributions to be compared into deciles and then calculate the ratio of densities at each decile (i.e., the relative density). This reveals the total difference between the two distributions. If the relative density is greater than 1, then it means the comparison distribution has more mass at that decile than the reference distribution; the converse is also true. Further this approach allows us to decompose the relative distribution into shape and location differences. It is the latter that allows us to say something about polarisation in one distribution compared to the other. Specifically, a 'U-shaped' shape component provides evidence of polarisation. This polarisation can be summarised by the *median relative polarisation* (MRP) index, *lower relative polarisation* (LRP) index, and *upper relative polarisation* (URP) index. Positive values for these indices constitute evidence in support of polarisation (see section S2-1 of supplementary file for the technical definitions).

Further, Clementi, et al., (2018) show that using the Regression Influence Function (RIF) regressions (Firpo, et al., 2009), one can use Oaxaca-Blinder decomposition (Blinder, 1973; Oaxaca, 1973) to identify variables that explain the shape and location differences associated with the relative densities. This makes it possible to identify covariates that explain the differences and whether the difference is due to differences in returns to these characteristics or differences in characteristics (see supplementary file S2-2 for more details).

This approach is used to perform aggregate and detailed decomposition by gender groups for April. Specifically, this decomposition is used to identify factors that explain the differences in the location and shape differences between gender groups in the April income distribution. It is acknowledged that ideally the decomposition should be used to explain the differences across time (i.e., between February and April); however, this is not done for two reasons. First, the period between the two time points is very short (two months), so a priori one should not expect many covariates (except the ones that have to do with labour-market disengagement) to change dramatically. Second, the data

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do not contain separate information on covariates for the two time points. The respondents were interviewed between May and June and asked about their income and employment in February and April. In other words, we have only retrospective information about employment and income in February.[4]

Given this restriction, we instead use the decomposition methodology to explain the shape and location differences between gender groups in April. This is because existing narratives suggest that gender is an important factor when it comes to the effect of the pandemic on the labour market. Furthermore, gender is correlated with work characteristics, which are also correlated with variations in the effect of the pandemic.

Results

Overall analysis

The two variables of interest are reported incomes for February and April. However, some respondents reported bracket information rather than their actual income. For these respondents, their income is replaced with the mean of actual reported income that falls within their reported bracket. Figure 1 shows the kernel density of the log of income in February and April. The result shows that, while the upper part of the income distributions is similar, there are notable differences in the lower tail. Recall that our analysis is restricted to those who reported working in February. Figure 1 shows a significant increase in the proportion of people who reported zero or close to zero income in April relative to February.

This can be attributed to job losses and workers who were furloughed as a result of the pandemic and lockdown. The result also suggests a possible change in the median as a result of the impact of the pandemic.

Figure 2 displays the relative density that compares the income distribution in February to the one in April (total difference). The lines on the bars represent the 95% confidence intervals. All the relative data estimations make use of survey weights and confidence intervals were computed using the bootstrap approach with 500 replications. Note that, when the confidence interval includes 1, we conclude that there is no significant difference between the relative density and 1. The result suggests that workers at or above the 7^{th} decile (of the February distribution) were barely affected in terms of income, since their relative densities are not significantly different from 1. Below the 7^{th} decile, the relative densities are significantly less than 1, which implies that there is more mass in these deciles in February relative to April 2020. It is also apparent that the 2^{nd} and 3^{rd} deciles were more affected than other deciles. As one would expect given Figure 1, the 1^{st} decile of the relative density is significantly greater than 1. This indicates that the comparison distribution (April) had more mass than the reference distribution (February) in this decile.

This picture is consistent with the hollowing out of the middle of the distribution in April relative to February. Specifically, it means the income distribution has changed with movement of mass being largely from the 2^{nd} and 3^{rd} deciles to the 1^{st} decile.

Next, we examine the location and shape difference between February and April 2020. Figures 3 and 4 show the location and shape components of the decomposition (respectively).

In terms of location difference, the pattern in Figure 3 suggests that (after adjusting for difference in shape) April's income distribution was to the left of the February's income distribution.

This suggests that the median in February was larger than the median in April, that is, in terms of location difference, the February distribution was better. This is consistent with the fact that many workers had lost some or all of their income by April. In terms of shape difference, the pattern in Figure 4 suggests that job loss between February and

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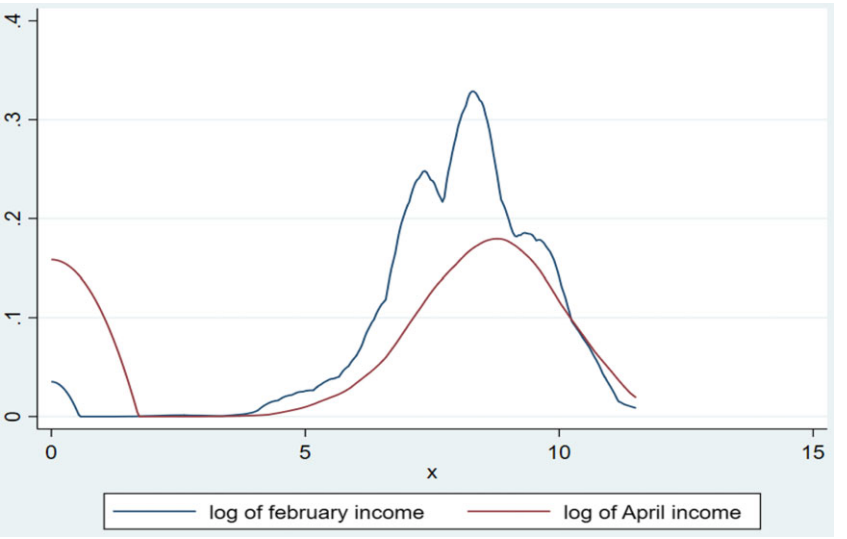

Figure 1. Weighted kernel densities of log of reported income in February and April, 2020. Source: Weighted Wave 1 of NIDS-CRAM.

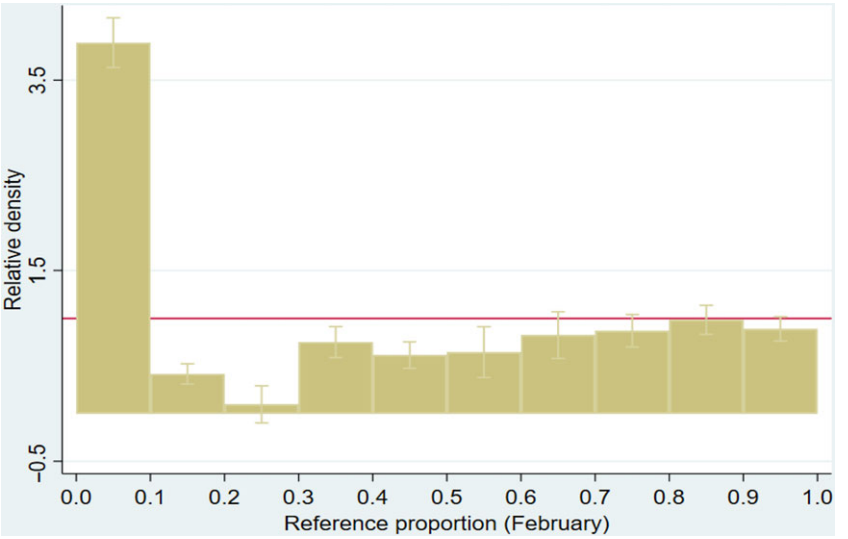

Figure 2. Weighted relative density using February income as the reference distribution. Source: Weighted Wave 1 of NIDS-CRAM.

April had resulted in polarisation of the income distribution, that is, net of the median difference, the April income distribution is more polarised than the February distribution. This is confirmed by the U-shaped relative density.

Furthermore, Figure 4 suggests that polarisation was stronger at the lower tail. Compared with the result of Machema (2019), this suggests that gains in terms of lower polarisation have been eroded by the pandemic.

The information provided by the graphs can be summarised with the polarisation indices. A positive index is evidence of polarisation, while a negative index suggests the

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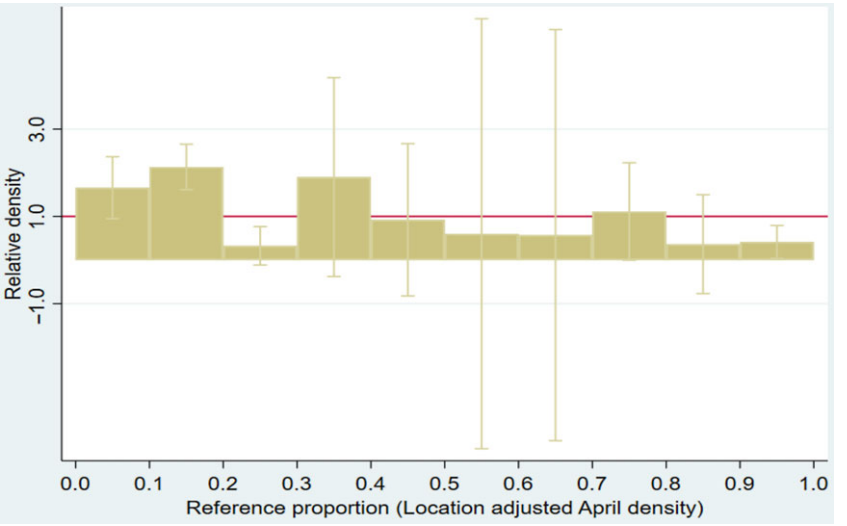

Figure 3. Location component of the overall decomposition. Source: Weighted Wave 1 of NIDS-CRAM.

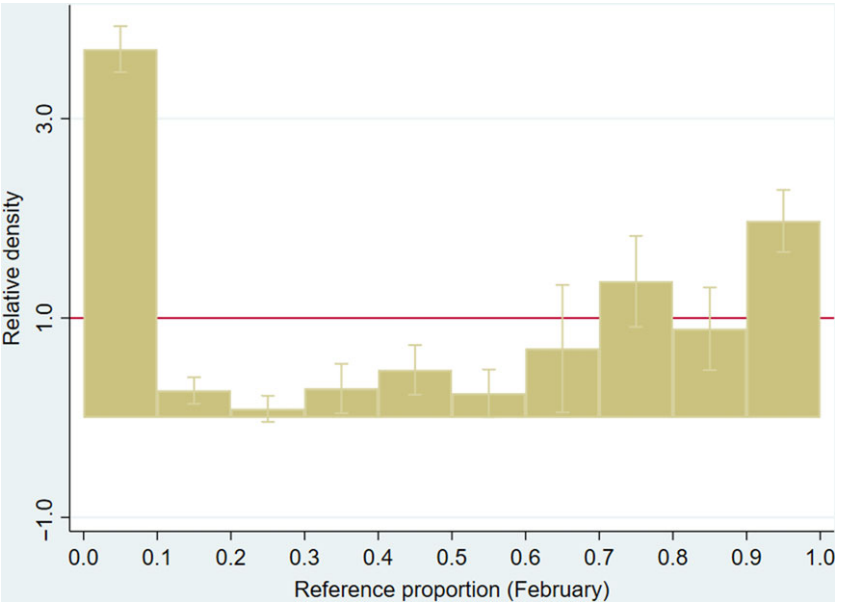

Figure 4. Shape component of the overall decomposition. Source: Weighted Wave 1 of NIDS-CRAM.

opposite (note this is only relevant for the shape component of the relative density decomposition). The polarisation indices in Table 1 (Panel 1) confirm the result presented in Figure 4 (shape component); all the polarisation indices MRP, URP, and the LRP are positive and statistically significant. The positive sign indicates that these coefficients represent polarisation from the median towards the tails of the distribution. Consistent with the description of how the pandemic has affected workers in South Africa – that is, the description of Jain, et al., (2020), Ranchhod and Daniels (2020), and Rogan and Skinner (2020) – LRP is larger in terms of magnitude, suggesting that the polarisation is stronger at the lower

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Table 1. Polarisation indices

	Total (Panel 1)				
	Coef.	Jackknife Std. Err.	t	P > t	95% confidence interval
MRP	0.44	0.03	13.33	0.00	0.38, 0.51
LRP	0.55	0.03	16.37	0.00	0.48, 0.62
URP	0.33	0.06	5.73	0.00	0.22, 0.45
Disaggregation by gender (Panel 2)					
Male					
MRP	0.28	0.04	7.09	0.00	0.20, 0.35
LRP	0.53	0.05	11.39	0.00	0.44, 0.62
URP	0.03	0.05	0.49	0.621	−0.08, 0.13
Female					
MRP	0.53	0.06	8.57	0.00	0.41, 0.65
LRP	0.67	0.05	13.79	0.00	0.57, 0.76
URP	0.39	0.10	4.08	0.00	0.20, 0.58
Disaggregation by race (Panel 3)					
Non-Blacks					
MRP	0.25	0.05	4.98	0.00	0.15, 0.35
LRP	0.38	0.08	4.50	0.00	0.21, 0.54
URP	0.12	0.08	1.49	0.14	−0.04, 0.28
Blacks					
MRP	0.49	0.04	12.34	0.00	0.41, 0.57
LRP	0.66	0.04	15.43	0.00	0.58, 0.75
URP	0.31	0.06	5.56	0.00	0.20, 0.42
Disaggregation by age groups (Panel 4)					
age > 30 years					
MRP	0.33	0.05	6.99	0.00	0.24, 0.43
LRP	0.57	0.03	19.04	0.00	0.51, 0.63
URP	0.09	0.09	1.06	0.29	−0.08, 0.27
age <= 30 years					
MRP	0.57	0.09	6.03	0.00	0.38, 0.75
LRP	0.69	0.10	6.63	0.00	0.49, 0.90
URP	0.44	0.13	3.32	0.00	0.18, 0.70

MPR = median polarisation index; LRP = lower polarisation index; URP = upper polarisation index.

tail. On the other hand, workers at the top deciles (in February) are less affected, since these workers are more likely to have employment contracts or/and are able to perform their work tasks from home. As noted earlier, to check the robustness of the result, we restrict the analysis to individuals who reported monthly income only (this is about

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58% of the unweighted sample). The result shows that there is significant polarisation from the median (MRP), and this is towards the bottom deciles (LRP). However, polarisation toward the upper deciles (URP) is not statistically significant. These results show that our substantive result is valid in the subsample (see table S1 in the supplementary file for details).

We note that the change in the income distribution can be interpreted as the impact of the pandemic on the income distribution. This is because the pandemic and associated lockdown can be thought of as an exogenous shock to the labour market. In other words, job losses between February and April were not influenced by actors in the labour market. The pandemic can therefore be argued to be the cause of the change in the income distribution.

Subgroup analysis

In this section, we explore the effect of the pandemic on the income distribution in different subgroups across time. This is motivated by the notion that workers with certain characteristics are disproportionately affected. In this section, we focus on the shape component. Figures 5 and 6 disaggregate the analysis in Figure 4 (i.e., the shape component) by gender to see if the polarising effect differs by gender. It is evident that, while the polarising effect is applicable to both gender groups, this effect is stronger for female workers.

This is because the relative density in Figure 6 (for women) appears to have been impacted more, relative to the one in Figure 5 (for men). Specifically, for the male distribution, individuals above the 5^{th} decile of the reference distribution are not affected (the relative densities are not statistically different from 1). However, in the female distribution, one must be above the 7^{th} decile of the reference distribution to experience the same protection. Table 1 (Panel 2) shows the associated MRP, LRP, and URP for Figures 5 and 6. Specifically, the polarisation indices are higher in the female distribution relative to the male distribution: 0.53 versus 0.28 for MRP; 0.67 versus 0.53 for lower relative polarisation (LRP); and 0.39 versus 0.03 for upper relative polarisation (URP). This result confirms that female workers are disproportionately affected.

Panels 3 and 4 of Table 1 show the polarisation results by race (Blacks vs. non-Blacks) and age (workers who are 30 years of age or younger vs. workers who are older than 30 years of age). The results are consistent with the gender result, that is, polarisation in the distribution of income in vulnerable groups (i.e., female and younger workers) is stronger than their counterparts. Specifically, the values of the polarisation indices are higher for the vulnerable groups. It is also evident that the polarisation is in the form of the downgrading of the income distribution.

Explaining gender differences (in April) using decomposition analysis

The analysis so far suggests that net of the pandemic-induced income losses, characteristics like being young, female, or African/Black was associated with higher income penalties in April (note that these groups are also more likely to work in the informal sector). However, the preceding analysis is not multivariate in nature, we therefore consider decomposition analysis that allows us to assess a more comprehensive list of characteristics that explains differences in the distributions. The advantage of the Oaxaca-Blinder decomposition discussed earlier is that one can identify covariates that explain these differences at the quantiles. However, unlike the previous analysis where income distribution was compared over time, this analysis compares the male and female distribution in April. This is because gender is one of the major factors that defines those who were disproportionately affected. Furthermore, as noted earlier, we only have the distribution of characteristics at one point in time.

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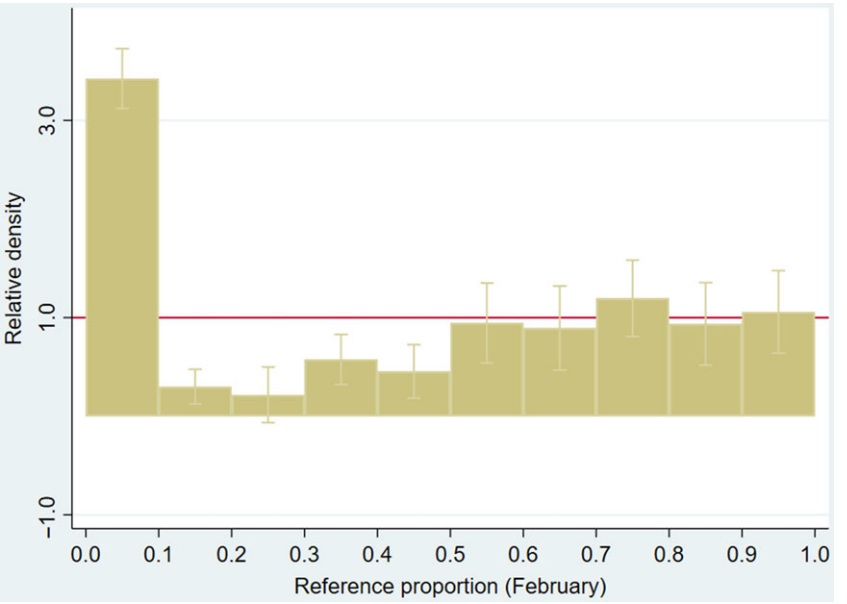

Figure 5. Weighted relative density using February income as the reference distribution (male). Source: Weighted Wave 1 of NIDS-CRAM.

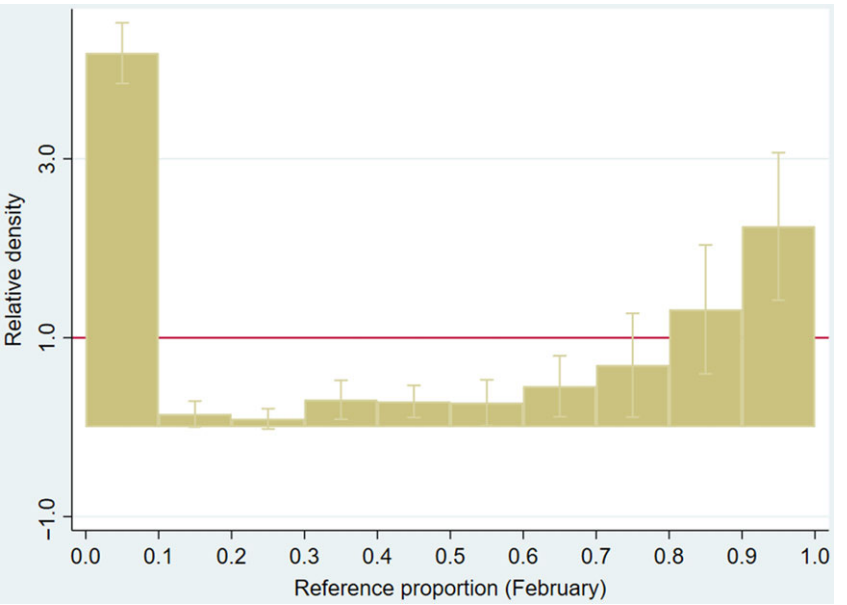

Figure 6. Weighted relative density using February income as the reference distribution (female). Source: Weighted Wave 1 of NIDS-CRAM.

The controls used in the decomposition analysis include location (traditional, urban, or farms), employment status in February and April, tertiary education, self-reported health, age, race, type of employment (regular, casual, self-employed, and running a business), a dummy for employment contract, and type of job (managers, professionals, and others).

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Table 2. Oaxaca-Blinder decomposition of location (median) difference

	(1)	(2)	(3)	(4)
Variables	Overall	Endowments	Coefficients	Interaction
Urban[d]		−0.00	0.16	−0.00
Farms[d]		−0.00	0.01	0.01
Employed in April		0.35***	−0.90**	−0.13**
Employed in Feb		−0.00	0.02	−0.01
Tertiary education		−0.01	0.18	−0.03
Self-reported poor health		−0.00	0.05	0.01
Age in years		−0.00	0.96*	−0.01
African		−0.01	0.04	0.00
Regular job[c]		0.20**	−0.48	−0.07
Contract[a]		−0.00	−0.36	0.00
Professional job[b]		−0.02	0.02	−0.01
Overall	.			
Male	8.35***			
Female	7.36***			
Difference	0.99***			
Endowments	0.50**			
Coefficients	0.72***		.	
Interaction	−0.24**			.
Constant			1.02	
Observations	3,039	3,039	3,039	3,039

Standard errors are in parentheses
*p < 0.1,
**p < 0.05,
***p < 0.01.
[a]Employee has an employment contract.
[b]This is a dummy that is 1 if the respondent is a manager or professional and 0 otherwise.
[c]Omitted category includes casual work, self-employment, and running a business.
[d]Omitted category is traditional areas.

Table A1 in the Supplementary file presents the summary statistics. Table 2 below presents the Oaxaca-Blinder decomposition of the location difference. Following Clementi, et al., (2018), it is noted that the densities being compared under the location effect only differ in the measure of location (median in this case), that is, they have the same shape, so performing the decomposition at the median will suffice.

Table 2 shows that male workers had a higher median wage than female workers, and the difference between the median was statistically significant. Furthermore, the endowment, coefficient, and interaction effects are statistically significant in explaining the median gap (note that both coefficient and endowment effect increase the gap[5]). Three variables explain significant variation in the media gap: employment status in April, having a regular job, and age. Consistent with results in the last section, this shows that, apart from employment status, type of employment and age explain the difference in median income between male and female workers in April.

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Tables 3 and 4 show the decomposition for the shape effect. For this analysis, the decomposition was estimated for $\tau = 10, 20, 30, 70, 80, 90$.[6] In terms of the coefficient and endowment effect, both effects are not significant in explaining the gap at the lowest quantile (i.e., $\tau = 10$); however, at the 20th and 30th quantiles, only the coefficient effect is significant. At the higher quantiles (i.e., $\tau = 70,\ 80$), both the coefficient and endowment effects are significant. While in the highest quantile (i.e., $\tau = 90$), only the coefficient effect is significant. The result shows that significant endowment effect can only be found at the upper quantiles (i.e., $\tau = 70,\ 80$). Apart from this, the size of the coefficient effect suggests that the polarisation effect becomes stronger at the higher quantiles. In other words, the coefficient (or unexplained) effect was more important and was stronger at higher quantiles.

The detailed decomposition shows that, like the median effect, employment status was important in explaining differences at the quantiles. Furthermore, job characteristics in terms of type of employment (regular as against casual, self-employment, and running a business), having an employment contract, and being a professional explain the shape effect. It is also noted that, while being a professional was not significant at the lower quantiles (i.e., $\tau = 10, 20, 30$), it was important at the higher quantiles.

The implication of this result is that net of change in employment status, the type of employment in terms of having an employment contract, being a professional, and having a regular job are important in explaining the income differences. The result also shows that differences in returns are not only important in explaining the inequality, but also the significance of this factor increased at the higher quantiles. This is important because it is consistent with existing evidence that suggests the returns are more important in explaining income differentials in South Africa (Mosomi, 2019). However, it further suggests that the unexplained effect that favoured male workers before the pandemic remained effective in mitigating the effect of the pandemic on male workers. The raw differences show that the net effect of these covariates was that they disproportionately protected male workers under the pandemic. This implies that the pandemic and the associated lockdown exacerbated existing income gaps like the gender and informal income gap.

These results are important for two reasons. First, the size of the informal economy in African countries is relatively large. The ILO estimate from 2018 showed that about 60% of the world's employed population are in the informal economy, while in sub-Saharan Africa this figure is 85%.[7] Second, because of relatively high unemployment rates in developing countries, women and young workers (who happen to be the demographic groups in the majority) are more exposed to informal employment (ILO, 2018). This indicates that a larger proportion of the African population has suffered under health restrictions that were designed to get the pandemic under control. Therefore, the current (largely informal) labour-market structure in developing countries is not designed to cope with a pandemic like COVID-19. Workers who are referred to as *vulnerable* in normal times are even more vulnerable under the kind of lockdown restrictions that have been necessary to control the outbreak of COVID-19. These categories of workers and the households that depend on them face a decision between hunger and compromising their health under these restrictions. It is therefore not surprising that workers in this category may opt not to obey lockdown rules, especially in countries where they are not covered by social security.

The World Health Organization has warned that COVID-19 may not be the last pandemic (Gill, 2020).[8] This raises the question of how low- and middle-income countries plan to deal with future pandemics if that were to occur. A fragile labour market structure coupled with an absence of social security systems in developing countries points to a lack of resilience in these economies to withstand the strain of a pandemic. South Africa is one of the few countries in Africa that has an existing and effective social security system, but it still struggled and is still struggling under the effects of the pandemic. The experience in South

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Table 3. Oaxaca-Blinder decomposition of shape effect

	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	10th quantile				20th quantile				30th quantile			
Variables	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction
Urban[d]		0.00	0.13	−0.00		0.00	0.36	−0.00		0.00	0.16	−0.00
Farms[d]		0.00	0.01	0.01		−0.01	0.02	0.01		−0.00	0.01	0.00
Employed in April		−0.06*	0.31	0.04		−0.04**	0.17*	0.02*		−0.04***	0.08	0.01
Employed in Feb		0.00	0.01	−0.00		−0.00	0.01	−0.00		−0.00	0.00	−0.00
Tertiary education		−0.01	0.15	−0.03		−0.02	0.07	−0.01		−0.03*	0.07	−0.01
Self-reported poor health		0.01	−0.08	−0.01		0.00	−0.05	−0.01		0.00	−0.03	−0.01
Age in years		0.01	0.99	−0.01		−0.00	0.36	−0.00		−0.00	0.20	−0.00
African		−0.01	0.02	0.00		−0.01	0.23	0.01		−0.01	0.06	0.00
Regular job[c]		0.12	−0.78**	−0.12		0.08**	−0.38**	−0.06*		0.07**	−0.24*	−0.04
Contract[a]		−0.00	0.61*	−0.00		−0.00	0.48***	−0.00		−0.01	0.34***	−0.00
Professional job[b]		−0.01	0.03	−0.01		−0.02	−0.05	0.01		−0.02	−0.04	0.01
Overall	.				.				.			
Male	3.42***				4.20***				4.69***			
Female	3.19***				3.94***				4.49***			
Difference	0.22				0.26				0.21			
Endowments	0.04	.			−0.02	.			−0.03	.		
Coefficients	0.32		.		0.31***		.		0.26***		.	

(*Continued*)

Table 3. (*Continued*)

	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	10th quantile				20th quantile				30th quantile			
Variables	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction
Interaction	−0.14			.	−0.03			.	−0.03			.
Constant			−1.10				−0.91*				−0.35	
Observations	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041

Standard errors are in parentheses
*p < 0.1,
**p < 0.05,
***p < 0.01.
[a]Employee has an employment contract.
[b]This is a dummy that is 1 if the respondent is a manager or professional and 0 otherwise.
[c]Omitted category includes casual work, self-employment, and running a business.
[d]Omitted category is traditional areas.

Table 4. Oaxaca-Blinder decomposition of shape effect (contd)

	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	70th quantile				80th quantile				90th quantile			
Variables	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction
Urban[d]		−0.00	−0.01	0.00		−0.00	0.42	−0.00		0.00	0.51	−0.01
Farms[d]		−0.00	−0.01	−0.00		−0.00	0.02	0.01		−0.00	0.02	0.01
Employed in April		0.42***	1.18**	0.17*		0.26***	0.83*	0.12*		0.08**	1.40***	0.20**
Employed in Feb		−0.00	0.00	−0.00		−0.00	0.01	−0.00		−0.00	0.03	−0.01
Tertiary education		−0.05	−0.07	0.01		−0.05*	−0.10	0.02		−0.03	0.11	−0.02
Self-reported poor health		−0.02	0.18**	0.03		−0.02	0.22**	0.04		−0.01	0.19**	0.03
Age in years		−0.01	−0.13	0.00		−0.01	0.41	−0.01		−0.01	1.65**	−0.02
African		−0.02	−0.15	−0.01		−0.02	0.12	0.01		−0.02	−0.22	−0.01
Regular job[c]		0.15**	0.09	0.01		0.10**	0.20	0.03		0.08*	−0.15	−0.02
Contract[a]		0.00	−0.90***	0.00		0.00	−0.66**	0.00		−0.00	−0.88**	0.00
Professional job[b]		−0.04	0.16***	−0.04		−0.02	0.25***	−0.07*		−0.01	0.25**	−0.07
overall	.				.				.			
Male	8.99***				9.54***				10.22***			
Female	7.75***				8.46***				9.17***			
Difference	1.24***				1.08***				1.05***			
Endowments	0.43***	.			0.23*	.			0.07	.		

(*Continued*)

Table 4. (*Continued*)

	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	70th quantile				80th quantile				90th quantile			
Variables	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction
Coefficients	0.63***		.		0.71***		.		0.90***		.	
Interaction	0.17*			.	0.14			.	0.08			.
Constant			0.28				−1.01				−2.02**	
Observations	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041	3,041

Standard errors are in parentheses
*p < 0.1,
**p < 0.05,
***p < 0.01.
[a]Employee has an employment contract.
[b]This is a dummy that is 1 if the respondent is a manager or professional and 0 otherwise.
[c]Omitted category includes casual work, self-employment, and running a business.
[d]Omitted category is traditional areas.

Africa suggests that only existing channels (i.e., old age pension, child support grant, etc.) were instrumental in getting needed help to the vulnerable under lockdown conditions. This is because the newly established Social Relief of Distress (SRD) grant, which was established to mitigate the effect of the lockdown on individuals who were not covered under existing grant systems, faced teething problems. The point is that most African countries were not prepared to cope under lockdown restrictions, both in terms of budget to make financial relief available and the logistics required to make sure such help gets to where it is needed the most.

In countries where social security systems are simply not in existence, one can imagine that the situation will be worse. Therefore, given that the threat of another pandemic remains a valid concern, the absence of a social security system coupled with a large informal economy predicts possible humanitarian crises going forward.

Conclusion

This article examined how the job and income losses induced by the COVID-19 pandemic have affected the income distribution in South Africa. Relying on the description of the effect of the pandemic and associated lockdown in the South African context (Jain, et al., 2020; Ranchhod and Daniels, 2020; Rogan and Skinner, 2020) and the fact that vulnerable workers are unlikely to be observed at the top of the pre-pandemic income distribution, this article hypothesises that the income distribution just after the lockdown will be more polarised than the income distribution that prevailed before the pandemic. Specifically, the finding of Jain, et al., (2020), Ranchhod and Daniels (2020), and Rogan and Skinner (2020) show that there have been substantial income and job losses as a result of the lockdown, and these losses disproportionately affect vulnerable groups (i.e., young, female, Black, and workers without employment contracts). Since vulnerable workers are unlikely to be at the top deciles of the pre-COVID income distribution, job and income losses should result in the hollowing out of the middle of the income distribution.

Using the relative distribution method (Handcock and Morris, 1998, 2006), our results show that, net of the median difference, the income distribution in April 2020 (COVID-19 period) is more polarised than the income distribution in February 2020 (pre-COVID-19 period). Specifically, the results show significant downgrading of the income distribution (i.e., movement of mass into the lowest decile of the income distribution). Furthermore, a disaggregation of the result by various demographic groups shows that, net of median difference, the income distribution in vulnerable groups was more polarised relative to their less vulnerable counterparts. For example, we find that polarisation in the April income distribution (relative to February) for female workers was stronger than the polarisation observed for male workers. Furthermore, when male and female income distributions are compared in April, income loss and job characteristics are significant in explaining both the median and the shape differences.

These results have two important implications for inequality in South Africa: (1) it suggests that within-group inequality in vulnerable groups has increased; and (2) against the backdrop of the findings of Machema (2019), which showed that the level of polarisation has declined in the recent past (2008 to 2014), our result suggests that these gains have been reversed within a short space of time. To the extent that inequality in labour-market income and within-group inequality are major factors driving stubbornly high inequality in South Africa (Leibbrandt, et al., 2012; Statistics South Africa, 2019), this result predicts higher inequality in South Africa driven by higher polarisation in the income distribution of vulnerable groups.

Reflecting on the results, this article notes that the structure of the South African labour market is similar to other developing countries in sub-Saharan Africa. These

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economies typically have a high unemployment rate, little to no social security system, and a large proportion of the workforce in the informal economy. COVID-19 has shown that livelihoods that depend on daily transactions are not compatible with the prolonged lockdowns that may be necessary to deal with a pandemic. In the words of Amr Adly, (2020), 'The bigger the informal economy, the poorer the capacity of the state to respond adequately to a public-health emergency, especially if this proves to be a lengthy crisis'.

Furthermore, since experts suggest that there is a reasonable probability of more pandemics in future,[9] the sustainability of such economies should be a cause for concern to policy-makers. Policy-makers in these countries should make efforts to have reliable information about the informal economy and work out ways to make sure that workers in this economy can function and survive (safely) even in the middle of a pandemic. Essentially, economies that cannot function under the kinds of restriction that were necessitated by the pandemic may not be sustainable going forward.

We note that our result is applicable to the period between February and April 2020. Lockdown restrictions have been relaxed in South Africa since then. Lockdown restrictions have been systematically reduced from Level 5 to Level 1 between March 2020 and March 2021. While available evidence suggests that the labour market has recovered to some extent, this evidence shows that women experienced a slower recovery than men as the economy started reopening (Casale and Shepherd, 2020). It appears that the recovery, just like the shock, has been uneven. While the results presented so far speak to the short-term effect of the pandemic on income distribution, we consider that polarisation may have dissipated but this does not take into account the dynamic effect of the relationship over time. Questions as to whether this effect will persist and for how long are left to future analysis.

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Notes

1 Informal workers are identified as regular and casual workers who do not have an employment contract, and unregulated own account workers and employers (Benhura and Magejo, 2020).

2 The NIDS-CRAM study (i.e., Data Collection) is funded by the Allan & Gill Gray Philanthropy, the FEM Education Foundation, and the Michael and Susan Dell Foundation.

3 It is noted that while the result should be interpreted in the context of being representative of 2017 adult population, there has not been any dramatic change in the trajectory of the South African population that suggests this might not give a credible picture of the job market in 2020. For example, rural urban migration has been on a steady rise, and the trajectory between 2017 and 2020 is consistent with what occurred before 2017 (see Statista, 2021)

4 Specifically with covariates at two time points, similar analysis to the one being proposed can be done over time. This will allow the analysis to differentiate the 'price effect' over time from the 'endowment effect'. This will be possible when more waves of the data become available.

5 Note that this means that if female workers have the endowment and return of male workers, their median income would be higher than what is observed

6 The focus is on the lowest and highest three deciles because of our interest in polarisation. These quantiles are the ones that are likely to be affected giving earlier results.

7 Compared to 68.2% in Asia, 68.6% in the Arab world, 40% in the Americas, and 21.5% in Europe.

8 Further, this article reports Professor Matthew Baylis from the University of Liverpool as saying: 'In the last 20 years, we've had six significant threats – SARS, MERS, Ebola, avian influenza and swine flu. We dodged five bullets but the sixth got us' (Gill, 202)

9 Another way to think of this is the fact that COVID-19 can hit in multiple waves as we have seen around the world. The effect of multiple lockdown scenarios can be argued to be similar to the effect of multiple pandemics. At the time of wrting, South Africa has tightened lockdown restriction from level 5 to 3 because of the spike in infection rate (the second wave). This means re-introduction of tighter restrictions that the country has gone through earlier. Obviously, this will mean job and income losses for workers in the affected industries.

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Appendix

Table A1. Summary statistics

Variable	Mean	Std. dev.	Min	Max
Income				
February	5747.03	8878.24	0	100000
April	4725.86	8530.03	0	100000
Geo location				
Trad	0.15	0.36	0	1
Urban	0.81	0.39	0	1
Farms	0.04	0.20	0	1
Employed				
In April	0.71	0.46	0	1
In February	0.09	0.29	0	1
Tertiary education	0.40	0.49	0	1
Self-reported poor health	0.26	0.44	0	1
Age in years	38.68	10.86	17	89
African	0.82	0.39	0	1
Regular job[c]	0.46	0.50	0	1
Employment contract[a]	0.42	0.49	0	1
Descent job[b]	0.09	0.28	0	1
Obs	3047			

[a]Employee has an employment contract.
[b]This is a dummy that is 1 if the respondent is a manager or professional and 0 otherwise.
[c]Omitted category includes casual work, self-employment, and running a business.

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