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Exploring psychological well-being and poverty dynamics in South-Africa: Evidence from NIDS waves 1-5

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Abstract

The mechanisms that perpetuate poverty are still not well understood. An emerging literature focuses on the psychology of poverty, investigating psychological and behavioral factors that may affect poverty entry and make it difficult to escape poverty. This paper explores the relationship between psychological well-being and poverty in South Africa. We rely on Waves 1-5 of the National Income Dynamics Study (NIDS), a nationally representative household panel survey that spans a decade. A descriptive analysis shows a strong negative correlation between psychological well-being and per capita household expenditure, with individuals in lower expenditure deciles displaying significantly higher risks of depression and lower levels of life satisfaction. To identify causal effects, we turn to an econometric framework that accounts for endogenous initial poverty conditions, unobserved heterogeneity and non-random panel attrition. Preliminary results suggest that the risk of poverty significantly increases as psychological well-being deteriorates, and the other way around. We discuss a range of avenues for follow-up research.

1. Introduction

Research in development economics has traditionally focused on *external constraints* faced by poor people and how to alleviate them. These constraints may relate for example to credit, education, health or infrastructure. Over the past decades, a growing number of economists have also started to recognize the role that *internal constraints* may play in perpetuating poverty. Drawing on findings from psychology and anthropology, they study psychological and behavioral factors that may affect poverty dynamics.

In this paper, we start exploring the relationship between psychological well-being and poverty dynamics in South Africa. Rather uniquely for a developing country, South Africa boasts a nationally representative household panel survey that spans a decade. We rely on data from the National Income Dynamics Study (NIDS), which is implemented by the Southern Africa Labor and Development Research Unit at the University of Cape Town. NIDS started in 2008 with a nationally representative sample covering more than 28,000 individuals in 7,300 households. Since then, survey waves were conducted bi-annually. Our analysis exploits all five waves of data that are currently available, covering the period 2008-2017 (SALDRU 2008, 2011, 2012, 2015, 2017). Besides a large range of socio-economic variables, NIDS incorporates measures of psychological well-being and life satisfaction, including the Epidemiologic Studies Depression (CES-D) scale. This is unique for a household panel survey in a developing country.

In a first descriptive analysis we find a strong negative correlation between psychological well-being and per capita household expenditure. Individuals in lower expenditure deciles display significantly lower levels of psychological well-being, are more likely to be at risk of depression, are less satisfied with their life overall and are more likely to be less happy than 10 years ago. Psychological well-being and poverty may mutually reinforce each other. To address this two-way causality, we turn to a rigorous econometric analysis. Specifically, we explore poverty dynamics with a tri-variate probit model that accounts for potential endogeneity arising from initial conditions affecting poverty status and non-random attrition from the sample. Preliminary results suggest that the risk of poverty increases as one's psychological well-being deteriorates, and the other way around.

In what follows, we first offer a brief overview of related literature. Section 3 presents the data and a descriptive analysis, while the role of psychological health in poverty dynamics is explored in Section 4. We conclude in Section 5 by discussing the results and highlighting potential avenues of further research.

2. Related literature

A longstanding body of literature, going back to Easterlin (1974), has investigated how income affects psychological well-being. Recent empirical evidence shows that self-reported happiness, well-being and satisfaction increase with absolute income, both within and across countries (Sacks, Stevenson, and Wolfers, 2012). Research further links poverty to poor mental health and mental disorders. A systematic review of the literature found that out of 115 studies on low and middle income countries, 79% reported a positive relationship between various poverty indicators and mental disorders (Lund, et al. 2010).

The psychological literature puts forward two main pathways that link poverty and mental health. The 'social causation' hypothesis posits that circumstances associated with living in poverty – e.g. high levels of stress, malnutrition, social exclusion, lowered social capital, exposure to violence – increase the risk of mental illnesses. The 'social drift' hypothesis reverses the argument, arguing that individuals with a mental illness are more likely to fall into poverty and less likely to escape from it, because of, for example, loss of productivity and employment, elevated health expenditures or stigma (Lund, et al. 2011).

Growing evidence from natural and field experiments confirms that increases in poverty are causally associated with lowered psychological well-being and stress, while the opposite is true for reductions in poverty. Moreover, stress and poor psychological well-being have been associated with short-sighted and risk-averse decision-making. These relationships may thus constitute a negative feedback loop, where poverty is perpetuated by inducing psychological states that lead to poor choices, such as lowering long-term investments in education and health (see Haushofer and Fehr, (2014) for an overview of the literature). Moreover, experimental research by Mani, et al. (2013) indicates that poverty causes a shortfall of cognitive capacity. Being preoccupied with poverty-related concerns limits the amount of mental resources that poor people have available for other tasks, thereby often leading to choices and behaviour that may further perpetuate poverty.

A burgeoning literature further investigates the link between economic development, hope, and aspirations. Theoretical work suggests that poverty stifles aspirations, leading the poor to underinvest in future-oriented behaviour because their own experiences and those of relevant others entrench the belief that it is almost impossible to escape poverty (Dalton, Ghosal, and Mani, 2016; Genicot and Ray, 2017; Ray, 2006).

The above studies call for increased attention to the psychological costs associated with poverty, as well as the potential psychological benefits of poverty-alleviating interventions. Theoretical research suggests that interventions only focused on relieving external constraints may have little impact in cases where internal constraints are binding (Lybbert and Wydick, forthcoming;

Dalton, Ghosal, and Mani 2016). A complementary approach to relieving both external and internal constraints thus seems warranted. Recent empirical evidence supports the idea that poverty-alleviation programmes with such a holistic approach may be highly effective. Wydick, et al. (2017) find that a child sponsorship programme, executed in six countries, had a significant impact on sponsored children's school completion, the probability and quality of employment, and their income and wealth in adulthood. The authors argue that the programme's impact was at least partly achieved through its ability to alleviate internal constraints. Two studies on currently sponsored children show that sponsorship significantly increases hope, happiness, self-efficacy, and educational aspirations (Glewwe, et al., forthcoming; Ross, et al., 2017).

A handful of recent innovative field experiments have focused on the design and evaluation of interventions that may alleviate internal constraints. Several studies point to the importance of role models in raising aspirations among the poor (Beaman, et al. 2012; Macours and Vakis, 2014). Interestingly, while these studies analyse actual exposure to and interaction with role models over several years, recent evidence tentatively suggests that a simple and more indirect exposure to role models may also work. In a randomised set-up in Ethiopia, Bernard, et al. (2014) organised the screening of documentaries featuring people with a similar background as the study participants, in which they tell the story of how they managed to escape from poverty. The intervention was found to have positively impacted aspirations, as well as future-oriented behaviour such as savings and investments in children's education. Lybbert and Wydick (Forthcoming) organised a similar documentary screening in Mexico. Here, the documentary was part of a larger intervention, which included an aspect of goal-setting and a four-week 'hope curriculum', in which the participants discussed various aspects of hope. Preliminary results suggest that the intervention significantly raised hope and aspirations. Riley (2018) experimentally evaluates the impact of role models in a movie on student performance in Uganda. Secondary school students who were randomly selected to watch the movie 'Queen of Katwe', featuring a potential role model, were significantly less likely to fail their mathematics exams and achieved higher overall exam scores. Finally, in a field experiment in Colombia, Aguinaga, et al. (2017) estimate how the achievement of business-related objectives is affected by goal-setting, monetary incentives and support groups. While the combination of the three programme components resulted in the highest achievements, the mere act of setting a goal yielded substantial positive results.

In sum, the existing evidence suggests that psychological well-being and internal constraints matter for economic development, and may partly explain poverty persistence. Early findings from a number of field experiments also suggest that simple and low-cost interventions may be effective in alleviating internal constraints. Programmes encompassing such interventions in an integrated

approach that simultaneously addresses external and internal constraints may especially have substantial potential to facilitate pathways out of poverty. However, in order to provide useful policy prescriptions, more research from different settings is needed to assess the external validity of such interventions and to find out under which circumstances they are most effective. Moreover, research over a longer time-span is needed to ascertain whether the early impacts persist over time.

This paper aims to offer an exploratory analysis of the relationship between psychological well-being and poverty dynamics in South Africa using NIDS data. We isolate the causal effect of psychological well-being on poverty transitions by estimating a multivariate model that accounts for the endogeneity of initial poverty status and non-random attrition. Avenues for follow-up research are discussed.

3. Data & descriptive analysis

NIDS consists of various survey modules and records a wide range of socio-economic variables at the individual and household level. Information relating to individual psychological well-being is drawn from two sections in the survey module implemented among adults: “Emotional Health” and “Well-being and Social Cohesion”.

3.1 Measures of psychological well-being

The first measure of psychological well-being we consider is the Epidemiologic Studies Depression (CES-D) scale. The CES-D scale was designed to measure depressive symptomatology (Radloff 1977). Respondents answer a range of questions relating to how often in the past week they felt emotions related to depression or well-being. NIDS includes a 10-item version of CES-D which probes the frequency of various feelings including depression, loneliness, fear, hopefulness, and happiness. Answer categories include (1) Rarely or none of the time – less than 1 day; (2) Some or little of the time – 1-2 days; (3) Occasionally or a moderate amount of time – 3-4 days; (4) All of the time – 5-7 days. For positive feelings the scores of the answer categories are reversed. Adding up the scores for each item yields the CES-D 10 scale, which ranges from 0 to 30, with higher scores indicating stronger presence of depressive symptoms. The CES-D score has been widely validated (e.g. Zhang, et al. 2012; González, et al. 2017) and used in analyses (e.g. Dustmann and Fasani, 2016; Hamad, et al. 2008). It can be considered as measuring a continuum from well-being to depression; the higher one’s score, the more likely one is to experience various psychological problems over time (Siddaway, Wood, and Taylor, 2017). A recent study tested the reliability and validity of the CES-D 10 in Zulu, Xhosa, and Afrikaans populations in South Africa and concluded that it is a “valid, reliable screening tool for

depression” (Baron, Davies, and Lund 2017, 1). The study further suggested that, in the South African context, a score of 12 or higher can be used to identify individuals at high risk of depression.

We further consider a subjective measure of well-being. Respondents were asked to assess the overall satisfaction with their life “Using a scale of 1 to 10 where 1 means “Very dissatisfied” and 10 means “Very satisfied”, how do you feel about your life as a whole right now?”. A large body of literature shows that measurements of subjective life satisfaction correlate in predictable ways with an individual’s demographic characteristics, health outcomes, and neurological functioning and characteristics, providing evidence that they are meaningful indicators of an individual’s well-being (e.g. Kahneman and Krueger, 2006; Frey and Stutzer, 2002; Stutzer and Frey, 2010; Posel and Casale, 2011; Sacks, Stevenson, and Wolfers, 2012).

3.2 Describing psychological well-being in NIDS

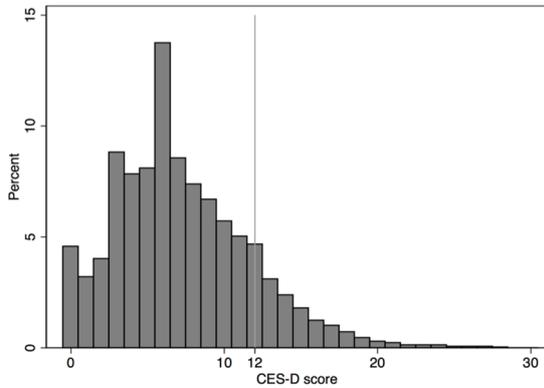
In what follows we limit the analysis to the sample of individuals (>14 years) that were successfully interviewed with the adult survey in all 5 waves; this balanced sample comprises 9,067 individuals. Not everyone answered the relevant questions to construct the measures of psychological well-being however. For the CES-D score the balanced panel comprises 6,100 adults and 30,500 observations; for the life satisfaction score we count 5,690 adults and 28,450 observations. The econometric framework employed in Section 4 accounts for attrition from the sample.

As expected, the CES-D and life satisfaction scores are negatively correlated. We find a correlation coefficient of -0.24, significant at the 1%-significance level. While the concepts are thus clearly connected, they are not perfectly correlated, indicating that they capture different elements of an individual’s psychological well-being. It is thus worth investigating how both measures relate to poverty.

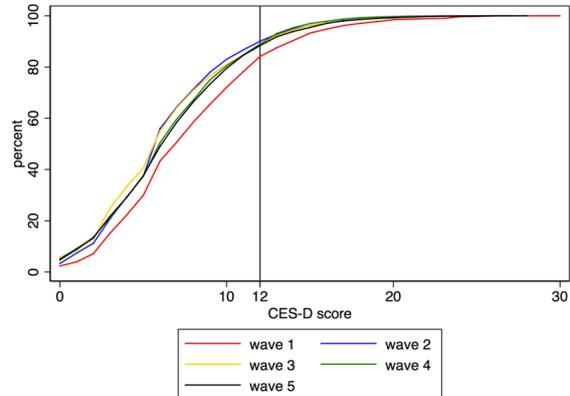
Panel A of Figure 1 shows the histogram of the CES-D score for the balanced panel of adults. The vertical line indicates the threshold of 12, identifying 16% of the sample as having a high risk of depression. Panel B of Figure 1 graphs the cumulative distribution by NIDS wave. At every step of the distribution, the CES-D score was highest in wave 1, while being quite comparable across following waves. This is also reflected in Table 1, showing that the average CES-D score was 8 in wave 1, while fluctuating around 7 in the following waves. The percentage of the sample at high risk of depression was highest in wave 1 (22%), dropped to 13% in wave 2 and then remained fairly stable in the following waves (around 15%).

Figure 1. CES-D score

Panel A. Histogram across all waves



Panel B. Cumulative distribution by wave



Notes: Post-stratified weights were applied.

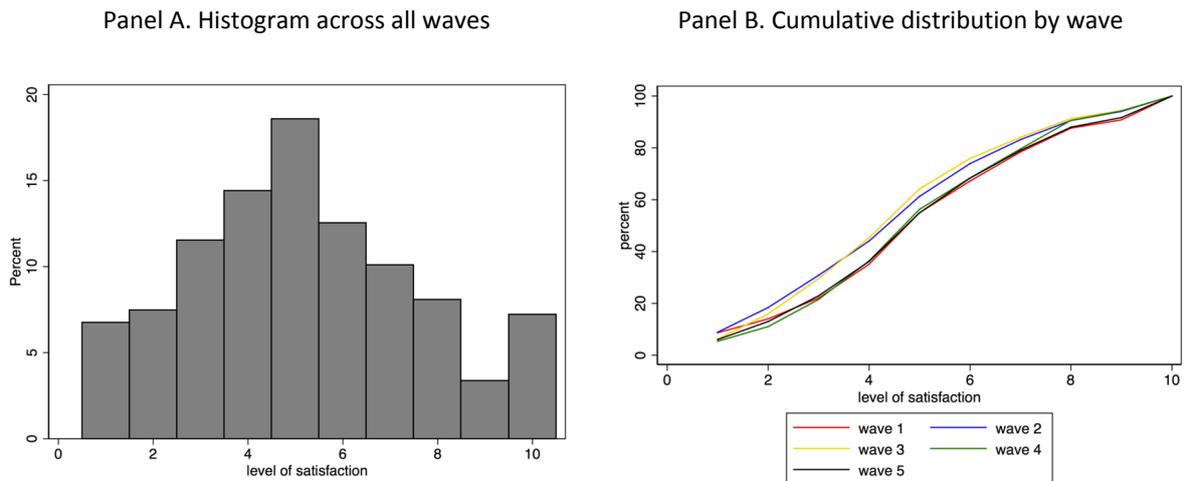
Table 1. CES-D 10, Summary Statistics

	obs.	CES-D 10 score				%
		mean	st.dev.	min	max.	CES-D \geq 12
Wave 1	6,100	8.16	4.66	0	30	21.81%
Wave 2	6,100	6.87	4.14	0	27	13.33%
Wave 3	6,100	6.78	4.30	0	27	15.27%
Wave 4	6,100	6.99	4.15	0	27	15.27%
Wave 5	6,100	7.13	4.37	0	28	15.39%
Overall	30,500	7.16	4.35	0	30	16.10%

Notes: Post-stratified weights were applied.

Panel A of Figure 2 shows the histogram of the life satisfaction scores for the balanced panel of adults, while Table 2 shows accompanying summary statistics. The overall life satisfaction averages a value of 5, with about 40% of the sample indicating they are less satisfied than this average. Panel B of Figure 2 graphs the cumulative distribution by NIDS wave. In wave 1, life satisfaction averaged at 5.4, with 35% scoring less than 5. Waves 4 and 5 are comparable to wave 1, while life satisfaction was lowest in waves 2 and 3, averaging 4.9 with about 45% scoring less than 5.

Figure 2. Life satisfaction score



Notes: Post-stratified weights were applied.

Table 2. Life satisfaction, Summary Statistics

	obs.	life satisfaction score				% satisfaction < 5
		mean	st.dev.	min	max.	
Wave 1	5,690	5.41	2.52	1	10	35.13%
Wave 2	5,690	4.95	2.47	1	10	44.06%
Wave 3	5,690	4.93	2.36	1	10	45.30%
Wave 4	5,690	5.36	2.32	1	10	36.40%
Wave 5	5,690	5.40	2.45	1	10	36.20%
Overall	28,450	5.20	2.43	1	10	39.65%

Notes: Post-stratified weights were applied.

We are interested in exploring the relationship between psychological well-being and income. Following the general practice of Statistics South Africa (Stats SA), we rely on per capita household expenditure, which is assumed to provide a better approximation of household income than reported income levels. Table 3 presents summary statistics for real per capita monthly household expenditure, which has been deflated to March 2017 prices.¹ Figure 3 graphically presents the relationship between psychological well-being and per capita household expenditure. Panels A and B show the average CES-D and life satisfaction score for each decile of per capita household expenditure, where real per capita household expenditure deciles were calculated separately for each wave. In line with the extant literature, we find a clear correlation for both measures, with individuals in lower expenditure deciles attaining on average higher CES-D scores and reporting lower life-satisfaction. We find correlation

¹ The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D and/or life satisfaction questions.

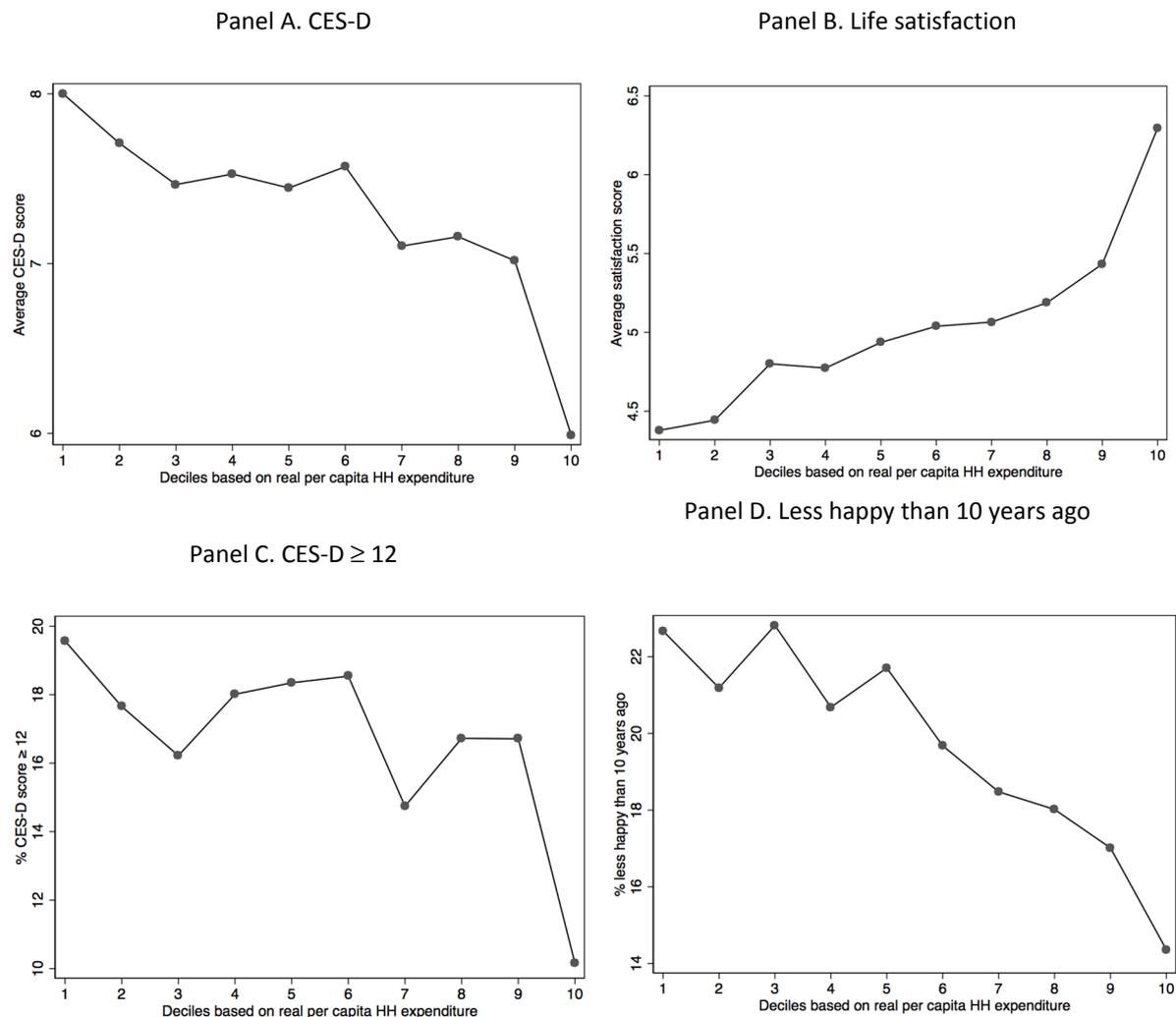
coefficients of -0.86 and 0.91, both significant at the 1%-significance level. Individuals in the lowest expenditure decile on average have a CES-D score of 8, compared to a score of 6 for individuals in the highest expenditure decile; similarly, their life satisfaction is lower (4.3 compared to 6.3).

Table 3. Per capita real monthly household expenditure

	obs.	mean	st.dev.	min	max.
Wave 1	6,475	1,881	4,354	111	40,632
Wave 2	6,475	2,095	5,119	72	44,630
Wave 3	6,475	2,328	4,455	107	36,909
Wave 4	6,475	2,522	5,019	128	34,783
Wave 5	6,475	2,251	3,639	142	62,025
Overall	32,375	2,219	4,204	72	62,025

Notes: Expenditures are presented in March 2017 values; Post-stratified weights were applied; To deal with outliers, the bottom and top 0.1% of expenditures in each wave were winsorized.

Figure 3. Psychological well-being and Expenditure



Notes: Post-stratified weights were applied. To deal with outliers, the bottom and top 0.1% of expenditures in each wave were winsorized.

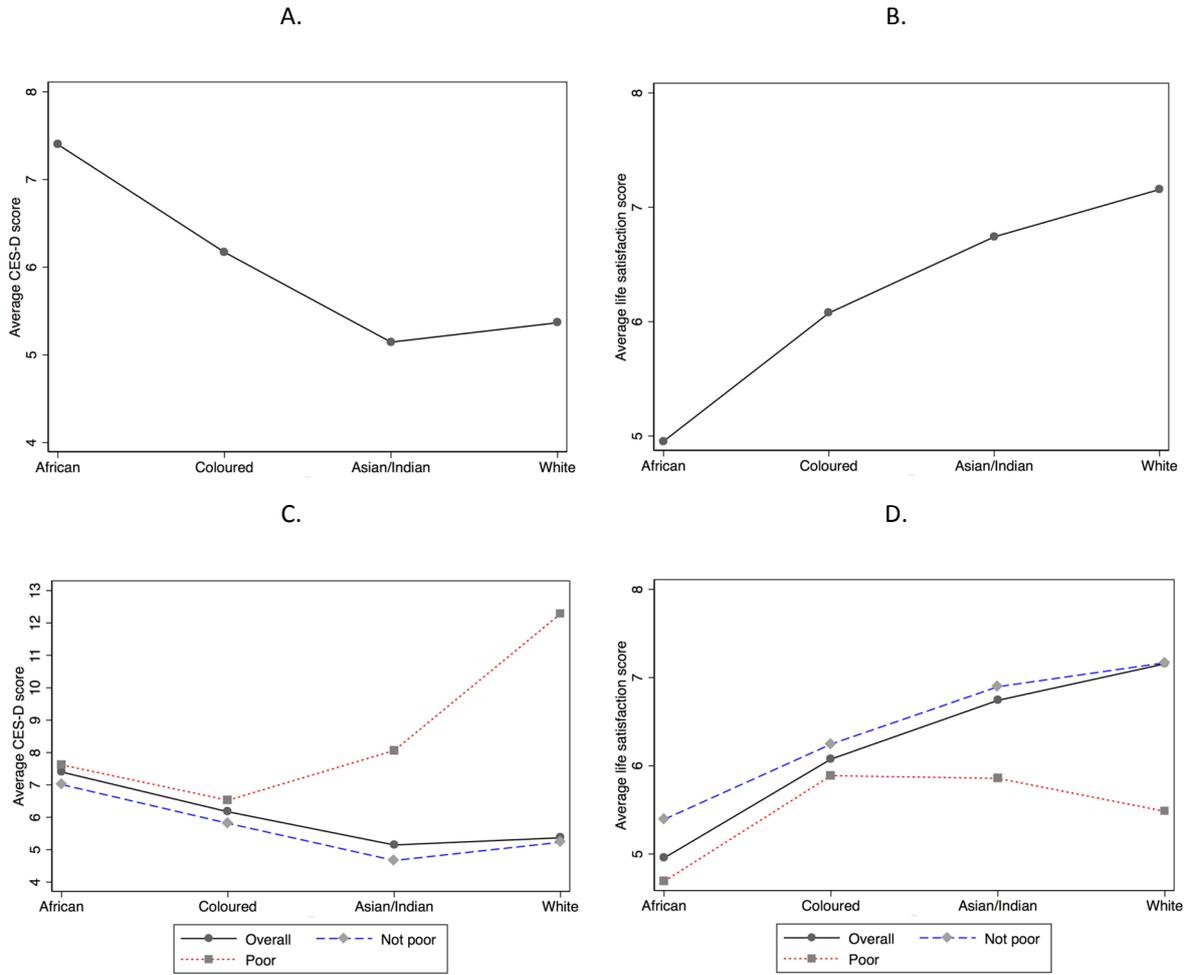
The graph in Panel C of Figure 3 shows the share of individuals at high risk of depression for each expenditure decile. We find strong differences, with 20% at high risk of depression in the lowest decile compared to 10% in the highest decile. Overall, we find a negative correlation coefficient of -0,68 significant at the 1%-level. Respondents in NIDS were also asked “Are you happier, the same or less happy with life than you were 10 years ago?”. Answer categories include (1) Happier; (2) The same; and (3) Less happy. Panel D graphs the share of individuals who indicate they are less happy than 10 years ago, by expenditure decile. Again, there is a large difference between the lowest decile (23%) and the highest (14%). Here we find a negative correlation coefficient of -0.93 significant at the 1%-level.

It is important to highlight that the above graphs merely provide evidence of significant correlations, not of causation. Moreover, they do not account for the potentially confounding effect of other individual, household, or environment characteristics. To illustrate the effect of confounding factors, Figure 4 graphs the relationship between psychological well-being, poverty status, and population group. An individual’s poverty status was defined according to Stats SA’s upper-bound poverty line, which is set at R1,136 per person per month (in March 2017 values).² Panels A and B present the average CES-D and life satisfaction score for each of the population groups interviewed by NIDS.³ On average, the lowest levels of psychological well-being are reported by Africans (CES-D: 7.4 ; life satisfaction: 5), followed by Coloureds (6.2 and 6), Asian/Indians (5.1 and 6.7) and whites (5.4 and 7.2). In Panels C and D of Figure 4 we reconstruct these graphs, while additionally accounting for poverty status. We now get a different picture, with poor individuals in the Asian/Indian and white population groups attaining the lowest mental health and life satisfaction scores.

² The upper-bound poverty line is calculated by Stats SA following a cost-of-basic-needs approach. Individuals with an expenditure level above the upper-bound poverty line are able to satisfy both their food- and non-food basic needs.

³ Note that the ‘Asian/Indian’ population group accounts for less than 1% of this balanced sample. Comparisons with this population group thus suffer from lack of power due to its small sample size.

Figure 4. Psychological well-being by population group & poverty status



Notes: Post-stratified weights were applied

As a first step in controlling for potentially confounding factors we simply look at the correlation between household expenditure and psychological well-being, while controlling for a large range of individual- and household-level socio-economic characteristics. Specifically, we run the following linear regression model:

$$(1) \quad \text{Exp}'_{iht} = \alpha_0 + \text{Ind}'_{iht} A + \text{HoH}'_{hz} B + \text{HH}'_{ht} \Gamma + \beta_1 \text{PW} + \gamma_{ht} + \mu_t + \varepsilon_{iht} ,$$

where i indexes individuals, h households and t survey waves. The outcome variable, denoted by Exp'_{iht} is real per capita household expenditure. Ind'_{iht} and HoH'_{hz} are vectors containing socio-demographic variables at the level of the individual and the household head; specifically: their age; gender; population group; education level and employment status. HH'_{ht} is a vector containing variables at the level of the household: the number of household members, employed household members, children (<18 years), and elderly (>60 years); a dummy indicating whether the household

has access to basic goods and services (shelter, tap water, sanitation, and electricity); and the area type (traditional, urban, or farming). Our measures for psychological well-being, the CES-D score and life satisfaction score, are denoted by PW . Finally, we control for fixed effects at the level of the province (γ_{ht}) and survey wave (μ_t). The standard errors, ε_{iht} , are clustered at the level of the individual. Since the measures of psychological well-being are correlated, we control for them in separate model specifications.

The results are presented in Table 4. Even when controlling for a large range of potentially confounding socio-economic variables, both measures of psychological well-being remain significantly correlated with per capita household expenditure. A ten-unit decrease on the CES-D scale, indicating an improvement in mental health, is associated with a monthly per capita household expenditure that is higher by about R95 (or about 4% of the average per capita household expenditure). A one-unit increase on the life satisfaction scale is associated with a monthly per capita household expenditure that is higher by about R64 (or about 3% of the average per capita household expenditure). These should not be interpreted as causal effects. We now move to a more rigorous econometric approach to explore the relationship between psychological well-being and poverty dynamics.

Table 4. Correlation between per capita HH expenditure and psychological well-being, controlling for socio-economic variables

	(1) Expenditure with CES-D Scale		(2) Expenditure with Life Satisfaction Scale	
	Estimate	s.e.	Estimate	s.e.
Individual characteristics				
Age	10.96***	(1.56)	11.56***	(1.64)
Female	-116.36**	(48.19)	-163.79***	(49.19)
Population group (base: African)				
Colored	242.61	(261.83)	237.90	(277.87)
Asian / Indian	-4419.98	(3804.42)	-5081.07	(4100.07)
White	-5964.00	(5059.62)	-7542.08	(5501.61)
Level of education (base: No schooling)				
Primary school not completed	61.32	(46.66)	38.86	(49.73)
Primary school completed	163.41**	(64.74)	143.06**	(66.42)
Secondary school not completed	269.03***	(62.38)	284.24***	(65.68)
Secondary school completed	660.75***	(92.38)	609.09***	(88.12)
Tertiary education	1033.61***	(112.52)	1069.29***	(114.53)
Employment status (base: Not economically active)				
Unemployed (discouraged)	-58.46	(87.35)	59.35	(52.61)
Unemployed (strict)	-62.05	(43.80)	-59.62	(45.60)
Employed	182.56***	(46.66)	186.90***	(48.23)
Characteristics of household head				
Age	9.24***	(1.60)	9.11***	(1.73)
HoH is female	-229.53***	(40.28)	-214.91***	(41.38)
Population group (base: African)				
Colored	-126.02	(265.84)	-204.23	(282.00)
Asian / Indian	6585.70*	(3787.18)	7239.55*	(4086.53)
White	12709.83**	(5041.80)	14225.41***	(5483.43)
Level of education (base: No schooling)				
Primary school not completed	-7.33	(34.39)	-17.41	(36.90)
Primary school completed	-48.40	(49.62)	-45.51	(52.43)
Secondary school not completed	110.74**	(47.76)	72.37	(50.86)
Secondary school completed	591.61***	(100.38)	577.32***	(100.63)
Tertiary education	1253.39***	(106.75)	1237.13***	(107.39)
Employment status (base: Not economically active)				
Unemployed (discouraged)	54.43	(163.75)	-121.29**	(55.47)
Unemployed (strict)	-82.08	(60.99)	-91.34	(64.75)
Employed	273.94***	(45.27)	248.37***	(47.47)
Household characteristics				
Nr. HH members	-159.76***	(11.13)	-160.17***	(11.89)
Nr. of employed HH members	28.96	(22.42)	19.82	(22.98)
Nr. of children (<18 years)	41.25***	(14.22)	36.96**	(15.15)
Nr. of elderly members (>60 years)	-110.47***	(37.70)	-136.40***	(37.72)
HH has access to basic goods and services	343.98***	(55.38)	275.54***	(53.70)
Geographic location (base: Traditional)				
Urban	105.14	(64.47)	160.17***	(61.17)
Farms	-365.32***	(71.89)	-321.14***	(76.93)
Psychological well-being				
CES-D scale	-9.48**	(3.95)		
Satisfaction with life scale			63.74***	(7.81)
Province FE	Yes		Yes	
Wave FE	Yes		Yes	
Observations	28,851		26,890	

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is per capita real household expenditure. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of psychological well-being. Post-stratified weights were applied.

4. Psychological well-being and poverty dynamics

As the literature review pointed out, it is likely that a feedback loop exists, with poverty and psychological well-being mutually affecting each other. We therefore build on a methodology developed by Cappellari and Jenkins (2002, 2004, 2008) to investigate what role psychological well-being plays in poverty dynamics. Their econometric approach allows us to estimate a multivariate model of poverty transitions from one wave to the next, investigating which variables are associated with poverty entry and exit. The method is particularly useful because it controls for the determinants of initial poverty status, allowing us to causally identify the impact of psychological well-being on poverty persistence and entry. Moreover, the approach allows us to deal with unobserved heterogeneity and non-random attrition from the sample.

We illustrate the importance of these issues by examining the descriptive poverty transitions presented in Table 5. These have been calculated by pooling the NIDS data such that we can examine transitions from one survey wave to the next. In total, we have information on 67,336 adults with non-missing expenditure data who were interviewed with the adult questionnaire over at least two consecutive waves, labeled year $t-1$ and year t .

Table 5: Descriptive poverty transitions

Poverty status, year $t-1$	Poverty status, year t		
	Non-poor	Poor	Missing
A: Sample with non-missing expenditure in year t			
Non-poor	76.88	23.12	
Poor	20.45	79.55	
All	43.48	56.52	
B: All individuals			
Non-poor	57.69	17.35	24.97
Poor	17.13	66.60	16.27
All	34.76	45.19	20.05

Notes: Calculations are based on the pooled sample of waves 1 to 5, considering transitions from one wave to the next. Poverty status was calculated based on the Stats SA upper-bound poverty line (as in Section 3). Post stratified survey weights were applied.

Panel A shows evidence of substantial poverty persistence: Most of the individuals who were poor in year $t-1$ remained poor in year t (80%), while most non-poor individuals remained non-poor (77%). Overall, individuals who were poor in year $t-1$ are 56.5 percentage points more likely to be poor in year t than individuals who were non-poor in year $t-1$. The econometric model we employ explicitly takes into account that the probability of being poor in the current period may depend on poverty status in the previous period, and allows for individual heterogeneity in this relationship. In particular,

it allows us to estimate how the experience of poverty, in combination with given attributes, may lower an individual's chances of escaping poverty in the future.

Panel B of Table 5 further considers individuals with missing information on expenditure in year t . It shows evidence of selective sample attrition: Individuals who were non-poor in year $t-1$ are about 9 percentage points more likely to be missing in year t . The chosen econometric approach aims to limit potential biases arising from selective sample attrition by jointly controlling for the observable and unobservable determinants of panel retention and poverty dynamics.

4.1 Model specification and test statistics

We model poverty dynamics from one period to the next by estimating a tri-variate probit estimation. Specifically, we jointly estimate three equations: 1) the determinants of poverty status in the previous period – allowing us to control for the potential endogeneity of initial conditions; 2) the determinants of retention in the sample from one period to the next – allowing us to control for potential selective panel attrition; and 3) the determinants of current poverty status. The impact of explanatory variables on current poverty status is allowed to differ according to poverty status in the previous period. Hence, the model allows us to estimate how the explanatory variables impact both poverty persistence and poverty entry.

The explanatory variables included in the three equations are the same as those presented in Section 3. All explanatory variables are measured in year $t-1$, prior to a potential poverty transition between year $t-1$ and year t , and are thus considered predetermined. The choice of these variables follows the literature, in particular Finn and Leibbrandt (2017) and Schotte, Zizzamia, and Leibbrandt (2018) who have previously applied this methodology to the NIDS data.⁴ We complement their analyses by explicitly considering the role of psychological well-being.

Identification in the model relies on instrumental variables that need to satisfy specific exclusion restrictions. In choosing the instruments, we follow Schotte, Zizzamia, and Leibbrandt (2018) who in turn base their approach on Cappellari and Jenkins (2002, 2004, 2008). As an instrument for the equation estimating the determinants of initial poverty status, we consider a variable describing the mother's highest level of education. Conditional on the other explanatory variables, it is assumed to affect an individual's initial poverty status, but have no direct impact on their wave-to-wave poverty transitions. As an instrument for the equation estimating the determinants of panel retention, we include a dummy variable for original sample members – indicating individuals who were included in the NIDS panel from the first wave onwards. It is assumed that sample retention is more likely for

⁴ We refer to these papers for further technical details regarding the econometric framework and its theoretical underpinnings.

these individuals, while their membership status should not directly impact wave-to-wave poverty transitions.

Panel A of Table 6 presents test results regarding the validity of these instruments. The contribution of mother's education level is statistically significant in the initial poverty status equation, while it can be safely excluded from the poverty transition equation. Likewise, membership status is statistically significant in the retention equation, but can be safely excluded from the poverty transition equation. These findings suggest that the exclusion restrictions hold for both instruments and provide confidence in the identification of the model.

We further tested the exogeneity of the initial poverty status and retention equations. Panel B of Table 6 presents estimates for the cross-equation correlations of unobservables. We find a negative and significant correlation between the unobservables affecting initial poverty status in year $t-1$ and conditional poverty status in year t . Thus, unobservable factors increasing the likelihood of being poor initially reduce the likelihood of conditional poverty. This is in line with previous findings in the literature (Stewart and Swaffield 1999; Cappellari and Jenkins 2002; Schotte, Zizzamia, and Leibbrandt 2018), and indicate that ignoring the endogeneity of initial poverty status would lead one to underestimate poverty persistence. We further find that the unobservables affecting the sample retention and poverty transition equations are negatively and significantly correlated, while there is no significant correlation between the unobservables affecting the retention and initial poverty equations. In Panel C of Table 6, we test the exogeneity of both selection equations. The null hypothesis for exogeneity of the initial poverty status is strongly rejected at the 1%-significance level, while that of the transition equation is rejected at the 10%-level. The null hypothesis for joint exogeneity is rejected at the 1%-level. Both selection mechanisms thus appear endogenous to poverty transitions, justifying our approach.

Table 6: Test statistics and cross-equation correlations

	<i>Chi2</i>	<i>p-value</i>
A: Instrument validity		
Inclusion of mother's education level in initial poverty status equation (df:5)	115.98***	0.000
Inclusion of original sample membership in retention equation (df:1)	20.91***	0.000
Exclusion of mother's education level from transition equation (df:10)	9.77	0.461
Exclusion of sample membership from transition equation (df:2)	1.67	0.434
Exclusion of mother's education level and sample membership from transition equation (df:12)	11.70	0.470
B: Cross-equation correlations between unobserved effects		
	<i>Corr.</i>	<i>s.e.</i>
Initial poverty status and transition equations (ρ_{21})	-0.331***	0.046
Retention and transition equations (ρ_{31})	-0.055*	0.029
Retention and initial poverty equations (ρ_{32})	0.049	0.033
C: Exogeneity of selection equations (Wald test)		
	<i>Chi2</i>	<i>p-value</i>
Initial poverty status equation ($\rho_{21}=\rho_{32}=0$)	53.55***	0.000
Retention equation ($\rho_{31}=\rho_{32}=0$)	4.68*	0.088
Joint exogeneity ($\rho_{21}=\rho_{31} = \rho_{32}=0$)	55.34***	0.000
D: State dependence		
	<i>Chi2</i>	<i>p-value</i>
Test whether poverty transition estimates are identical for initially poor and non-poor (df:44)	385.11***	0.000

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Calculations are based on the pooled sample of waves 1 to 5, considering transitions from one wave to the next. Poverty status was calculated based on the Stats SA upper-bound poverty line (as in Section 3). Post stratified survey weights were applied. Simulated maximum likelihood estimation with 250 draws.

Finally, in Panel D of Table 6, we test whether the coefficient estimates in the poverty transition equation are identical for the initially poor and the initially non-poor. This test is strongly rejected, at the 1% level, indicating that past poverty status has a significant effect on future poverty transitions.

4.2 Results

Table 7 presents the results for the poverty transition equation. As previously indicated, the impact of explanatory variables on poverty status in year t is allowed to differ according to poverty status in year $t-1$. Hence, two sets of estimates are reported, indicating how the explanatory variables impact both poverty persistence and poverty entry. Besides coefficient estimates from the tri-variate probit model, we also calculated average marginal effects – indicating how a marginal change in an explanatory variable affects one's probability of remaining in poverty (for individuals who were poor in year $t-1$) or of entering poverty (for those who were not poor in year $t-1$).

Demographic characteristics of the individual matter. For those who were initially poor, the probability of poverty persistence is lower for individuals who are younger, male, white and highly educated. It is interesting to note, however, that these characteristics barely affect the probability of

falling into poverty for those who were initially not poor. Formal self-employment and having a permanent contract as an employee further significantly reduce the risk of poverty. Demographic characteristics of the household head also matter significantly, with individuals living in households where the head is female, African, and poorly educated facing higher poverty risks. The risk of poverty is reduced, on the other hand, when the household head has a permanent employment contract or is engaged in formal self-employment. Individuals living in larger households also face a higher risk of poverty, but this risk reduces with the number of employed household members.

Moving to our measures of psychological well-being, the results in Table 7 indicate that an individual's CES-D score in year t-1 is significantly related to their poverty transitions between year t-1 and year t. Specifically, a 10-unit increase in the CES-D score increases the risk of poverty persistence with 2 percentage points and increases the risk of poverty entry with 4 percentage points. It is important to highlight that, having controlled for initial poverty status, we can now be more confident that we are isolating a unidirectional effect from psychological well-being on conditional poverty transitions. Table 8 presents the results from the initial poverty status and panel retention equations. It is interesting to note that a higher CES-D score increases the probability of being poor initially, but has no significant effect on the likelihood of panel retention. We further present the coefficient estimates of the instruments which are in line with the validity tests presented in Table 6.

Table 7: Determinants of being poor in year t, conditional on poverty status in year t-1

	Poverty persistence			Poverty entry		
	average marg. eff.	coeff. estimate	s.e.	average marg. eff.	coeff. estimate	s.e.
Individual characteristics in t-1						
Age	0.001	0.004***	(0.001)	-0.000	-0.001	(0.002)
Female	0.024	0.088***	(0.024)	0.014	0.050	(0.040)
Population group (base: African)						
Colored	0.108	0.436***	(0.140)	0.0716	0.254	(0.216)
Asian / Indian	0.228	1.300***	(0.471)	0.027	0.097	(0.436)
White	-0.454	-1.418**	(0.637)	0.003	0.011	(0.413)
Level of education (base: No schooling)						
Primary school not completed	0.019	0.072	(0.050)	0.060	0.206*	(0.119)
Primary school completed	0.024	0.090	(0.060)	0.047	0.164	(0.138)
Secondary school not completed	-0.006	-0.020	(0.049)	0.022	0.077	(0.110)
Secondary school completed	-0.044	-0.156***	(0.059)	-0.030	-0.108	(0.117)
Tertiary education	-0.086	-0.296***	(0.065)	-0.063	-0.235*	(0.122)
Employment status (base: Inactive)						
Unemployed (discouraged)	0.035	0.133*	(0.072)	0.128	0.448***	(0.139)
Unemployed (strict)	-0.016	-0.058	(0.039)	0.092	0.325***	(0.081)
Subsistence farmer	0.046	0.174	(0.108)	0.068	0.243	(0.217)
Casual worker / helping others	0.023	0.085	(0.067)	0.120	0.418***	(0.127)
Self-employed	-0.019	-0.069	(0.076)	0.072	0.256**	(0.115)
Formal self-employment	0.024	0.088	(0.274)	-0.130	-0.552***	(0.206)
Employee	-0.001	-0.002	(0.046)	0.020	0.075	(0.076)
Employee with a permanent contract	-0.029	-0.104*	(0.059)	-0.007	-0.028	(0.079)
Characteristics of household head in t-1						
Age	0.001	0.002**	(0.001)	-0.003	-0.010***	(0.002)
HoH is female	0.020	0.073***	(0.026)	0.064	0.228***	(0.041)
Population group (base: African)						
Colored	-0.072	-0.259*	(0.141)	-0.107	-0.382*	(0.217)
Asian / Indian	-0.655	-2.695***	(0.500)	-0.276	-1.295***	(0.437)
White	0.074	0.310	(0.613)	-0.246	-1.068***	(0.409)
Level of education (base: No schooling)						
Primary school not completed	0.022	0.079**	(0.039)	-0.060	-0.191*	(0.106)
Primary school completed	0.031	0.112**	(0.052)	-0.071	-0.228*	(0.131)
Secondary school not completed	0.014	0.052	(0.042)	-0.138	-0.456***	(0.105)
Secondary school completed	-0.007	-0.026	(0.061)	-0.158	-0.527***	(0.116)
Tertiary education	-0.058	-0.196***	(0.067)	-0.212	-0.738***	(0.116)
Employment status (base: Inactive)						
Unemployed (discouraged)	0.005	0.017	(0.080)	-0.068	-0.265*	(0.142)
Unemployed (strict)	0.011	0.039	(0.046)	0.017	0.061	(0.089)
Subsistence farmer	0.003	0.012	(0.089)	-0.016	-0.060	(0.198)
Casual worker / helping others	0.046	0.171***	(0.066)	0.092	0.324**	(0.143)
Self-employed	0.021	0.076	(0.062)	0.044	0.157	(0.104)
Formal self-employment	-0.133	-0.442**	(0.200)	-0.042	-0.159	(0.152)
Employee	0.023	0.085*	(0.046)	0.052	0.187**	(0.080)
Employee with a permanent contract	-0.031	-0.108**	(0.054)	-0.054	-0.208***	(0.080)
Household characteristics in t-1						
Nr. HH members	0.022	0.078***	(0.009)	0.043	0.149***	(0.022)
Nr. of employed HH members	-0.024	-0.080***	(0.017)	-0.026	-0.117***	(0.032)
Nr. of children (<18 years)	0.009	0.033***	(0.013)	-0.013	-0.053*	(0.028)
Nr. of elderly members (>60 years)	-0.025	-0.083***	(0.022)	0.030	0.103***	(0.039)
HH has access to basic goods and services	-0.053	-0.187***	(0.035)	-0.025	-0.089**	(0.045)
Geographic location (base: Traditional)						
Urban	0.012	0.042	(0.035)	-0.056	-0.199***	(0.052)
Farms	0.049	0.184***	(0.055)	0.054	0.181*	(0.100)
Psychological well-being in t-1						
CES-D scale	0.002	0.006**	(0.003)	0.004	0.015***	(0.004)
Province FE			Yes			
Wave FE			Yes			
Observations			55,088			

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual-level and reported in parentheses. Calculations are based on the pooled sample of waves 1 to 5, considering transitions from one wave to the next. Poverty status was calculated based on the Stats SA upper-bound poverty line (as in Section 3). Post stratified survey weights were applied. Simulated maximum likelihood estimation with 250 draws.

Table 8: Determinants of initial poverty status and panel retention

	Initial poverty status		Panel retention	
	coeff. estimate	s.e.	coeff. estimate	s.e.
Psychological well-being in t-1				
CES-D scale	0.007***	(0.003)	-0.000	(0.005)
Instruments				
Level of education Mother (base: No schooling)				
Primary school not completed	-0.179***	(0.041)		
Primary school completed	-0.342***	(0.045)		
Secondary school not completed	-0.566***	(0.061)		
Secondary school completed	-0.106***	(0.039)		
Tertiary education	-0.164***	(0.038)		
Original sample member			0.271***	(0.059)
Individual characteristics in t-1			Yes	
Characteristics of household head in t-1			Yes	
Household characteristics in t-1			Yes	
Province FE			Yes	
Wave FE			Yes	
Observations			55,088	

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual-level and reported in parentheses. Calculations are based on the pooled sample of waves 1 to 5, considering transitions from one wave to the next. Poverty status was calculated based on the Stats SA upper-bound poverty line (as in Section 3). Post stratified survey weights were applied. Simulated maximum likelihood estimation with 250 draws.

Table 9: Psychological well-being and conditional poverty status in year t

	obs.	Poverty persistence			Poverty entry		
		average marg. eff.	coeff. estimate	s.e.	average marg. eff.	coeff. estimate	s.e.
Psychological well-being in t-1							
CES-D scale	55,088	0.002	0.006**	(0.003)	0.004	0.015***	(0.004)
Life satisfaction scale	54,585	0.003	0.010**	(0.005)	-0.007	-0.026***	(0.008)
CES-D 12	55,088	0.004	0.015	(0.033)	0.030	0.106**	(0.051)
Less happy than 10 years ago	55,197	0.016	0.060**	(0.030)	0.029	0.100**	(0.049)

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual-level and reported in parentheses. Calculations are based on the pooled sample of waves 1 to 5, considering transitions from one wave to the next. Poverty status was calculated based on the Stats SA upper-bound poverty line (as in Section 3). Post stratified survey weights were applied. Simulated maximum likelihood estimation with 250 draws.

We ran the model several times, including different measures of psychological well-being. Table 9 presents an overview of the results for these measures in the poverty transition equation. Recall that all explanatory variables are measured at year t-1, while we estimate their effect on poverty transitions between year t-1 and year t.

The results are slightly ambiguous concerning the risk of poverty persistence for those who were initially poor. On the one hand, we find that a 10-unit increase in the CES-D score increases the

risk of poverty persistence BY 2 percentage points, and that individuals who were less happy with their life than 10 years before are 1.6 percentage points more likely to remain in poverty. On the other hand, we don't find any significant effect for individuals with an elevated risk of depression, and the results suggest that poor individuals who were more satisfied with their life have a slightly higher risk of remaining in poverty. However, the results all point in the same direction when it comes to the risk of falling into poverty for those who were initially not poor. A 10-unit increase in the CES-D score increases the risk of poverty entry by 4 percentage points, while a 1-unit increase on the life satisfaction scale decreases an individual's risk of falling into poverty by 0.7 percentage points. Individuals with an elevated risk of depression are 3 percentage points more likely to fall into poverty, and individuals who are less happy with their life than 10 years before are 2.9 percentage points more likely to enter poverty.

Overall, these preliminary findings suggest that the risk of poverty increases as psychological well-being deteriorates. We discuss several avenues for follow-up research below.

5. Discussion

We set out to investigate the relationship between psychological well-being and poverty in South Africa. Using data from Waves 1-5 of the National Income Dynamics Study, we document a strong negative correlation between psychological well-being and per capita household expenditure. On average, individuals in lower expenditure deciles display lower levels of psychological well-being, a higher risk of depression, and lower life satisfaction. They are also more likely to be less happy compared to 10 years previously.

Poverty and psychological well-being may mutually reinforce each other. We empirically isolate the causal impact running from psychological well-being to poverty transitions by relying on a tri-variate probit model that accounts for endogeneity stemming from initial poverty conditions and non-random panel attrition. Preliminary results suggest that the risk of both poverty entry and poverty persistence increase as an individual's psychological well-being deteriorates.

Our analysis resonates with findings from the recent economic literature on the psychology of poverty. The existing evidence suggests that psychological well-being and internal constraints matter for economic development, and may partly explain poverty persistence. Overall, this literature calls for an increased attention on the psychological costs associated with poverty, as well as the potential psychological benefits of poverty-alleviating interventions.

While other disciplines, notably psychology, have a longer history researching internal constraints, Lybbert and Wydick (forthcoming) argue that economists have several contributions to make. First, the majority of research in psychology has focused on the developed world. Drawing on

insights from these studies, development economists are trying to build a more complete understanding of poverty and economic mobility by applying these insights in the context of developing countries. Second, since internal constraints appear to be important in explaining movements into and out of poverty, an area of comparative advantage lies in economist's use of sophisticated tools to analyse heterogeneous poverty dynamics. Third, from a policy perspective it is important to get a better understanding of the extent to which development interventions may alleviate internal constraints. Here economists may contribute by developing and implementing identification frameworks that enable the estimation of causal effects. Finally, as economic analysis often displays a strong link with state actors and policymakers, economists may be better placed to influence policy.

We discuss several avenues for further research within this agenda, most of which can be explored with the existing NIDS data. First, previous research on poverty dynamics in South Africa has pointed to the importance of the Child Support Grant (CSG) in lifting individuals out of poverty (Finn and Leibbrandt, 2017). In terms of outreach, the CSG is the largest social protection programme in South Africa, reaching about 10.8 million individuals. It consists of an unconditional cash transfer to eligible recipients that meet two requirements: Having children of a certain age, and having an income below a certain threshold. Both criteria have been significantly reformed over time (DSD, SASSA, and UNICEF 2012). Since especially the age criterion is strictly applied, it is possible to evaluate the CSG's impact by exploiting cohort discontinuities in access to the grant, caused by unanticipated and exogenous changes in the age-threshold (see e.g. Eyal and Woolard, 2013; Tondini, 2017). Several studies have evaluated the grant's impact on various outcomes, including child health, school enrolment and labour supply (Coetzee, 2013; DSD, SASSA and UNICEF, 2012; Eyal and Woolard, 2013; Tondini, 2017). However, none of these studies has addressed the grant's impact on alleviating internal constraints. While the CSG does not explicitly aim to improve psychological well-being, recent evidence suggests that unconditional cash transfers may also have a significant impact in this area (Haushofer and Shapiro 2016).⁵

Second, existing research suggests that the experience of local violence and crime has a negative effect on an individual's mental health (e.g. Dustmann and Fasani, 2016). The NIDS dataset also records information on the perception of local community violence and crime. Tomita, Labys, and Burns (2015) rely on this information, from NIDS wave 2, to demonstrate that the perception of such violence is associated with an increased risk of depression. Other studies suggests that exposure to violent crime may limit one's economic mobility (e.g. Sharkey and Torrats-Espinosa 2017). By

⁵ Work in progress looking at the longer-term impact (three years instead of nine months) of unconditional cash transfers finds a sustained increase in psychological well-being when comparing recipients and non-recipients in the same village – but not when comparing to non-recipients in distant villages (Haushofer and Shapiro 2018).

combining information from NIDS waves 1-5 one could examine in more detail the relationship between the experience of violence, psychological well-being, and economic mobility.

Third, Schotte, Zizzamia, and Leibbrandt (2018) use the NIDS data to define five social classes in South Africa based on their risk of remaining in or falling into poverty: The chronic poor, the transient poor, the vulnerable, the middle class, and the elite. Their analysis could be expanded by exploring the extent to which psychological well-being plays a role in inter-class transitions. It would further be particularly interesting to explore potential causal mechanisms of such transitions e.g. by examining the relationship between psychological well-being and labour market attachment, employment discouragement, and performance at work.

Fourth, existing evidence suggests the existence of a feedback loop between psychological well-being and poverty. The econometric approach taken by Alloush (2018) – a panel GMM (Generalized Method of Moments) – offers opportunities to look beyond unidirectional effects and explore the full bi-directional relationship.

Finally, despite economists' increasing interest in hope and aspirations as causal mechanisms for poverty reduction, very little research has tested and validated measurement instruments for these concepts in the context of developing countries. A recent paper evaluates how standard measures developed by psychologists perform in rural Myanmar (Bloem, et al., 2017). While the measures performed relatively well, the authors highlight the importance of contextualizing them to local circumstances. To date, no such exercise has been conducted in South Africa. Such a study would be interesting in and of itself, but could also serve two other purposes.

First, developing and validating such measurement instruments would be a pre-requisite to evaluate the impact of an integrated development intervention on alleviating internal constraints. Early evidence from a number of studies and field experiments suggests that integrated development interventions, simultaneously addressing both external and internal constraints, may have substantial potential to facilitate pathways out of poverty. However, more research from different contexts is necessary to assess their external validity and to get a better insight into the conditions under which they are most effective. Several poverty-alleviation interventions in South Africa provide economic support, while also trying to alleviate internal constraints. To date, no such intervention has been the subject of a rigorous evaluation in an experimental set-up.

Second, such research would be a necessary step towards potentially incorporating refined instruments to measure internal constraints within a nationally representative panel survey such as NIDS. This, in turn, would allow for a more nuanced analysis of the role that internal constraints play in poverty dynamics.

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The Southern Africa Labour and Development Research Unit (SALDRU) conducts research directed at improving the well-being of South Africa's poor. It was established in 1975. Over the next two decades the unit's research played a central role in documenting the human costs of apartheid. Key projects from this period included the Farm Labour Conference (1976), the Economics of Health Care Conference (1978), and the Second Carnegie Enquiry into Poverty and Development in South Africa (1983-86). At the urging of the African National Congress, from 1992-1994 SALDRU and the World Bank coordinated the Project for Statistics on Living Standards and Development (PSLSD). This project provide baseline data for the implementation of post-apartheid socio-economic policies through South Africa's first non-racial national sample survey.

In the post-apartheid period, SALDRU has continued to gather data and conduct research directed at informing and assessing anti-poverty policy. In line with its historical contribution, SALDRU's researchers continue to conduct research detailing changing patterns of well-being in South Africa and assessing the impact of government policy on the poor. Current research work falls into the following research themes: post-apartheid poverty; employment and migration dynamics; family support structures in an era of rapid social change; public works and public infrastructure programmes, financial strategies of the poor; common property resources and the poor. Key survey projects include the Langeberg Integrated Family Survey (1999), the Khayelitsha/Mitchell's Plain Survey (2000), the ongoing Cape Area Panel Study (2001-) and the Financial Diaries Project.

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