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Subjective and objective measures of household resilience capacity in sub-Saharan Africa

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Abstract

Resilience plays an essential role in sustaining and improving people's livelihood during environmental changes. While several resilience measurements approaches have emerged, few studies compare the use of different resilience measurement tools. This paper addresses this gap by investigating how subjectively evaluated resilience measurements compare and relate to objective measurement tools. Using regionally representative household data of 24,516 households in 9 countries, we investigate whether the Subjective self-Evaluated Resilience Score (SERS) can act as a substitute to the objectively evaluated Resilience Capacity Index (RCI) estimated through the Resilience Index and Measurement Analysis (RIMA) approach. We further examine how these measures capture the effect of experiencing climate and socio-economic shocks on resilience. Finally, we investigate the determinants of these measures. We find that overall, the correlations between SERS and RCI are weak and not consistent across countries. Further, we find that while several determinants have the same direction and almost the same magnitude of effect for both SERS and RCI. However, the effect of having experienced past shocks on these resilience capacity measurements differs as SERS decreases whereas RCI increases. We therefore conclude that SERS and RCI are not substitutes, and that they may be capturing various and different aspects of resilience capacities. This is essential to consider when designing targeting criteria for resilience-building projects and ensuring proper measurement and evaluation.

Keywords: Resilience; subjective measures; quantitative; shocks; cross-countries

JEL Classification Codes: D10; I32; O12; Q50

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1. Introduction

Resilience plays an essential role in sustaining and improving people's livelihood outcomes and wellbeing in the face of environmental, political, and socioeconomic shocks (Tanner et al., 2015). Building resilience has therefore become a priority for development actors, along with understanding how to effectively measure resilience (Jones & Tanner, 2017; Bahadur et al., 2015). To date, a spectrum of measurement frameworks and approaches have emerged, from more "objective" ones to more "subjective" ones (Jones, 2019; Jones & d'Errico, 2019). Resilience measurements that evaluate objective indicators - such as level of assets, transfers, and education - are often the ones most used (Jones & d'Errico, 2019; Bahadur & Pichon, 2017). Yet, these objective measurements do not necessarily capture the intangible and psychological factors of resilience. In contrast, subjective tools allow respondents to evaluate for themselves how resilient they are based on their own understanding of resilience and on the mental resources they have. In addition, responses to subjective resilience questions are less time-consuming and costly to collect (Jones, 2017). As such, and given the multidimensional nature of resilience, objective and subjective measures of resilience may act as complements, and discrepancies between them may challenge long-held assumptions about the drivers of resilience (Jones, 2017).

This paper addresses three gaps in the literature on subjective and objective measurements of resilience. First, we want to investigate if subjective and objective measures of resilience are possible substitutes, such that subjective measures could be employed in time-constrained emergency contexts as opposed to objective measures. Comparison studies between objective and subjective resilience measurement tools are nearly absent (Jones, 2019). A recent like-for-like comparison study in Northern Uganda found a moderate correlation between the objectively evaluated tool, Resilience Index and Measurement Analysis (RIMA), and the Subjective self-Evaluated Resilience Score (SERS). There were also notable differences in the effect that important traits such as exposure to previous shocks had on RIMA and SERS, which begs further examination (Jones & d'Errico, 2019). This is, to the best of our knowledge, the only case of subjective versus objective comparison.

The second gap we address is how subjective and objective measures of resilience respond to the effect of shocks. Jones and d'Errico (2019) demonstrate that SERS and RIMA captured opposite reactions to previous shocks; we therefore aim to replicate the analysis using multiple datasets from several countries. Finally, a third gap in this new literature that we investigate is whether subjective and objective resilience capacities have similar or different determinants. In this case, we assume that psychological aspects of strength and resilience might be affected by different explanatory variables than assets, livelihoods, and food security.

In this paper, we employ 13 datasets from 9 countries. We make use of 16,402 to 24,516 household observations depending on how we specify the sample (more details are provided in Section 2). Although we recognize the high level of regional homogeneity of our datasets, we are confident that the statistical power gained ensures adequate certainty in our findings. A basic assumption of this paper is that we consider RIMA and SERS as reliable measures of objective and subjective household resilience capacities.

This paper is organized as follows: in Section 2, we describe the data, sampling criteria, and summary statistics. In Section 3, we present the methods for constructing key variables and the empirical design used in our estimation strategies. In Section 4, we present our results and robustness checks. Section 5 discusses, and Section 6 concludes.

2. Data

This paper employs data from 13 household surveys conducted by the United Nations Food and Agriculture Organization (FAO) in Burkina Faso, Niger, Mali, Somalia, the Democratic Republic of the Congo (DRC), Uganda, Ethiopia, Nigeria, and West Bank and Gaza Strip (WBGS) from 2016 to 2019 for a cross-country analysis at the household level. These datasets contain both the RIMA and the SERS module. The SERS module generally consists of 10 generic shock questions and 3 specific shock questions. Responses range from 1-5 on a well-tested Likert scale, where a higher score signifies a higher level of perceived resilience (Jones, 2017). For this analysis, responses recorded on a 1-4 Likert scale have been rescaled to 1-5.[1] The generic shock questions are meant to capture the multidimensionality of resilience by covering 10 resilience related capacities (see Table 1). The generalisability of these questions makes it possible to apply them across several contexts (Jones & Tanner, 2016). The limitation of these generic question is that they do not disentangle resilience to particular hazards (Jones, 2018). In contrast, the specific shock questions explicitly ask the respondent to consider a specific event (see Table 2). Another key distinction between the general and specific shock questions is that the latter has an added time perspective to the questions, which may help reduce recall bias (Jones, 2017). These differences on event specificity and time perspectives between the generic and the specific shock questions may influence respondents' understanding of and response to each question, which in turn may affect the comparability of responses to perceived resilience (Jones & Tanner, 2016).

Table 1. Generic shock questions (sample 3)

Resilience related capacity	Question
1. Absorptive Capacity	My household can bounce back from any challenge that life throws at us
2. Absorptive Capacity	My household is better able to deal with hardship compared with others in our community
3. Adaptive Capacity	If threats to my household become more frequent and intense, we would still find a way to get by
4. Transformative capacity	During times of hardship, my household can change its primary source of income or livelihood if needed
5. Financial capital	My household can afford all of the things that it needs to survive and thrive
6. Social capital	My household can rely on the support of family and friends when we need help
7. Social/Political capital	My household can rely on the support politicians and government when we need help
8. Learning Capacity	My household has learned important lessons from past hardships that will help us to better prepare for the future
9. Anticipatory Capacity	My household is fully prepared for any future threats and challenges that life throws at us
10. Knowledge and Information	My household frequently receives information warning us about future extreme weather events in advance

[1] This is the case for DRC and Somalia.

Table 2. Specific shock questions

Drought Specific Questions - Sample 1 and Sample 2	
1. Absorptive Capacity	If a severe drought occurred tomorrow, my household would be well prepared in advance
2. Absorptive Capacity	If a severe drought occurred tomorrow, my household could recover fully within six months?
3. Adaptive Capacity	If severe droughts were to become more frequent and intense, my household would still find a way to get by?
Other Shock Specific Questions* - Sample 2	
Drought & Flood	
1. Absorptive Capacity	If a severe [drought&flood] occurred tomorrow, my household would be well prepared in advance
2. Absorptive Capacity	If a severe [drought&flood] occurred tomorrow, my household could recover fully within six months?
3. Adaptive Capacity	If severe [droughts&floods] were to become more frequent and intense, my household would still find a way to get by?
Electric power cuts	
1. Absorptive Capacity	If a severe electric power cuts occurred tomorrow, my household would be well prepared in advance
2. Absorptive Capacity	If a severe electric power cuts occurred tomorrow, my household could recover fully within six months.
3. Adaptive Capacity	If severe power cuts were to become more frequent and intense, my household would still find a way to get by.
1) Strongly Disagree ; 2) Disagree ; 3) Neither Agree or Disagree ; 4) Agree ; 5) Strongly Agree	
Drought	
1. Absorptive Capacity	If an extreme drought occured, what is the probability that your household would be well prepared in advance?
2. Absorptive Capacity	If an extreme drought occured, what is the probability that your household could recover fully within six months after the end of the drought?
3. Adaptive Capacity	If extreme drought were to become more frequent, what is the probability that your household can change their source of revenue/and or subsistance means if necessary?
Rain	
1. Absorptive Capacity	If extreme rain occured, what is the probability that your household would be well prepared in advance?
2. Absorptive Capacity	If extreme rain occured, what is the probability that your household could recover fully within six months?
3. Adaptive Capacity	If extreme rain were to become more frequent, what is the probability that your household can change their source of revenue and/or subsistance means if necessary?
Flood	
1. Absorptive Capacity	If an extreme flood occured, what is the probability that your household would be well prepared in advance?
2. Absorptive Capacity	If an extreme flood occured, what is the probability that your household could recover fully within six months after the end of the flood?
3. Adaptive Capacity	If extreme floods were to become more frequent, what is the probability that your household can change their source of revenue and/or subsistance means if necessary?
1) Extremely Unlikely ; 2) Unlikely ; 3) Likely ; 4) Extremely Likely	

Sample

We divide the observations into three samples: 1) drought specific shock respondents, 2) specific shock respondents (drought, rain, and flood), and 3) generic shock respondents (see Table 3). Our preferred sample consists of 16,402 households that have responded to three drought specific shock questions. The drought specific sample is preferred to that of households responding to the 10 generic shock questions because shock specific questions are less ambiguous and easier to comprehend, and therefore more likely to provide responses that are more robust (Jones and Tanner, 2016). Our second sample expands from our preferred sample by including households that responded to three extreme rain and/or three extreme flood specific questions (which are slightly differently framed than the drought specific questions), making up 24,516 households.[2] Our third sample consists of households that responded to 10 generic shock questions, making up 19,425 households.[3] We consider the second (specific shock) sample and the third (generic shock) sample to be less accurate than the main preferred sample for the reasons mentioned above, and we will therefore use these samples for robustness checks in Section 4.

Table 3: Samples

Country	Year	Sample 1 (drought shock)	Sample 2 (specific shock)	Sample 3 (generic shock)
Burkina Faso	2019	√	√	√
Mali	2019	√	√	√
Niger	2019	√	√	√
Nigeria	2018	√	√	√
Ethiopia	2019	√	√	√
Uganda (Karamoja)	2016	√	√	√
Uganda (Karamoja)	2019	√	√	√
Uganda (North)	2017	√	√	√
Uganda (North)	2018	√	√	√
Somalia	2019	-	√	√
DRC	2017	-	√	-
DRC	2019	√	√	√
WBGS	2019	-	√	√

The specific shock responses from Somalia and DRC have been rescaled from a Likert scale of 1-4 to a Likert scale of 1-5[4], and were slightly differently asked than other specific shock questions (see Table 2). Due to missing data on total number of shocks experienced in Burkina Faso, Mali, Niger, and WBGS, these countries have been excluded from our estimation of our second research question investigating the relationship between total number of shocks experienced and RIMA and SERS.

Summary Statistics

Our preferred sample consists of 16,402 households, out of which 21.6% are female headed (see Table 4). Household size does not significantly vary across the samples, with an average of 7 members. The average years of schooling for the household head is 2.9 in our preferred sample, compared to 3.6 and 3.5 years in other samples. The vast majority (83.7%) has experienced at least one shock in the past 12 months. Sample 2 and sample 3 only slightly deviate from these percentages (19.3% and 88.5%, and 20.6% and 85.4% respectively). Out of the three samples, the preferred one has the lowest SERS of 2.3, compared to 2.5 and 2.7 for sample 2 and sample 3, respectively. In contrast, the preferred sample has a significantly higher RCI (of 43) than sample 2 and sample 3 (41.0 and 42.6 respectively).

[2] The observations are double counted for DRC 17 (rain and flood), and DRC 19 (drought and flood)

[3] WBGS does not have shock module and is therefore excluded from sample 3 (along with Burkina Faso, Mali, and Niger as they lack data) when analysing RQ2, making the sample total 13,062 observations

[4] Formula used: ((4*(x- x_min))/x_max-x_min))+1

Table 4. Summary statistics of the different samples

	Sample 1		Sample 2		Sample 3	
Obs	16402		23750		19425	
	mean	sd	mean	sd	mean	sd
SERS	2.300	0.906	2.546	0.992	2.697	0.821
RCI	42.979	17.880	41.495	17.850	42.647	17.800
Food Consumption Score (FCS)	44.566	19.550	39.992	19.080	43.603	19.190
HH Dietary Diversity Score (HDDS)	6.504	2.211	8.760	7.418	6.487	2.137
Experienced at least one shock	0.837	0.369	0.885	0.319	0.854	0.353
Years in school of HH head	2.929	4.139	3.295	3.991	3.516	4.478
Female HH head	0.216	0.412	0.198	0.398	0.206	0.405
HH size	7.316	4.133	7.267	3.736	7.308	3.947

3. Methods and Empirical Design

Methods

For exploring the RQs we employ several dependent variables which are presented here.

SERS

The Self-Evaluated Resilience Score (SERS) is a score based on responses from 1 to 5 on a well-tested Likert scale on either 3 shock specific questions or 10 generic shock questions. The generalisability of SERS is useful as it can be applied to several contexts to derive information on the extent to which various threats may affect household resilience (Jones & Tanner, 2016). The higher the SERS, the more strongly the respondent agrees with statements aimed at capturing resilience capacities such as "My household can bounce back from any challenge that life throws at us," and the more resilient the respondent is considered to perceive themselves to be. In this paper, the SERS has been constructed as an equally weighted average of the responses. While this method may be subject to methodological weaknesses, one must bear in mind that it is likely that any weighting of the responses to the subjective resilience questions will have its assumptions and weaknesses (Jones & Tanner, 2016). Following, SERS has been rescaled from 1-5 to 0-100 in regressions to allow for a more nuanced comparison across countries, reflected as "SERS 100" in the tables.

RIMA

RIMA's Resilience Capacity Index (RCI) unpacks resilience into four "pillars": Assets (AST), Access to Basic Services (ABS), Adaptive Capacity (AC) and Social Safety Nets (SSN). These pillars are considered latent variables and are made up of at least three indicators each which have been combined using factor analysis at the first stage. Following, the RCI is estimated by adopting a Structural Equation Model (SEM) at the second stage (FAO, 2016). Contrary to the latest iteration of RIMA (RIMA-II), the RIMA score used in this paper is not tied to a specific outcome to allow for a better comparison with SERS, which is similarly focused on the multidimensional aspect of resilience (Jones & d'Errico, 2019). The RIMA scores are normalized to a scale of 0-100.

Food Security

Food security is measured through three main indicators: the Food Consumption Score (FCS), the Household Dietary Diversity Score (HDDS), and food expenditure. The FCS is a composite score based on dietary diversity, food frequency, and relative nutritional importance of different food groups consumed in a week, whereas the HDDS is a total score of the number of certain food groups the household consumed in a week. Food expenditure is measured on a weekly level in US dollars.

Empirical Design

The first research question we address is whether the objectively evaluated (RIMA) and the subjectively evaluated (SERS) measures are possible substitutes. To check for consistencies and differences between RIMA and SERS we first use simple descriptive statistics, comparing average values and trends; results are presented in Table 6-6.2 in Section 4. We then unpack the descriptive statistics by different demographic characteristics, such as gender of household head and level of dependency ratio, and five levels of objective resilience (where the bottom quintile of the RCI distribution is labelled as very weak resilience, and the top quintile as very strong resilience). Following, we conduct Hotelling's T-squared test on the differences in RIMA and SERS between these categories. Results are presented in Table 11-11.2 in Section 4. We estimate the relationship between RIMA's RCI and SERS using Ordinary Least Squares as per Eq. (1):

$$RCI = \alpha_0 + \beta_1 SERS_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (1)$$

We then run Eq. (1) with and without covariates, as a normal OLS, and as quantile regressions of the 25th, 50th, and 75th percentile, with the hope of capturing variation in the causal relation along the distributions (results in Table 7-8 in Section 4). Finally, we benchmark the SERS against a widely recognized measure of food security, the Food Consumption Score, to investigate if and to which extent this may drive the trend of SERS. Basic descriptive statistics enabled us to show consistencies and inconsistencies with people's perception and quantified level of food security. Results are presented in Table 9, Section 4.

The second research question we address is whether and how the number of total shocks experienced by a household relates to RIMA and SERS, using the following specification for household *i* at time *t*;

$$Y = \alpha_0 + \beta_1 Shocks_{it} + \beta_2 Copingst_{it} + \beta_3 X_{it} + \varepsilon_{it} \quad (2)$$

where the dependent variable is in separate regressions, as described above, the Resilience Capacity Index (RCI) and the Self-Evaluated Resilience Score (SERS)[5]. *Shocks* is a variable on the number of shocks a household reported experiencing in the last 12 months.[6] *Copingst* is a categorical variable on strategies household used to cope with drought. If the household did not experience a drought, the variable is coded as 0. X is a set of characteristics for which we control, such as household size, country, type of livelihood (farmer, agro-pastoralist/pastoralist, urban, and other where farmer is the base group), gender of household head, number of years of education of household head, and dependency ratio. Where RCI is the outcome variable, we exclude education and dependency ratio as controls to avoid potential collinearity.

Eq. (2) is also employed to respond to the third research question, i.e., if the determinants of subjective and objective resilience differ. Finally, we conduct robustness checks on our results by using sample 2 (households responding to specific shock questions) and sample 3 (households responding to generic shock questions).

4. Results

For our first research question, we found that there are heterogeneous patterns between the level of objective and perceived resilience. However, the correlations between SERS and RIMA for all countries (except for Ethiopia) in our preferred sample are positive, ranging from 0.04 to 0.26 (see Table 5). The direction of the correlations is heterogeneous once we disaggregate observations by level of resilience capacity index. With few exceptions (Niger and Uganda Karamoja 2016), there is not a consistent pattern of direction in the correlation matrix. The only pattern we may spot – and only considering the datasets aggregated – is that the correlations between SERS and RCI are negative in the bottom part of the RCI distribution and positive in the upper part, and that the average value of SERS increases consistently (from 2.175 to 2.507) with increases in level of RCI (from 21.889 to 66.719) (see Table 6). Overall, the most noticeable finding is that the level of correlation is normally extremely low. This advised us to engage with Eq. (1) to further investigate the casual relation between RCI and SERS.

[5] We also ran Eq. (2) with the Food Consumption Score (FCS), the Household Dietary Diversity Score (HDDS), and total and per capita food expenditure as the dependent variable but did not find any significant or consistent patterns.

[6] We also added squared terms on total number of shocks experienced and household size to allow for a higher number of shocks and larger household size to have a greater impact, but we did not find any coherent patterns.

Table 5. Correlation between SERS and RCI

Sample 1 - drought	All	Very weak resilience	Weak resilience	Moderate resilience	Strong resilience	Very strong resilience
Burkina Faso	0.151	0.118	-0.002	0.003	0.021	0.178
Ethiopia	-0.042	-0.463	0.087	-0.063	-0.129	-0.350
Mali	0.037	0.093	-0.086	0.023	-0.041	0.101
Niger	0.220	0.037	0.040	0.068	0.006	0.180
Nigeria	0.115	-0.004	0.047	-0.048	0.091	-0.132
Uganda (Karamoja) 16	0.234	0.136	0.095	0.090	0.020	0.084
Uganda (Karamoja) 19	0.053	0.055	0.049	-0.038	-0.005	0.214
Uganda (North) 17	0.163	0.101	0.029	0.049	-0.009	0.016
Uganda (North) 18	0.260	0.064	-0.092	-0.014	0.233	0.108
Total	0.1011	-0.0894	-0.0879	-0.0281	0.0397	0.0469

Table 6. Comparison between SERS and different levels of RCI - sample 1

	All				Very weak resilience (0-20th percentile)				Weak resilience (20-40th percentile)				Moderate resilience (40-60th percentile)				Strong resilience (60-80th percentile)				Very strong resilience (80-100th percentile)			
Sample 1 - Drought shock	SERS		RCI		SERS		RCI		SERS		RCI		SERS		RCI		SERS		RCI		SERS		RCI	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Burkina Faso	1.728	0.706	48.753	15.480	1.734	0.701	29.455	10.470	1.561	0.687	40.932	1.590	1.648	0.687	46.707	1.921	1.761	0.704	55.329	3.004	1.935	0.697	71.477	8.573
Ethiopia	2.246	1.128	30.299	18.320	2.442	1.189	10.191	4.415	1.971	0.742	18.599	2.218	2.181	0.980	25.979	2.235	2.199	1.018	36.779	5.095	2.437	1.510	59.949	11.850
Mali	1.889	0.761	40.834	19.930	1.879	0.737	14.913	7.970	1.939	0.860	30.131	2.901	1.826	0.718	39.653	2.481	1.836	0.728	49.312	3.095	1.965	0.748	70.340	12.850
Niger	2.289	0.924	48.338	18.030	2.030	0.739	23.161	6.159	2.166	0.847	37.584	3.177	2.286	0.918	48.234	3.022	2.357	0.999	59.100	3.478	2.606	0.996	73.692	6.943
Nigeria	2.956	0.883	44.153	19.140	2.732	0.785	18.272	6.565	2.890	0.888	32.857	3.005	3.069	0.883	43.013	3.042	3.011	0.885	54.505	4.015	3.077	0.925	72.115	8.149
Uga Karamoja 16	2.365	0.871	44.787	17.000	2.141	0.807	22.589	5.573	2.246	0.822	34.873	2.348	2.303	0.794	43.272	2.360	2.428	0.871	52.900	3.148	2.709	0.944	70.349	8.874
Uga Karamoja 19	2.394	0.850	26.881	10.540	2.424	0.872	13.745	3.673	2.357	0.828	20.748	1.493	2.379	0.902	25.691	1.505	2.333	0.790	31.676	1.834	2.478	0.848	42.543	7.336
Uga North 17	2.285	0.754	46.752	13.490	2.118	0.666	29.098	6.582	2.204	0.713	39.146	1.919	2.266	0.754	45.599	2.039	2.382	0.768	53.460	2.690	2.457	0.815	66.487	6.821
Uga North 18	2.545	0.872	47.297	17.780	2.286	0.817	22.943	7.552	2.400	0.802	37.145	2.870	2.506	0.911	47.059	2.812	2.567	0.843	56.691	3.157	2.965	0.841	72.646	8.310
Total	2.300	0.906	42.979	17.880	2.175	0.834	21.889	9.121	2.204	0.870	33.753	7.216	2.279	0.908	41.694	7.845	2.334	0.908	50.891	8.955	2.507	0.967	66.719	12.760

From running Eq. (1) with and without covariates, as a normal OLS, and as quantile regressions of the 25th, 50th, and 75th percentile (i.e. mimicking the results shown by the correlation matrix), we can report that the positive causal relation between SERS and RCI (and vice versa) follows a positive pattern, increasing in size of magnitude as the resilience capacity grows (see Table 7). Even when controlling for various covariates, the results do not change (see Table 8).

Table 7. Quantile regressions without covariates

Sample 1 - Drought shock	RCI	RCI 25th pctile	RCI 50th pctile	RCI 75th pctile
	(1)	(2)	(3)	(4)
SERS 100	0.088***	0.064***	0.086***	0.133***
	(0.01)	(0.01)	(0.01)	(0.01)
Constant	40.034***	28.413***	39.351***	50.181***
	(0.24)	(0.35)	(0.29)	(0.38)
R-sqr	0.013			
Observations	16402	16402	16402	16402
BIC	140939.5			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8. Quantile regressions with covariates

Sample 1 - Drought specific	RCI	RCI 25th pctile	RCI 50th pctile	RCI 75th pctile
	(1)	(2)	(3)	(4)
SERS 100	0.088***	0.041***	0.094***	0.131***
	(0.01)	(0.01)	(0.01)	(0.01)
Female HH head	-3.832***	-3.687***	-3.507***	-4.688***
	(0.34)	(0.47)	(0.42)	(0.51)
HH size	0.473***	0.736***	0.537***	0.284***
	(0.03)	(0.05)	(0.04)	(0.05)
Country	-0.073	-0.032	-0.093	-0.084
	(0.07)	(0.09)	(0.09)	(0.10)
Agro-pastoralist/pastoralist	0.115	-1.943***	-0.348	1.343**
	(0.32)	(0.44)	(0.40)	(0.48)
Urban work	0.156	0.520	0.495	0.936
	(0.84)	(1.14)	(1.03)	(1.24)
Other work	1.065*	-1.345*	0.746	3.402***
	(0.42)	(0.57)	(0.51)	(0.62)
Constant	37.505***	25.892***	36.176***	48.298***
	(0.60)	(0.82)	(0.74)	(0.89)
R-sqr	0.038			
Observations	16402	16402	16402	16402
BIC	140571.7			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We finally benchmarked SERS against FCS and RCI to see how subjectively perceived resilience relate to food security outcomes and objectively measured resilience, and we noticed some differences in the direction. In particular, we find that for our preferred sample, all datasets except for the one follow the same direction, where a higher food security score is related to a higher SERS (see Table 9).

Table 9. FCS benchmarked against SERS

Sample 1 - Drought shock	All: SERS		All: RCI		FCS non acceptable (<= 35): SERS		FCS non acceptable (<= 35): FCS		FCS acceptable (>35): SERS		FCS acceptable (>35): FCS	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Burkina Faso	1.728	0.706	48.753	15.480	1.686	0.694	28.394	4.636	1.754	0.712	55.767	16.390
Ethiopia	2.246	1.128	30.299	18.320	2.206	1.024	17.136	8.151	2.380	1.422	52.221	11.850
Mali	1.889	0.761	40.834	19.930	1.979	0.910	23.733	8.704	1.851	0.685	58.711	15.420
Niger	2.289	0.924	48.338	18.030	2.042	0.737	26.860	5.347	2.352	0.956	65.546	18.030
Nigeria	2.956	0.883	44.153	19.140	2.933	0.879	23.929	6.679	2.969	0.885	57.820	15.910
Uganda (Karamoja) 16	2.365	0.871	44.787	17.000	2.196	0.804	25.718	6.184	2.536	0.902	50.733	13.310
Uganda (Karamoja) 19	2.394	0.850	26.881	10.540	2.321	0.849	25.624	6.629	2.450	0.846	49.532	11.330
Uganda (North) 17	2.285	0.754	46.752	13.490	2.159	0.687	28.649	5.490	2.328	0.771	49.533	11.500
Uganda (North) 18	2.545	0.872	47.297	17.780	2.203	0.792	28.784	7.146	2.618	0.872	54.400	15.050
Total	2.300	0.906	42.979	17.880	2.208	0.883	25.370	7.201	2.351	0.915	55.231	15.710

The number of discrepancies from this positive trend increases to 4 out of 15 datasets when using sample 2, and 4 out of 12 datasets when using sample 3. In Mali, people perceive themselves and their family as more resilient, although they seem, from a food security point of view, less well-off. The only result vis-à-vis our first research question that we feel confident to defend is that the correlation and the causal relation between SERS and RCI increase proportional to the increase of resilience (see Table 6). We therefore cannot conclude that the two resilience capacity measurements are interchangeable. For our second research question, we find that having experienced more shocks has 1) a positive effect on objectively evaluated resilience (RCI) and 2) a negative effect on perceived resilience (SERS) (see Table 10).

Table 10. Relationship between shocks and RCI and SERS

Sample 1 - drought shock	RCI (1)	SERS 100 (2)
Total number of shocks experienced	1.030***	-0.327*
	(0.12)	(0.16)
Coping strategy against drought	-0.315***	-0.219***
	(0.02)	(0.03)
Female HH head	-4.007***	-5.567***
	(0.37)	(0.50)
HH size	0.471***	0.437***
	(0.06)	(0.08)
Country	0.776***	-1.107***
	(0.09)	(0.12)
Agro-pastoralist/pastoralist	-0.945**	0.418
	(0.36)	(0.47)
Urban work	1.945*	5.415***
	(0.82)	(1.09)
Other work	-1.848*	-2.976**
	(0.84)	(1.11)
Number of years in school of HH head		0.268***
		(0.05)
Dependency ratio		-0.065***
		(0.01)
Constant	30.201***	51.961***
	(1.08)	(1.48)
R-sqr	0.053	0.042
Observations	10805	10805
BIC	92024.9	97959.5

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This contrast in the direction of the effect suggests that the two resilience measurement approaches capture different aspects of resilience. On the one hand, the finding that objective resilience increases in response to having experienced more shocks may suggest that households receive more support or even financial assistance[7], whereas the finding that subjective resilience decreases as a household experiences more shocks may reflect a loss of confidence in their own capacity to withstand shocks over time. RCI and SERS increase with the years of education the household head has and the size of the household/family, suggesting that having more knowledge and options available and more people you can rely on in case of need could play a role for perceived resilience. The magnitude of the coefficients on years of education of household head and household size otherwise decreases if coping mechanisms are put in place, suggesting that the households deteriorate their assets and/or mental strength. We see similarly that resilience decreases if the household has a greater dependency ratio (larger non-active population vs. active population of the household), and if the household head is female.

[7] To consider the possibility that the positive effect of number of shocks experienced on RCI is due to increased amount of aid to the households, we ran Eq. (2) with value of formal and informal transfers received as dependent variables, discussed in Section 5
.

For our third and last research question investigating other determinants of RIMA and SERS, we found some interesting results. We notice that the role of the adoption of coping strategy, gender of household head, and household size have the same direction and almost the same magnitude of effect for both SERS and RCI (see Table 10). However, differences emerge for the other explanatory variables. Experiencing shocks increases RCI and reduces SERS. When we control for country, we notice a change in direction and magnitude, which we believe reflects the context specificity of perceived and objective resilience capacity. Finally, looking at livelihoods, we note that working in urban areas translates into greater objective resilience and even greater perceived resilience. We comment on these results in Section 5.

Robustness

We know that our findings might be biased for several reasons. As explained before, minor differences in the way questions are framed might lead to differences in comprehension and reporting. Therefore, we want to test whether our findings are also valid using several types of questions, such as the generic shock questions (sample 3). We also make use of the other event-specific questions (sample 2) as an additional robustness check. This sample extends our preferred sample by including responses to questions on the following event-specific shocks: extreme rain, extreme flood, and electric power cuts. Furthermore, given that there might be differences in livelihoods and other demographic characteristics that explain the consistency between SERS and RIMA, we tested by disaggregating the summary statistics of each sample by various categories and conducting Hotelling's T-squared test on the differences before comparing across the three samples (see Table 11-11.2).

For our first research question, we see that all samples follow the same pattern where SERS is low for low levels of RCI, and gradually increases as the level of RCI increases (see Table 6-6.2). Similarly, all samples have weak correlations between SERS and RCI, supporting the conclusion that correlations do not follow any clear pattern. The quantile regressions of the 25th, 50th, and 75th percentile of sample 2 and sample 3 are consistent with direction, size, and significance of the coefficient results from our preferred sample (see Table 7-7.2).

Table 6.1. Comparison between SERS and different levels of RCI - sample 2

	All				Very weak resilience (0-20th pctile)				Weak resilience (20-40th pctile)				Moderate resilience (40-60th pctile)				Strong resilience (60-80th pctile)				Very strong resilience (80-100th pctile)			
Sample 2 - Specific shock	SERS		RCI		SERS		RCI		SERS		RCI		SERS		RCI		SERS		RCI		SERS		RCI	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Burkina Faso	1.728	0.706	48.753	15.480	1.734	0.701	29.455	10.470	1.561	0.687	40.932	1.590	1.648	0.687	46.707	1.921	1.761	0.704	55.329	3.004	1.935	0.697	71.477	8.573
DRC 17 rain	2.506	0.711	29.721	15.860	2.451	0.703	11.106	3.950	2.444	0.717	20.252	2.056	2.465	0.680	27.140	2.111	2.537	0.662	35.863	2.828	2.632	0.776	54.315	11.910
DRC 19 flood	3.799	0.740	44.869	14.230	3.753	0.752	25.738	6.801	3.906	0.767	37.781	2.121	3.893	0.691	43.911	2.027	3.790	0.676	51.545	2.348	3.652	0.782	65.429	8.194
DRC 17 flood	2.560	0.750	29.721	15.860	2.543	0.792	11.106	3.950	2.463	0.778	20.252	2.056	2.511	0.697	27.140	2.111	2.582	0.705	35.863	2.828	2.700	0.755	54.315	11.910
DRC 19 drought	3.792	0.760	44.869	14.230	3.754	0.724	25.738	6.801	3.864	0.735	37.781	2.121	3.940	0.701	43.911	2.027	3.775	0.724	51.545	2.348	3.626	0.871	65.429	8.194
Ethiopia	2.246	1.128	30.299	18.320	2.442	1.189	10.191	4.415	1.971	0.742	18.599	2.218	2.181	0.980	25.979	2.235	2.199	1.018	36.779	5.095	2.437	1.510	59.949	11.850
Mali	1.889	0.761	40.834	19.930	1.879	0.737	14.913	7.970	1.939	0.860	30.131	2.901	1.826	0.718	39.653	2.481	1.836	0.728	49.312	3.095	1.965	0.748	70.340	12.850
Niger	2.289	0.924	48.338	18.030	2.030	0.739	23.161	6.159	2.166	0.847	37.584	3.177	2.286	0.918	48.234	3.022	2.357	0.999	59.100	3.478	2.606	0.996	73.692	6.943
Nigeria	2.956	0.883	44.153	19.140	2.732	0.785	18.272	6.565	2.890	0.888	32.857	3.005	3.069	0.883	43.013	3.042	3.011	0.885	54.505	4.015	3.077	0.925	72.115	8.149
Somalia	2.502	0.397	49.935	17.900	2.510	0.443	25.291	8.765	2.528	0.411	41.928	2.873	2.435	0.331	48.759	1.644	2.510	0.381	57.675	4.027	2.526	0.408	76.236	8.714
Uga Karamoja 16	2.365	0.871	44.787	17.000	2.141	0.807	22.589	5.573	2.246	0.822	34.873	2.348	2.303	0.794	43.272	2.360	2.428	0.871	52.900	3.148	2.709	0.944	70.349	8.874
Uga Karamoja 19	2.394	0.850	26.881	10.540	2.424	0.872	13.745	3.673	2.357	0.828	20.748	1.493	2.379	0.902	25.691	1.505	2.333	0.790	31.676	1.834	2.478	0.848	42.543	7.336
Uga North 17	2.285	0.754	46.752	13.490	2.118	0.666	29.098	6.582	2.204	0.713	39.146	1.919	2.266	0.754	45.599	2.039	2.382	0.768	53.460	2.690	2.457	0.815	66.487	6.821
Uga North 18	2.545	0.872	47.297	17.780	2.286	0.817	22.943	7.552	2.400	0.802	37.145	2.870	2.506	0.911	47.059	2.812	2.567	0.843	56.691	3.157	2.965	0.841	72.646	8.310
WBGS	2.245	0.810	24.927	11.370	2.063	0.694	10.836	3.498	2.094	0.719	17.962	1.608	2.198	0.728	23.755	1.755	2.383	0.888	30.558	1.928	2.488	0.920	41.615	8.047
Total	2.536	0.988	40.978	17.910	2.437	0.959	20.628	9.337	2.470	1.001	32.106	8.419	2.529	1.003	39.559	8.929	2.566	0.973	48.400	9.783	2.681	0.988	64.256	13.400

Table 6.2. Comparison between SERS and different levels of RCI - sample 3

	All				Very weak resilience (0-20th pctile)				Weak resilience (20-40th pctile)				Moderate resilience (40-60th pctile)				Strong resilience (60-80th pctile)				Very strong resilience (80-100th pctile)			
Sample 3 - Generic shock	SERS		RCI		SERS		RCI		SERS		RCI		SERS		RCI		SERS		RCI		SERS		RCI	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Burkina Faso	2.318	0.658	48.753	15.480	2.322	0.766	29.455	10.470	2.170	0.645	40.932	1.590	2.255	0.609	46.707	1.921	2.294	0.618	55.329	3.004	2.551	0.575	71.477	8.573
DRC 19	3.765	0.687	44.869	14.230	3.853	0.624	25.738	6.801	3.881	0.645	37.781	2.121	3.823	0.638	43.911	2.027	3.680	0.665	51.545	2.348	3.586	0.806	65.429	8.194
Ethiopia	2.342	0.951	30.299	18.320	2.454	0.999	10.191	4.415	2.143	0.601	18.599	2.218	2.222	0.666	25.979	2.235	2.348	0.915	36.779	5.095	2.542	1.340	59.949	11.850
Mali	2.000	0.660	40.834	19.930	1.910	0.620	14.913	7.970	2.059	0.766	30.131	2.901	1.949	0.635	39.653	2.481	1.981	0.631	49.312	3.095	2.099	0.622	70.340	12.850
Niger	2.347	0.781	48.338	18.030	2.154	0.652	23.161	6.159	2.308	0.742	37.584	3.177	2.295	0.788	48.234	3.022	2.450	0.828	59.100	3.478	2.525	0.831	73.692	6.943
Nigeria	3.217	0.635	44.153	19.140	2.977	0.631	18.272	6.565	3.134	0.670	32.857	3.005	3.309	0.624	43.013	3.042	3.304	0.583	54.505	4.015	3.363	0.585	72.115	8.149
Somalia	2.218	0.196	49.935	17.900	2.266	0.200	25.291	8.765	2.249	0.196	41.928	2.873	2.167	0.193	48.759	1.644	2.185	0.187	57.675	4.027	2.222	0.190	76.236	8.714
Uga Karamoja 16	2.642	0.701	44.787	17.000	2.430	0.687	22.589	5.573	2.532	0.673	34.873	2.348	2.575	0.650	43.272	2.360	2.695	0.705	52.900	3.148	2.979	0.663	70.349	8.874
Uga Karamoja 19	2.681	0.697	26.881	10.540	2.726	0.734	13.745	3.673	2.618	0.695	20.748	1.493	2.632	0.721	25.691	1.505	2.616	0.648	31.676	1.834	2.814	0.667	42.543	7.336
Uganda (North) 17	2.744	0.638	46.752	13.490	2.581	0.630	29.098	6.582	2.652	0.617	39.146	1.919	2.740	0.639	45.599	2.039	2.814	0.627	53.460	2.690	2.933	0.620	66.487	6.821
Uganda (North) 18	2.950	0.655	47.297	17.780	2.650	0.717	22.943	7.552	2.869	0.609	37.145	2.870	2.905	0.685	47.059	2.812	3.015	0.566	56.691	3.157	3.309	0.499	72.646	8.310
WBGS	2.865	0.710	24.927	11.370	3.114	0.763	10.836	3.498	3.120	0.684	17.962	1.608	2.876	0.639	23.755	1.755	2.652	0.618	30.558	1.928	2.560	0.650	41.615	8.047
Total	2.697	0.821	42.647	17.800	2.610	0.835	21.884	9.137	2.650	0.825	33.731	7.617	2.674	0.823	41.398	8.192	2.711	0.801	50.360	9.291	2.841	0.806	65.919	13.240

Table 7.1. Quantile regressions without covariates

Sample 2 - Specific shock	RCI (1)	RCI 25th pctile (2)	RCI 50th pctile (3)	RCI 75th pctile (4)
SERS 100	0.077***	0.102***	0.068***	0.078***
	(0.00)	(0.01)	(0.01)	(0.01)
Constant	37.943***	24.005***	37.360***	49.319***
	(0.21)	(0.28)	(0.27)	(0.31)
R-sqr	0.012			
Observations	24516	24516	24516	24516
BIC	210794.5			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7.2. Quantile regressions without covariates

Sample 3 - Generic shock	RCI (1)	RCI 25th pctile (2)	RCI 50th pctile (3)	RCI 75th pctile (4)
SERS 100	0.116***	0.133***	0.110***	0.135***
	(0.01)	(0.01)	(0.01)	(0.01)
Constant	37.428***	24.424***	36.881***	47.964***
	(0.29)	(0.40)	(0.37)	(0.45)
R-sqr	0.020			
Observations	19425	19425	19425	19425
BIC	166607.4			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

For our second research question, we find that those who have experienced at least one shock are on average significantly less resilient than those who experienced no shock, and this pattern holds for the third sample, i.e., the respondents of generic shock questions. The difference in SERS between those who experienced no shock and those who experienced at least one shock is not significant for sample 2, driven by the presence of DRC 19 in the sample (see Table 11-11.2). This discrepancy can partially be explained by the fact that the framing of the subjective resilience module questions in DRC are slightly differently framed, where respondents are asked to rank the *likelihood* from 1-4 of overcoming a challenge (as opposed to being asked to rank the extent to which they *agree* with a statement from 1-5). The scores for DRC have therefore been rescaled to 1-5 before SERS was calculated for consistency, but notably the nature of the SERS composition for DRC is fundamentally different. Regarding demographic characteristics, we find that female headed households on average perceive themselves to be significantly less resilient than what male headed households do. This pattern is consistent across all three samples. In our preferred sample, households with a dependency ratio below 50 (on a 0-100 scale where 100 is the largest burden) perceive themselves to be significantly more resilient than household with a dependency ratio above 50. In contrast, we find the opposite trend for sample 2 and sample 3, i.e., those with the larger burden perceived themselves to be more resilient. However, once DRC 19 is dropped from sample 2 and sample 3, the trends are the same as that of our preferred sample.

Table 11. Hotelling's T-squared test of various categories - sample 1

Sample 1	Category	Obs	SERS (mean)	Std.Dev.	Min	Max	Hotelling's T^2	Prob >F(1,df)
Burkina Faso	Male	1810	1.722	0.704	1	4.3	1.754	0.186
	Female	148	1.802	0.729	1	3.3		
	Dep. ratio <50	632	1.725	0.697	1	4.0	0.020	0.888
	Dep. ratio >= 50	1326	1.730	0.71	1	4.3		
	Shock	1545	1.688	0.733	1	4.3	23.719	0.000
	No shock	413	1.877	0.569	1	3.3		
	FCS non acceptable	754	1.686	0.694	1	4.0	4.408	0.036
	FCS acceptable	1204	1.754	0.712	1	4.3		
Niger	Male	1994	2.318	0.922	1	5.0	20.756	0.000
	Female	219	2.020	0.906	1	5.0		
	Dep. ratio <50	1894	2.354	0.918	1	5.0	68.392	0.000
	Dep. ratio >= 50	319	1.899	0.863	1	4.3		
	Shock	1643	2.191	0.93	1	5.0	73.164	0.000
	No shock	570	2.570	0.85	1	5.0		
	FCS non acceptable	449	2.042	0.737	1	4.3	40.995	0.000
	FCS acceptable	1764	2.352	0.956	1	5.0		
Mali	Male	1200	1.939	0.788	1	5.0	33.725	0.000
	Female	226	1.622	0.517	1	3.3		
	Dep. ratio <50	650	1.927	0.846	1	5.0	3.018	0.083
	Dep. ratio >= 50	776	1.857	0.681	1	4.0		
	Shock	1113	1.777	0.608	1	4.0	118.513	0.000
	No shock	313	2.286	1.059	1	5.0		
	FCS non acceptable	423	1.979	0.91	1	4.0	8.415	0.004
	FCS acceptable	1003	1.851	0.685	1	5.0		
Ethiopia	Male	445	2.421	1.155	1	5.0	26.998	0.000
	Female	310	1.995	1.041	1	5.0		
	Dep. ratio <50	192	2.241	1.119	1	5.0	0.004	0.948
	Dep. ratio >= 50	563	2.247	1.132	1	5.0		
	Shock	588	2.159	1.084	1	5.0	16.198	0.000
	No shock	167	2.553	1.225	1	5.0		
	FCS non acceptable	583	2.206	1.024	1	5.0	3.148	0.076
	FCS acceptable	172	2.38	1.422	1	5.0		
Nigeria	Male	1686	2.972	0.884	1	5.0	3.657	0.056
	Female	294	2.865	0.876	1	5.0		
	Dep. ratio <50	751	2.996	0.888	1	5.0	2.499	0.114
	Dep. ratio >= 50	1229	2.931	0.879	1	5.0		
	Shock	1329	2.944	0.893	1	5.0	0.694	0.405
	No shock	651	2.980	0.862	1	5.0		
	FCS non acceptable	722	2.933	0.879	1	5.0	0.791	0.374
	FCS acceptable	1258	2.969	0.885	1	5.0		
Karamoja 16	Male	1873	2.391	0.875	1	4.7	8.061	0.005
	Female	493	2.266	0.85	1	4.7		
	Dep. ratio <50	671	2.435	0.92	1	4.7	5.955	0.015
	Dep. ratio >= 50	1695	2.338	0.849	1	4.7		
	Shock	2245	2.356	0.867	1	4.7	4.509	0.034
	No shock	121	2.529	0.92	1	4.3		
	FCS non acceptable	1186	2.196	0.804	1	4.3	93.862	0.000
	FCS acceptable	1180	2.536	0.902	1	4.7		
Karamoja 19	Male	1428	2.422	0.86	1	5.0	5.636	0.018
	Female	537	2.320	0.818	1	5.0		
	Dep. ratio <50	1182	2.424	0.866	1	5.0	3.503	0.061
	Dep. ratio >= 50	783	2.350	0.822	1	5.0		
	Shock	1944	2.385	0.842	1	5.0	22.793	0.000
	No shock	21	3.270	1.094	1.3	5.0		
	FCS non acceptable	845	2.321	0.849	1	5.0	11.094	0.001
	FCS acceptable	1120	2.45	0.846	1	5.0		

Uganda North 17	Male	1883	2.357	0.783	1	5.0	45.696	0.000
	Female	1151	2.168	0.689	1	4.3		
	Dep. ratio <50	999	2.303	0.768	1	4.7	0.795	0.373
	Dep. ratio >= 50	2035	2.277	0.748	1	5.0		
	Shock	2708	2.283	0.747	1	5.0	0.219	0.640
	No shock	326	2.304	0.811	1	4.3		
	FCS non acceptable	771	2.159	0.687	1	5.0	29.167	0.000
	FCS acceptable	2263	2.328	0.771	1	4.7		
Uganda North 18	Male	539	2.586	0.886	1	4.7	5.079	0.025
	Female	166	2.412	0.816	1	4.7		
	Dep. ratio <50	242	2.656	0.91	1	4.7	6.005	0.015
	Dep. ratio >= 50	463	2.487	0.847	1	4.7		
	Shock	617	2.519	0.88	1	4.7	4.244	0.040
	No shock	88	2.723	0.799	1	4.7		
	FCS non acceptable	125	2.203	0.792	1	4.0	24.122	0.000
	FCS acceptable	580	2.618	0.872	1	4.7		
Total	Male	12858	2.327	0.921	1	5.0	55.409	0.000
	Female	3544	2.199	0.843	1	5.0		
	Dep. ratio <50	7213	2.346	0.924	1	5.0	34.131	0.000
	Dep. ratio >= 50	9189	2.263	0.891	1	5.0		
	Shock	13732	2.260	0.893	1	5.0	164.542	0.000
	No shock	2670	2.504	0.944	1	5.0		
	FCS non acceptable	5858	2.208	0.883	1	5.0	94.019	0.000
	FCS acceptable	10544	2.351	0.915	1	5.0		

Table 11.1. Hotelling's T-squared test of various categories - sample 2

Sample 2 - Specific shock	Categories	Obs	Mean	Std.Dev.	Min	Max	Hotelling's T^2	Prob >F(1,df)
Burkina Faso	Male	1810	1.722	0.704	1	4.3	1.754	0.186
	Female	148	1.802	0.729	1	3.3		
	Dep. ratio <50	632	1.725	0.697	1	4.0	0.020	0.888
	Dep. ratio >= 50	1326	1.73	0.71	1	4.3		
	Shock	1545	1.688	0.733	1	4.3	23.719	0.000
	No shock	413	1.877	0.569	1	3.3		
	FCS non acceptable	754	1.686	0.694	1	4.0	4.408	0.036
	FCS acceptable	1204	1.754	0.712	1	4.3		
Niger	Male	1994	2.318	0.922	1	5.0	20.756	0.000
	Female	219	2.02	0.906	1	5.0		
	Dep. ratio <50	1894	2.354	0.918	1	5.0	68.392	0.000
	Dep. ratio >= 50	319	1.899	0.863	1	4.3		
	Shock	1643	2.191	0.93	1	5.0	73.164	0.000
	No shock	570	2.57	0.85	1	5.0		
	FCS non acceptable	449	2.042	0.737	1	4.3	40.995	0.000
	FCS acceptable	1764	2.352	0.956	1	5.0		
Mali	Male	1200	1.939	0.788	1	5.0	33.725	0.000
	Female	226	1.622	0.517	1	3.3		
	Dep. ratio <50	650	1.927	0.846	1	5.0	3.018	0.083
	Dep. ratio >= 50	776	1.857	0.681	1	4.0		
	Shock	1113	1.777	0.608	1	4.0	118.513	0.000
	No shock	313	2.286	1.059	1	5.0		
	FCS non acceptable	423	1.979	0.91	1	4.0	8.415	0.004
	FCS acceptable	1003	1.851	0.685	1	5.0		
Ethiopia	Male	445	2.421	1.155	1	5.0	26.998	0.000
	Female	310	1.995	1.041	1	5.0		
	Dep. ratio <50	192	2.241	1.119	1	5.0	0.004	0.948
	Dep. ratio >= 50	563	2.247	1.132	1	5.0		
	Shock	588	2.159	1.084	1	5.0	16.198	0.000
	No shock	167	2.553	1.225	1	5.0		
	FCS non acceptable	583	2.206	1.024	1	5.0	3.148	0.076
	FCS acceptable	172	2.38	1.422	1	5.0		
Somalia	Male	427	2.519	0.41	1	3.7	2.464	0.117
	Female	187	2.464	0.364	1.9	4.1		
	Dep. ratio <50	86	2.54	0.424	1.9	3.7	0.920	0.338
	Dep. ratio >= 50	528	2.496	0.392	1	4.1		
	Shock	574	2.461	0.354	1	4.1	110.304	0.000
	No shock	40	3.089	0.505	2.3	3.7		
	FCS non acceptable	207	2.539	0.422	1.9	4.1	2.792	0.095
	FCS acceptable	407	2.483	0.383	1	4.1		
Nigeria	Male	1686	2.972	0.884	1	5.0	3.657	0.056
	Female	294	2.865	0.876	1	5.0		
	Dep. ratio <50	751	2.996	0.888	1	5.0	2.499	0.114
	Dep. ratio >= 50	1229	2.931	0.879	1	5.0		
	Shock	1329	2.944	0.893	1	5.0	0.694	0.405
	No shock	651	2.98	0.862	1	5.0		
	FCS non acceptable	722	2.933	0.879	1	5.0	0.791	0.374
	FCS acceptable	1258	2.969	0.885	1	5.0		
Uganda Karamoja 2016	Male	1579	2.407	0.881	1	4.7	11.728	0.001
	Female	390	2.238	0.837	1	4.3		
	Dep. ratio <50	535	2.448	0.908	1	4.3	5.268	0.022
	Dep. ratio >= 50	1434	2.346	0.861	1	4.7		
	Shock	1862	2.375	0.875	1	4.7	0.013	0.908
	No shock	107	2.364	0.872	1	4.3		
	FCS non acceptable	1186	2.196	0.804	1	4.3	93.862	0.000
	FCS acceptable	1180	2.536	0.902	1	4.7		

Uganda Karamoja 2019	Male	1428	2.422	0.86	1	5.0	5.636	0.018
	Female	537	2.32	0.818	1	5.0		
	Dep. ratio <50	1182	2.424	0.866	1	5.0	3.503	0.061
	Dep. ratio >= 50	783	2.35	0.822	1	5.0		
	Shock	1944	2.385	0.842	1	5.0	22.793	0.000
	No shock	21	3.27	1.094	1.3	5.0		
	FCS non acceptable	845	2.321	0.849	1	5.0	11.094	0.001
	FCS acceptable	1120	2.45	0.846	1	5.0		
Uganda North 2017	Male	1883	2.357	0.783	1	5.0	45.696	0.000
	Female	1151	2.168	0.689	1	4.3		
	Dep. ratio <50	999	2.303	0.768	1	4.7	0.795	0.373
	Dep. ratio >= 50	2035	2.277	0.748	1	5.0		
	Shock	2708	2.283	0.747	1	5.0	0.219	0.640
	No shock	326	2.304	0.811	1	4.3		
	FCS non acceptable	771	2.159	0.687	1	5.0	29.167	0.000
	FCS acceptable	2263	2.328	0.771	1	4.7		
Uganda North 2018	Male	539	2.586	0.886	1	4.7	5.079	0.025
	Female	166	2.412	0.816	1	4.7		
	Dep. ratio <50	242	2.656	0.91	1	4.7	6.005	0.015
	Dep. ratio >= 50	463	2.487	0.847	1	4.7		
	Shock	617	2.519	0.88	1	4.7	4.244	0.040
	No shock	88	2.723	0.799	1	4.7		
	FCS non acceptable	125	2.203	0.792	1	4.0	24.122	0.000
	FCS acceptable	580	2.618	0.872	1	4.7		
DRC 19	Male	1409	3.787	0.758	1	5.0	0.496	0.481
	Female	234	3.824	0.772	1.4	5.0		
	Dep. ratio <50	439	3.69	0.795	1	5.0	10.849	0.001
	Dep. ratio >= 50	1204	3.829	0.744	1	5.0		
	Shock	1629	3.793	0.762	1	5.0	0.214	0.644
	No shock	14	3.698	0.536	2.3	4.6		
	FCS non acceptable	1168	3.814	0.735	1	5.0	3.514	0.061
	FCS acceptable	475	3.737	0.817	1	5.0		
DRC 19 (flood)	Male	1409	3.792	0.738	1	5.0	0.831	0.362
	Female	234	3.84	0.753	1.4	5.0		
	Dep. ratio <50	439	3.737	0.771	1.4	5.0	4.235	0.040
	Dep. ratio >= 50	1204	3.821	0.727	1	5.0		
	Shock	1629	3.8	0.741	1	5.0	0.986	0.321
	No shock	14	3.603	0.519	1.9	4.1		
	FCS non acceptable	1168	3.83	0.737	1.4	5.0	7.404	0.007
	FCS acceptable	475	3.721	0.743	1	5.0		

Table 11.2. Hotelling's T-squared test of various categories - sample 3

Sample 3 - Generic shock	Categories	Obs	Mean	Std.Dev.	Min	Max	Hotelling's T^2	Prob >F(1,df)
Burkina Faso	Male	1810	2.333	0.653	1	4.3	12.425	0.000
	Female	148	2.136	0.688	1	3.6		
	Dep. ratio <50	632	2.298	0.66	1	4.3	0.925	0.336
	Dep. ratio >= 50	1326	2.328	0.657	1	4.2		
	Shock	1545	2.257	0.658	1	4.3	66.545	0.000
	No shock	413	2.549	0.601	1	3.9		
	FCS non acceptable	754	2.267	0.702	1	3.9	7.432	0.007
	FCS acceptable	1204	2.35	0.626	1	4.3		
Niger	Male	1994	2.373	0.777	1	5	22.959	0.000
	Female	219	2.108	0.783	1	5		
	Dep. ratio <50	1894	2.422	0.763	1	5	129.286	0.000
	Dep. ratio >= 50	319	1.899	0.736	1	4.1		
	Shock	1643	2.268	0.789	1	5	67.074	0.000
	No shock	570	2.574	0.713	1	4.8		
	FCS non acceptable	449	2.184	0.665	1	4	24.767	0.000
	FCS acceptable	1764	2.388	0.803	1	5		
Mali	Male	1200	2.031	0.688	1	5	17.547	0.000
	Female	226	1.832	0.45	1	3.3		
	Dep. ratio <50	650	2	0.752	1	5	0.000	0.986
	Dep. ratio >= 50	776	1.999	0.571	1	4		
	Shock	1113	1.857	0.54	1	4	282.444	0.000
	No shock	313	2.505	0.787	1.1	5		
	FCS non acceptable	423	2.022	0.779	1	4	0.728	0.394
	FCS acceptable	1003	1.99	0.602	1	5		
Ethiopia	Male	445	2.527	0.967	1	5	43.260	0.000
	Female	310	2.076	0.861	1	5		
	Dep. ratio <50	192	2.384	0.973	1	5	0.506	0.477
	Dep. ratio >= 50	563	2.327	0.943	1	5		
	Shock	588	2.343	0.938	1	5	0.006	0.936
	No shock	167	2.337	0.995	1	4.9		
	FCS non acceptable	583	2.292	0.828	1	5	7.027	0.008
	FCS acceptable	172	2.51	1.271	1	5		
Somalia	Male	427	2.228	0.195	1.7	2.9	4.098	0.043
	Female	187	2.194	0.197	1.6	2.8		
	Dep. ratio <50	86	2.247	0.206	1.9	2.8	2.151	0.143
	Dep. ratio >= 50	528	2.213	0.194	1.6	2.9		
	Shock	574	2.206	0.186	1.6	2.9	34.766	0.000
	No shock	40	2.39	0.259	1.8	2.8		
	FCS non acceptable	207	2.254	0.2	1.6	2.9	10.593	0.001
	FCS acceptable	407	2.2	0.192	1.7	2.8		
Nigeria	Male	1686	3.226	0.63	1.2	4.9	2.340	0.126
	Female	294	3.165	0.662	1.4	4.9		
	Dep. ratio <50	751	3.238	0.643	1.5	4.7	1.357	0.244
	Dep. ratio >= 50	1229	3.204	0.63	1.2	4.9		
	Shock	1329	3.247	0.611	1.2	4.9	8.987	0.003
	No shock	651	3.156	0.677	1.3	4.9		
	FCS non acceptable	722	3.109	0.657	1.2	4.9	33.288	0.000
	FCS acceptable	1258	3.279	0.614	1.4	4.9		
Uganda Karamoja 2016	Male	1873	2.677	0.687	1	4.3	22.570	0.000
	Female	493	2.509	0.74	1	4.4		
	Dep. ratio <50	671	2.727	0.712	1	4.4	13.777	0.001
	Dep. ratio >= 50	1695	2.608	0.694	1	4.3		
	Shock	2245	2.632	0.703	1	4.4	8.932	0.003
	No shock	121	2.827	0.651	1	4.4		
	FCS non acceptable	1186	2.495	0.682	1	4.4	109.674	0.000
	FCS acceptable	1180	2.79	0.689	1	4.4		

Uganda Karamoja 2019	Male	1428	2.694	0.703	1	4.7	1.905	0.168
	Female	537	2.646	0.68	1	5		
	Dep. ratio <50	1182	2.694	0.708	1	5	1.041	0.308
	Dep. ratio >= 50	783	2.661	0.681	1	4.7		
	Shock	1944	2.675	0.696	1	5	13.405	0.000
	No shock	21	3.233	0.624	2	4.3		
	FCS non acceptable	845	2.604	0.714	1	4.5	18.068	0.000
	FCS acceptable	1120	2.739	0.679	1	5		
Uganda North 2017	Male	1883	2.837	0.636	1	4.8	109.066	0.000
	Female	1151	2.592	0.613	1	4.3		
	Dep. ratio <50	999	2.764	0.649	1	4.4	1.423	0.233
	Dep. ratio >= 50	2035	2.734	0.633	1	4.8		
	Shock	2708	2.749	0.633	1	4.8	1.372	0.242
	No shock	326	2.705	0.684	1	4.5		
	FCS non acceptable	771	2.589	0.639	1	4.3	61.906	0.000
	FCS acceptable	2263	2.797	0.629	1	4.8		
Uganda North 2018	Male	539	2.988	0.644	1	4.5	8.198	0.004
	Female	166	2.823	0.676	1	4.1		
	Dep. ratio <50	242	3.013	0.66	1	4.5	3.501	0.062
	Dep. ratio >= 50	463	2.916	0.651	1	4.4		
	Shock	617	2.93	0.657	1	4.5	4.194	0.041
	No shock	88	3.083	0.629	1.4	4.3		
	FCS non acceptable	125	2.543	0.659	1	3.8	63.690	0.000
	FCS acceptable	580	3.037	0.621	1	4.5		
DRC 19	Male	1409	3.76	0.694	1	5	0.496	0.481
	Female	234	3.794	0.649	1.7	5		
	Dep. ratio <50	439	3.709	0.714	1.8	5	3.925	0.048
	Dep. ratio >= 50	1204	3.785	0.677	1	5		
	Shock	1629	3.767	0.685	1	5	2.210	0.137
	No shock	14	3.493	0.944	1	4.6		
	FCS non acceptable	1168	3.823	0.642	1.7	5	29.071	0.000
	FCS acceptable	475	3.623	0.77	1	5		
WBGS	Male	725	2.868	0.708	1.6	5	0.237	0.626
	Female	41	2.812	0.75	1.4	4.3		
	Dep. ratio <50	458	2.891	0.69	1.4	5	1.565	0.211
	Dep. ratio >= 50	308	2.826	0.737	1.4	5		
	FCS non acceptable	41	2.971	0.734	1.9	5	0.966	0.326
	FCS acceptable	725	2.859	0.708	1.4	5		
Total	Male	15419	2.73	0.825	1	5	124.418	0.000
	Female	4006	2.568	0.795	1	5		
	Dep. ratio <50	8196	2.669	0.815	1	5	15.828	0.000
	Dep. ratio >= 50	11229	2.717	0.826	1	5		
	Shock	15935	2.682	0.835	1	5	10.540	0.001
	No shock	2724	2.737	0.759	1	5		
	FCS non acceptable	7274	2.702	0.882	1	5	0.429	0.5125
	FCS acceptable	12151	2.694	0.783	1	5		

Finally, we investigate whether the household's FCS (which is part of RIMA) is consistent with SERS. We find that in our preferred sample, those with a non-acceptable FCS (i.e., less than a score of 35) have significantly lower SERS than those with acceptable FCS (above 35). Again, while this trend is opposite for sample 2 and sample 3 (i.e., those with non-acceptable FCS have higher SERS), once DRC 19 is dropped from these samples, the finding of our preferred sample is consistent with sample 2 and sample 3. Finally, we find a positive effect of number of total shocks on SERS for sample 2 and sample 3, in contrast to the negative effect total shocks had on SERS for sample 1 (see Table 10-10.2). This opposite trend is not surprising, since for sample 3 the questions are very differently framed, whereas for sample 2, the effect is positive and consistent with those derived from our preferred sample once we drop DRC 19 from the sample for the reasons explained above.

Table 10.1. Relationship between shocks and RCI and SERS

Sample 2 - specific shock	RCI (1)	SERS 100 (2)
Total number of shocks experienced	1.534***	2.319***
	(0.09)	(0.12)
Coping strategy against drought	-0.312***	-0.531***
	(0.02)	(0.03)
Female HH head	-3.134***	-4.574***
	(0.31)	(0.42)
HH size	0.523***	0.330***
	(0.05)	(0.06)
Country	0.845***	-1.570***
	(0.03)	(0.05)
Agro-pastoralist/pastoralist	-0.693*	-2.212***
	(0.31)	(0.42)
Urban work	5.046***	5.074***
	(0.66)	(0.90)
Other work	0.017	-3.694***
	(0.48)	(0.65)
Number of years in school of HH head		0.337***
		(0.04)
Dependency ratio		-0.056***
		(0.01)
Constant	28.141***	55.168***
	(0.48)	(0.77)
R-sqr	0.071	0.136
Observations	18153	18153
BIC	154179.0	165047.5

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10.2. Relationship between shocks and RCI and SERS

Sample 3 - generic shock	RCI (1)	SERS 100 (2)
Total number of shocks experienced	1.233***	1.753***
	(0.10)	(0.12)
Coping strategy against drought	-0.281***	-0.379***
	(0.02)	(0.02)
Female HH head	-3.686***	-5.494***
	(0.34)	(0.39)
HH size	0.451***	0.415***
	(0.05)	(0.06)
Country	0.300***	-1.604***
	(0.06)	(0.06)
Agro-pastoralist/pastoralist	-2.075***	-2.534***
	(0.33)	(0.38)
Urban work	1.902*	0.840
	(0.74)	(0.83)
Other work	-1.966**	-6.985***
	(0.70)	(0.78)
Number of years in school of HH head		0.308***
		(0.04)
Dependency ratio		-0.038***
		(0.01)
Constant	36.143***	64.893***
	(0.74)	(0.91)
R-sqr	0.042	0.123
Observations	13062	13062
BIC	111048.8	114131.9

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5. Discussion

We were specifically interested in understanding whether the SERS module (which is short and rapid) can complement or substitute a more thorough data collection in rapid emergency scenarios. The results presented above show very weak correlation and causal relation. Although subjective resilience tends to increase proportionally to the growth of resilience capacity, this is not enough to suggest that RCI and SERS can be adopted as substitutes. In other words, we are not confident that the results obtained with SERS are capturing the objective combination of quantifiable assets and endowments that fall within the RIMA analytical framework. On top of this, when considering the possibility of employing SERS for rapid assessments, we must also notice that perceptions might change according to the climate and tensions that the respondent is experiencing. The results in Table 9 reinforce our convincement that what contributes to resilience in one community may not have the same effect in another (Jones & Tanner, 2016).

With regards to shocks, it is interesting to notice that the more shocks a household reports having experienced, there is an increase in RCI but a decrease in SERS. While an increase in RCI due to having experienced more shocks may seem counterintuitive due to loss of assets etc., it may suggest that these households also received more transfers. To check for this, we regressed formal and informal transfers on total shocks and other household characteristics and found that total shocks had a significant and positive effect on informal transfers, which in turn is included in the RIMA approach to estimate RCI (see Table 12). The decrease in SERS due to experiencing shocks we associate with an element of social psychological stress (Béné et al., 2019). When people face more than one shock, besides the quantifiable effects on their assets and possessions, the internal will, strength, and overall capacity to resist may well be deteriorated if not completely lost (Carter et al., 2007). This is an element, we believe, that highlights the relevance of collecting both SERS and RIMA to investigate root causes of food security and resilience. We believe that this finding is particularly relevant for food crisis and protracted crisis countries (Pingali *et al.*, 2005). For instance, the finding that in Mali people may perceive themselves and their family as more resilient despite being less food secure, highlights the risk of misaligning targeting criteria (based on food security indicators) with people's perceived resilience capacity to react to shocks. We believe this is an important finding because people's capacity to react depends on how they see themselves in comparison to other, vis-à-vis the violence or frequency of shocks, self-esteem, informal social networks, roles and positions within their own community, and several other intangible aspects that cannot be measured by objective metrics (Silbert & Useche, 2012). Our results, however, show this discrepancy in one case only (Mali) which becomes 4 cases when using the specific shock and generic shock module. This is not enough to conclude that certainly SERS captures things that RIMA does not, but it is enough to suggest that it may, and is worthy of further exploration.

Table 12. Relation between transfers received and number of shocks experienced

Sample 1 - Drought	Formal transfers (1)	Informal transfers (2)	Formal/Informal transfers (3)
Total number of shocks experienced	0.009	0.027***	0.021**
	(0.01)	(0.01)	(0.01)
Total shocks experienced squared	-0.000	-0.003***	-0.002
	(0.00)	(0.00)	(0.00)
Coping strategy against drought	0.001	0.000	0.001
	(0.00)	(0.00)	(0.00)
Female HH head	0.137***	0.043***	0.148***
	(0.01)	(0.01)	(0.01)
Number of years in school of HH head	0.007***	0.004***	0.008***
	(0.00)	(0.00)	(0.00)
HH size	-0.014**	-0.000	-0.013*
	(0.01)	(0.00)	(0.01)
HH size squared	0.001**	0.000	0.001*
	(0.00)	(0.00)	(0.00)
Dependency ratio	0.002***	0.000	0.002***
	(0.00)	(0.00)	(0.00)
Country	-0.051***	0.006***	-0.038***
	(0.00)	(0.00)	(0.00)
Agro-pastoralist/pastoralist	-0.054***	0.020**	-0.015
	(0.01)	(0.01)	(0.01)
Urban work	0.066**	-0.026	0.066**
	(0.02)	(0.02)	(0.02)
Other work	0.055*	-0.031	0.075**
	(0.02)	(0.02)	(0.02)
Constant	0.821***	-0.006	0.740***
	(0.03)	(0.03)	(0.04)
R-sqr	0.081	0.014	0.057
Observations	10805	10805	10805
BIC	14260.4	8486.2	15135.5

Finally, we note the separate roles played by context and livelihood in explaining SERS and RCI. Our findings show that working in an urban context is associated with greater objective and subjective resilience. This is explained by having greater access to (normally better) basic services, being able to receive support, being easily reachable by international assistance, being more connected with formal and informal social networks, and experiencing less direct impacts of shocks (Da Silva et al., 2012; Jones & Tanner, 2017).

6. Conclusion

This study was conducted to better understand how subjectively evaluated measures of resilience compare and relate to objectively evaluated measurement tools. The data employed are from 13 data collections, containing a module on the Subjective self-Evaluated Resilience Score (SERS) and the objectively evaluated RIMA measurement, the Resilience Capacity Index (RCI). This paper contributes to the literature on like-for-like comparison studies on subjective and objective resilience measurement tools, using a cross-countries analysis with great statistical power. This paper finds that the correlation and the causal relation between SERS and RCI is proportional to changes of resilience, but overall, these correlations are weak and not consistent across countries. We therefore cannot conclude that the two resilience capacity measurements are interchangeable. The second contribution of this paper is to investigate underlying determinants of RIMA and SERS, and to consider the role of past shocks on resilience capacities. We find that while several determinants have the same direction and almost the same magnitude of effect for both SERS and RIMA, the effect of having experienced past shocks on these resilience capacity measurements differ, whereby SERS is reduced and RCI increases. We therefore conclude that SERS and RIMA are not substitutes, and that in fact they may be capturing several aspects of resilience capacities. This is important to consider when designing targeting criteria for resilience-building projects. In particular, there is a need to better understand which questions on subjective resilience give value for analysis, and which projects could benefit from including questions on subjective resilience. Finally, we conclude that SERS cannot be employed in rapid assessments as a substitute to RIMA to capture resilience. We otherwise suggest that both clarify resilience characteristics and, ultimately, some aspects that contribute to maintaining food security. In reflecting on the implications of these findings, it is important to bear in mind that the contexts in which respondents found themselves differs greatly across the countries involved in this study. Future work is needed to better understand how to deal with such context-specificity (Jones & d'Errico, 2019). In particular, the SERS could serve as a basis for developing a qualitative tool to capture context specific aspects and act as a supplement to quantitative methods. In addition, this study would benefit from using panel data to better track changes over time with respect to the effect of past shocks, perceived resilience, and future resilience capacity.

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