

A Scoping Review of the Development Resilience Literature: Theory, Methods and Evidence

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Abstract: Development and humanitarian agencies have rapidly embraced the concept of resilience since the 2008 global financial and food price crises. We report the results of a formal scoping review of the literature on development resilience over the ensuing period. The review identifies the theoretical and methodological underpinnings and empirical applications of resilience as the concept has been applied to individual or household well-being in low-and middle-income countries. From 9,558 search records spanning 2008-20, 301 studies met our pre-registered inclusion criteria. Among these, we identify three broad conceptualizations employed – resilience as capacity, as a normative condition, or as return to equilibrium – and explain how the resulting variation in framing leads to marked differences in empirical methods and findings. We study in greater depth a set of 45 studies that met five key criteria for empirical studies of resilience. The larger, more established, qualitative empirical literature yields insights suggestive that the concept of resilience can add value. The quantitative literature is thinner and divided among methods that limit cross-study comparability of findings. Overall, we find that development resilience remains inconsistently theorized and reliant on methods that have not been adequately reconciled to identify which tools are best suited to which questions. Despite much published evidence, most findings concentrate on just a few countries and natural shocks, and rely on cross-sectional data at just one scale of analysis. The result is a dearth of generalizable evidence, especially of rigorous impact evaluations, to guide whether or how agencies might build resilience among target populations.

Keywords: food security, risk, shocks, stressors, vulnerability, well-being

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1. Introduction

Recurrent humanitarian crises resulting from political conflict, climatic, economic, or health shocks, including those arising from the COVID-19 pandemic, together with expectations of increased frequency of extreme weather events, have led many development and humanitarian actors to reconceptualize development amid (ex ante) stressors and (ex post) shocks. These agencies increasingly employ the concept of resilience to integrate across longstanding – but traditionally more siloed – domains of humanitarian assistance, governance, food security, and economic development to link longer-term livelihoods programming with emergency response. Conostas et al. (2014, p.4) write, “In a world where conventional approaches to dealing with humanitarian aid and development assistance have been questioned, resilience has captured the attention of many audiences because it provides a new perspective on how to effectively plan for and analyze the effects of shocks and stressors that threaten the well-being of vulnerable populations.”

Resilience is both appealing and daunting as a concept because it compels a coherent, multidisciplinary explanation of the interrelated dynamics of risk exposure, multi-scalar human living standards, and the dynamics of broader ecological and social processes. Agency programming around “resilience” has grown dramatically and quickly over the last decade. In 2018 one major donor, the United States Agency for International Development (USAID), even began renaming one of its largest bureaus, inserting “Resilience” before “and Food Security”.

At the same time, there has also been an explosion of published work on the topic. A casual Google Scholar search on “development resilience” produces almost 2.4 million results of varying relevance and quality, nearly 1.4 million of them since 2008, when the global

financial and food price crises first pushed the term into widespread use. The sheer volume of published work and the rapidly expanding practitioner demand for guidance around resilience suggests there is value in a formal, comprehensive scoping review to assess the current state of research on development resilience. No such review seems to exist.⁷

This paper seeks to fill this knowledge gap. It summarizes results of a formal, pre-registered scoping review of the development resilience literature. It seeks to answer three questions: (1) How is resilience conceptualized in the development literature? (2) How is it measured? and (3) What has been learned from empirical applications of the concept of resilience? We find that development resilience remains inconsistently theorized and the methods have been improvised. Despite an abundance of empirical evidence, most of it lacks comparability as it is drawn from diverse contexts, employs myriad methods of uncertain reliability, and is of highly uneven quality. The literature concentrates heavily on a few locations and shocks, which risks overgeneralizing place-specific findings. An early observer noted that “[i]nstead of bringing clarity to the table as envisaged, it has brought utter confusion. ... nobody really knows what resilience means, or perhaps more accurately, everybody has a different understanding of it” (Hussain, 2013). While the literature has exploded in the years since

⁷ Reviews of the concept of resilience exist in separate disciplines. Several exist in the psychology literature that address questions specifically related to the psychological resilience of children (e.g., Luthar et al. 2000; Windle et al. 2011) or reviewing the literature related to different types of shocks or stressors and/or in specific contexts (Tol et al. 2013). Reviews exist on the resilience of ecological systems (e.g., Gunderson 2000), social-ecological systems (e.g., Folke 2016), and the nexus between psychological and ecological resilience (Ungar et al. 2012). Some link the concept of risk and resilience across disciplines (e.g., Bhamra et al. 2011). While some of these relate peripherally to development resilience, the vast majority of these reviews do not meet the inclusion criteria we describe below. The few review papers that do meet those criteria were either very early in the literature’s emergence (Béné et al. 2014), restricted just to measurement, monitoring and evaluation tools (Schipper and Langston 2015; Asadzadeh et al. 2017; Douchamps et al. 2017; Serfilippi and Ramnath 2018), or seem to have captured just a small share of the literature (Ansah et al. 2019). Differences in the objectives, breadth and period of material covered, and the use of formal, pre-registered review methods distinguish these efforts from what we do here.

Hussain's claim, and there have been some laudable advances, the many limitations of work on this topic to date remain concerning.

In the next section, we detail the scoping review methods we employed. Section 3 reviews the conceptual and theory-oriented resilience papers found in our review. Section 4 provides an overview of empirical studies on development resilience, followed in section 5 by summaries of papers that satisfy five key criteria described in our methods section. In section 6 we briefly synthesize a limited update of the review through November of 2020. Section 7 summarizes our findings and maps an agenda for future research.

2. Methods

(a) Scoping Review Methodology

A scoping review methodology provides a rigorous and transparent approach to mapping the rapidly growing literature on resilience. It allows us to contextualize knowledge within the current landscape of policy and practice (Anderson et al., 2008) and identify gaps in research. It also provides the opportunity to summarize the entire literature that satisfies the pre-determined eligibility criteria as presented in our protocol, limiting the biases that might arise based on author preference or prior familiarity with the work. Further, it means that we can accurately characterize the volume and patterns of the published research in a replicable way. That said, as we show below, the heterogeneity of definitions, methods and outcomes considered within the development resilience literature precludes the quantitative analysis of these papers' empirical findings, as is commonly found in systematic reviews and meta-

analyses. It also means that we cannot, unlike those approaches, quantitatively assess the risk of bias.⁸

This scoping review was prepared in accordance with the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) extension for essential reporting items for scoping reviews (PRISMA-ScR, Tricco et al., 2018). We follow Arksey and O'Malley's (2005) five-stage methodological framework, as modified by Levac et al. (2010): (1) identifying our research question; (2) identifying relevant studies; (3) performing study selection; (4) charting the data; and (5) collating, summarizing, and reporting the results. All materials for this study, including the pre-registered protocol, full search strategies, and data extraction form, were pre-published on the Open Science Framework (OSF) (<https://osf.io/5rgb7/>).

b) Data sources and searches

A comprehensive search strategy was performed across multiple electronic databases and grey literature resources to address our central research question: "What are the theoretical and methodological underpinnings and empirical applications of resilience as the concept applies to individual or household well-being in low-and middle-income countries?" Search terms included variations of the key concepts of interest: resilience, well-being, shock, and low- and middle-income countries. Searches were performed in Scopus, CAB Abstracts and Global Health (via the Web of Science platform), Social Sciences Research Network, and OpenGrey. Following Haddaway et al. (2015) a sample set of 300 search results was retrieved from Google Scholar. After the searches were executed on October 28, 2018, the resulting set of 9,012 records were

⁸ Inherent in scoping review methodology is the expectation that included studies will be of heterogeneous design. The PRISMA-ScR guidelines state that risk of bias and methodological quality of included studies are generally not appraised (Tricco et al., 2018).

de-duplicated to remove redundant findings, and imported into article screening software, Covidence.

c) Eligibility criteria and study selection

Study screening and selection was carried out in three stages: title-only screening, title and abstract screening, and finally, full-text screening. Two independent reviewers screened all identified studies at all stages. During each stage of the selection process, discrepancies between the two reviewers were resolved by a third, independent reviewer.

Given the widespread use of the terms ‘resilience’ and ‘development’ on topics not relevant to this review, study titles were assessed and included for the second stage of title and abstract screening if they 1) were published (or posted/dated) between January 2008 and December 2019; 2) focused on a study area restricted to a low or middle-income country (or countries), according to 2019 World Bank classifications; and 3) were an international development study, as indicated by the title and/or publication in a source *other* than a medical, psychology, ecology, computer science, technology, architecture and planning, physical science or engineering outlet. We note that the presence of “ecology” among excluded outlets introduces potential confusion, as the concept of resilience in development studies builds directly on the ecological concept, and for many is also explicitly about the connection between human and environmental or ecological systems. Some journals and articles that appropriately address social-environmental systems are naturally also about ecology, and/or include the word in the title (most notably, *Ecology and Society*). The intent and practice, in our case, was to exclude outlets that focus on resilience as a feature of purely ecological systems

(e.g., wolf population dynamics). Studies that did not meet these three criteria based on their titles and journal sources were excluded.

After removing studies that did not meet the three title screening criteria, titles and abstracts of the remaining studies, and then subsequently, full-text studies, were eligible for inclusion if they met the following criteria:

1. Published between January 2008 – December 2019
2. Empirical studies or reviews of existing research⁹
3. Conceptually concerned with shock/stressor response. Shocks and stressors were defined as adverse stochastic events that have the potential to directly or indirectly adversely impact human well-being. Stressors refer to known ex ante exposure to some positive probability of the event occurring, while shocks refer to an adverse event that has already occurred.¹⁰

4. Micro-scale. The study applies resilience as particularly relevant to individuals and/or households, and not exclusively to larger aggregates such as communities or countries.

Studies of village or community or system resilience are also considered micro-scale, and as such relevant, if they are based on individual or household data, and/or if they also apply the concept of resilience to individuals or households (even if measured at a more aggregate scale).

⁹ While we consider this criterion in our ultimate discussion, we recognize that it is somewhat subjective and hence did not operationally apply it to exclude work at earlier stages.

¹⁰ We focus exclusively on negative shocks because that is the resilience community's focus. As an anonymous reviewer emphasizes, however, the capacities that promote resilience may also, likely inadvertently, affect individuals', households' and communities' ability to seize opportunities arising from favorable (e.g., market or technological) shocks. This is potentially a useful avenue for research bridging the resilience and, for example, technology adoption or market participation literatures. This topic lies beyond the scope of this review, however.

5. Explicit focus on “resilience” (i.e., resilience theory or measurement is central to the study)
6. Explicit reference to a measure of human well-being, defined as “the various things a person may value doing or being” (Sen 1999, p. 75). Examples of “well-being” outcomes included, but were not limited to: expenditures, consumption, income, assets, poverty, food security indicators (including, but not limited to, dietary diversity indices, coping strategies indices), health indicators (child health, anthropometry, morbidity, mortality), happiness and life satisfaction, equality, marginalization, safety and security, experiences of conflict or violence.
7. Study area or focus includes populations in low- and middle- income countries, according to the 2019 World Bank classification.
8. Must appear in outlets outside the medical, psychology, ecology, computer science, technology, architecture and planning, physical science and engineering disciplines.
9. Is not a study of cognitive/psychological resilience, engineering resilience (including resilience of infrastructure or the built environment), ecosystem resilience, or the resilience of a non-human system (e.g., the resilience of a business, industry, organization, water management).

Studies that did not meet these nine criteria were excluded. Finally, a list of 29 experts were contacted for identification of known studies that may be relevant to this review and provided with our preliminary screened set of 269 studies. All additional studies identified through expert consultation were assessed against eligibility criteria for inclusion. Figure 1, the PRISMA Flow Diagram, presents the study selection process and indicates the number of articles excluded at each stage of screening. Our scoping review narrows its focus ultimately on 291

studies, and provides a synthesis of these studies – not a quantitative synthesis as in a meta-analysis, rather a knowledge synthesis that contextualizes and integrates each of these studies into the larger body of knowledge about our topic (Levac et al., 2010; Anderson et al., 2008). A database enumerating all the included studies is publicly available at <https://osf.io/72feu/>.

As we report below, we used an adapted version of this protocol to update our review through mid-November, pre-publication. That update yielded an additional 546 studies, 84 of which passed the screening criteria, only 10 of which satisfied all inclusion criteria.

d) Data extraction and study categorization

A formal data extraction protocol was used to thematically characterize each included empirical study, including the study context, data and methods. Using this information, we then drew on the Critical Appraisal Skills Program (CASP) checklists for study appraisal (<https://casp-uk.net/casp-tools-checklists/>) to categorize the empirical studies found by our scoping review. We required that resilience was central to the analysis presented in the paper and that it was clearly conceptualized. The research design, methods, and data must be well documented, replicable, and appropriate for the study of well-being over time in the presence of shocks or stressors. We assessed empirical studies according to the following specific criteria:

- 1 – A clear definition or conceptualization of the term “resilience”
- 2 – Explicit attention to ex-ante risk/stressor exposure and/or ex-post effects of shocks

For quantitative papers, we also considered whether the study:

- 3 – Contained a clear method or explanation as to how resilience was measured
- 4 – Used longitudinal data
- 5 – Drew on a sample size of 200 observations or more per survey round

And for qualitative studies, we considered whether the study included:

3 - A clear method or explanation as to how resilience is measured qualitatively

4 - Data suitable for measuring well-being over time.

5 - Clear documentation of data collection.

Below, we refer to empirical studies meeting all five criteria as 5C studies and focus particular attention on them in section 5. In section 6, we explain a limited update we made to bring the study current through mid-November 2020.

3. Theories and definitions of development resilience

Resilience is not a new concept. The word itself comes from the Latin word *resilire*, meaning to rebound or recoil. Perhaps its earliest usage in research, as a measure of the capacity of different materials to absorb loads, was found in 19th century ship building (Tredgold, 1818 and Mallett, 1862; cited in McAslan, 2010) and the ‘modulus of resilience’ is a common measure in civil and mechanical engineering. Starting in the 1970s, researchers in the fields of ecology and psychology began to explore the notion of resilience. In ecology, Holling (1973) described resilience as the amount of disturbance a system can absorb before shifting into an alternative state (Walker et al, 2006) while others follow Pimm’s (1984) focus on the speed of return to a pre-existing equilibrium following a perturbation or shock (Perrings, 2006). Resilience as “the ability of people, communities, societies, and cultures to live and develop with change, with ever-changing environments” (Folke 2016, p. 3) has emerged as a focal point in sustainable development research that takes a social-ecological systems (SES) approach (see Folke 2016;

Reyers et al. 2018 for reviews).¹¹ Psychologists also began exploring the notion of resilience in the 1970s (Garmezy, 1974; Bleuler, 1978), summarized by Rutter (2012, p. 336) as “reduced vulnerability to environmental risk experiences, the overcoming of a stress or adversity, or a relatively good outcome despite risk experiences.”

The translation of this broadly applied concept into the international development space over the past decade or so has proved contentious, as others have observed. “The assessment of resilience is fraught with complexity: both the definition of resilience and the methodologies used to measure it are heavily contested” (Jones and Tanner, 2017, p. 229). “There is considerable debate and ambiguity over the question of whether resilience is a state, a capacity or a condition and how, whether resilience inheres in individuals, communities and institutions and whether it refers to short- or long-term responses. Typologies of resilience and shopping lists of resilience properties abound” (Watts, 2016, p. 263). The net result is sometimes “an uncomfortable mix of fervent enthusiasm and cool skepticism” (Béné et al. 2016, p. 123). As we detail below, the best studies in this literature offer an explicit conceptualization of resilience and use a measurement method that follows directly from that conceptualization. A portion of the variation one finds in the literature therefore begins with differences in the core definition the analysts use for resilience. We emphasize three broad conceptualizations that are most widespread in the literature.

(a) Resilience as capacity

¹¹ Social-ecological systems research emphasizes that “the delineation between social and natural systems is artificial and arbitrary” (Berkes and Folke 1998, p. 4). While a small number of SES studies are included in this scoping review (e.g., see our summary of the 5C qualitative empirical literature in section 5), much of the SES literature on resilience do not meet the inclusion criteria for this study, in particular due to more aggregate scales of analysis.

This approach sees resilience as the “capacity that ensures stressors and shocks do not have long-lasting adverse development consequences” (Constas et al. 2014, p.4). This definition emerged from a February 2013 multi-agency expert consultation that established a Resilience Measurement Technical Working Group (RMTWG).¹² A central idea of the capacity conceptualization is that resilience is a latent variable that captures the effects of some combination of observable and unobservable attributes – of an individual, household, community, or more aggregate unit – that limit the adverse well-being effects of ex ante risk exposure (i.e., stressors) and/or the near- or longer-term consequences of shocks. This conceptualization fosters integration across different domains, a systemic approach that allows for multi-scalar socioeconomic-ecological interactions that hold widespread appeal (Béné et al. 2015, 2016). The multidimensionality of resilience holds particular appeal for those working on natural disasters, including those associated with climate change. Thus, the most common conceptual approach treats resilience as an *ex ante* capacity. A representative definition is this: “Resilience can be understood as the capacity to withstand or absorb sudden or chronic shock; cope with temporary disruption while minimizing the damages and costs from hazard; restore after an event; manage or maintain basic functions and structures to become suitable for future situation.” (Birhanu et al, 2017, p.2).

Resilience as a latent capacity to avoid harm to well-being due to shocks remains a challenge to measure. Some analysts therefore revert to measures that draw explicitly on one

¹² The RMTWG’s outputs have proved influential, especially with donor and operational agencies that drove and supported the effort. See <http://www.fsincop.net/topics/resilience-measurement/technical-working-group/en/> for details and links to the RMTWG’s outputs.

or both of the subsequent two conceptualizations we cover below: resilience as a normative condition or as return to equilibrium. They then associate measures of resilience capacities as hypothesized determinants of resilience to normative outcomes or changes in normative outcomes, implicitly linking the distinct conceptualizations found in the literature.

In practice, analysts frequently operationalize resilience as a capacity either through a multidimensional set of indicators thought to capture resilience's various features or by reducing such a set to an index through a data reduction method such as factor analysis. The subtle distinction between the abstract, latent 'resilience as capacity' and the operationalizable 'resilience capacities' that are explanatory variables rather than outcomes too often gets lost in this literature. The former – multiple indicators – approach often nests resilience analysis within the Sustainable Livelihoods framework that conceptualizes well-being as a function of five asset categories: financial, human, natural, physical and social capitals (Quandt, 2019; Saxena et al, 2016; Stanford et al, 2017). For example, Ranjan (2014) focuses on the role that social and financial capital play in dealing with drought. Others (Quandt, 2019) construct composite indices across the five asset categories or aggregate assets using principal components (Browne et al, 2014), while others (Stanford et al, 2017) argue that households who score highly on all five asset categories (as well as a sixth that they call institutional capital) are best placed to be resilient. Some of the studies that emphasize resilience capacity in terms of household assets also note that resources beyond the household such as infrastructure and social services contribute to resilience (Birhanu et al, 2017; Stanford et al, 2017; Woolf et al, 2016). Béné (2013, p. 22) expands on this point, arguing that "resilience is not simply about coping strategies that help households to 'survive' a shock; resilience is also about adaptive strategies

or even transformative strategies. It is about ex-post but also ex-ante (anticipation) strategies.” This echoes a growing consensus in the related SES literature that resilience encompasses transformability, defined by Walker et al. (2004, p. 1) as “the capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable” (Reyers et al. 2018).

The recognition that there may be multiple capacities or ‘pillars’ has been operationalized through two index-based measures. The first was the Resilience Indicators for Measurement and Analysis (RIMA), developed by the Food and Agriculture Organization of the United Nations (FAO). An updated version, RIMA-II (FAO 2016), uses factor analysis to estimate four latent variables, labelled “pillars” - Access to Basic Services (ABS), Assets (AS), Social Safety Nets (SSN), and Adaptive Capacity (AC) – from standard household and community survey data. These are combined into an overall resilience capacity index (RCI). Examples of this approach include Alinovi et al. (2008, 2010), d’Errico et al. (2017, 2018) and d’Errico and Di Giuseppe (2018). RIMA-II is now the recommended tool within United Nations affiliate organizations (e.g., FAO, WFP, UNICEF, and IFAD).

A different RCI has been developed by the consulting firm TANGO International (Smith and Frankenberger 2018). Building on Béné et al. (2015), the TANGO approach also conceptualizes resilience as a latent capacity, one that reflects absorptive, adaptive, and transformative capacities that ultimately determine resilience. Absorptive capacities seek to mitigate the impact of shocks and include the availability of assets and savings. Adaptive capacities spread risk by diversifying livelihoods and relying on social safety nets. Transformative capacities seek to change the underlying dynamics, for example by improving

governance, improving access to markets or empowering women. Currently, the TANGO approach serves as the basis for recommended resilience analysis under some projects funded by the United States Agency for International Development (USAID, Henly-Shepard and Sagara, 2018).

The RIMA and TANGO measures are the methods most commonly used to implement the “resilience as capacity” conceptualization. As d’Errico et al. (2016) note, this conceptualization expressly positions resilience as a variable that helps explain variation in human well-being outcomes, one that mediates the malign impacts of shocks and stressors. This makes resilience capacities an explanatory variable, not an outcome. This implies, of course, that the measure of resilience one uses must be positively correlated with the outcome(s) of interest. Evidence demonstrating the extent to which such measures indeed predict well-being out of sample remains, however, limited and mixed.¹³

The resilience as capacity conceptualization holds considerable appeal because of its breadth and flexibility. Moreover, the many development interventions that explicitly or implicitly aim to ‘build resilience’ also necessitate a conceptualization and measure of resilience that can equally serve as an outcome, in order that one can rigorously monitor and evaluate whether resilience is indeed increasing among intervention participants. RCIs and similar measures have not been used for this purpose.

(b) Resilience as a normative condition

Some resilience definitions go an important step further and anchor this concept to normative well-being standards, just as poverty assessments employ a poverty line as a reference point.

¹³ Papers that address this concern include Alloush (2019), Upton et al. (2020), and d’Errico and Smith (2020).

The objective of normative anchoring is to ensure that resilience is a pro-poor concept (Barrett and Conostas 2014; Béné et al. 2014). Indeed, the RMTWG's first principle was that resilience "should be indexed to a given development outcome (e.g., food security, poverty, health) with a normative threshold" (Conostas et al. 2014, p. 7). That principle seems to have fallen away in the 'resilience as capacity' formulations and in the RMTWG's final definition of resilience as the "capacity that ensures stressors and shocks do not have long-lasting adverse development consequences" (Conostas et al. 2014, p.4). The normative standard proved controversial within the RMTWG, apparently because of some members' concern that including a normative standard would limit resilience measurement and/or that an absolute standard rather than a relative one tied explicitly to the development impact of stressors and shocks would conflate different phenomena.

Barrett and Conostas (2014) develop the 'resilience as a normative condition' idea in detail, conceptualizing resilience as an individual's probability of achieving at least some minimal standard of living conditional on a wide range of observable characteristics, and exposure to stressors and shocks. Resilience thus becomes a condition that reflects one's capacity to avoid adverse well-being states, rather than a capacity itself. Cissé and Barrett (2018) translate this conceptualization into an econometric method, estimating resilience as a conditional probability of satisfying some normative standard of living, e.g., a minimum herd size, per capita expenditures level, food consumption score, or child mid-upper arm circumference. This is done by estimating two multivariate regressions that together reflect the conditional mean and variance of a well-being indicator— like herd size or expenditures — and then using those regression-based estimates to generate a probability measure based on an

assumed, two-parameter distribution. They show how this measure, just like standard poverty measures, can be aggregated from individual or household level into community, region or national resilience indicators.

Studies that conceptualize resilience as a normative condition most commonly treat the resulting measure as an outcome. This has made it popular among academics doing impact evaluation or trying to describe the resilience of distinct populations (Cissé and Ikegami 2016, Upton et al. 2016, Alloush 2019, Knippenberg et al. 2019, Phadera et al. 2019, Vaitla et al. 2020).

A shortcoming of both the ‘resilience as capacity’ and ‘resilience as a normative condition’ approaches that follow Cissé and Barrett (2018), especially as operationalized quantitatively, is that they typically ignore “the least well understood features of system structure ... the nonmaterial relations of solidarity, social exclusion, power, and other sociocultural phenomena” (Barrett and Constanas 2014, p. 14628) because those features typically remain unobserved in survey and biophysical data. The various resilience capacities indices make an attempt in this direction by including various proxy measures for social capital, aspirations, etc. However, it remains unclear how well these household and community-level measures capture the underlying concepts, such as the capacity to adapt and transform.¹⁴ Toward that end, a robust qualitative literature has emerged that attempts to foreground power, agency and hard-to-observe psychosocial factors (Carr 2019). This literature too fits

¹⁴ SES scholarship highlights not only the importance of feedbacks within local social-ecological systems, but also the importance of context and connectivity across scales and places (e.g. Carpenter et al. 2001; Dakos et al. 2015; Tu et al. 2019). Reyers et al. (2018, p. 271) argue against the usefulness of “direct cause-effect analysis at the microscopic level,” emphasizing that “SES approaches reveal the role of feedbacks, power asymmetries, external factors, system structures and processes, as well as temporal and spatial scale dynamics that significantly affect development outcomes.”

under the general ‘resilience as a normative condition’ framing, but follows a different, qualitative route to empirical implementation.

Building on this insight that attempts at objective measurement can miss many important features, a small number of recent studies argue that resilience might be best measured through respondents’ own assessments that can be brought back into quantitative analysis (Béné et al. 2019; Jones and d’Errico 2019). For example, Jones and Tanner (2017) use Likert scale questions to ask respondents to assess their resilience in terms of financial capital, coping capacity, social capital and knowledge and information.

(c) Resilience as return to equilibrium

A third approach pays greater attention to assessing the ex post effects of shocks on well-being outcomes and associate resilience with whether households have the capacity to recover from a shock (Constas et al. 2014a; Constas et al. 2014b; Vollenweider 2015; Hoddinott 2014; Knippenberg et al. 2019).¹⁵ This conceptualization of resilience sticks more closely to the use of the concept in ecology and engineering, and to the word’s etymological roots. Like the ‘resilience as a normative condition’ approach, it describes a condition – ex post recovery from shocks – of a well-being variable of interest rather than attempting to explicitly model the various capacities that result in rapid recovery as in the ‘resilience as capacity’ approach. The two can be linked, as when measures of resilience capacities are used as explanatory variables for observed changes in familiar well-being measures related to food security or poverty status (d’Errico & Di Giuseppe 2018, Smith & Frankenberger 2018). But caution is needed when using the ‘resilience as recovery’ approach as it risks departing from the ‘resilience as a normative

¹⁵ This approach is similar to ideas originating in Carter and Barrett (2006) and Carter et al (2007).

condition' conceptualization by omitting the normative anchoring. Put differently, resilience should not be seen just as the return to a pre-shock equilibrium without considering whether that ex ante state was desirable (Barrett and Constanas 2014). Figures 2a, 2b and 2c, taken from Hoddinott (2014), illustrate this idea. They use a measure of food security called the food consumption score (FCS), but we could easily substitute some other well-being indicator. Figure 2a graphs two elements of the FCS for six hypothetical households, its initial level shown by the dark rectangles, and its range shown by the horizontal lines going outward from each rectangle. Four households (A, C, E, and F) are food secure (their FCSs lie to the right of the FCS value associated with some minimum food security level; this is denoted by the vertical line) and two (B and D) are food insecure. The range provides an indication as to how shocks of different severity will affect food security. So, for example, when a shock does occur, FCS initially falls, as shown by the solid arrows in Figure 2b. Each household's new FCS is given by the diamond shape. After this shock, five households are now food insecure. Figure 2c then describes the subsequent food security status of each household, after the shock has passed. These are denoted by circles with a wavy fill pattern, with the direction of change in FCS during the recovery period, from that shown in Figure 2b, denoted by the open-filled arrows. Households A, D, and F see FCS returning to at least the level observed in Figure 2a. In two households, B and C, there is partial recovery from the shock, but their FCS is still less than that observed in Figure 2a. Finally, the food security situation for household E has continued to deteriorate, with its FCS now lower than it was in Figures 2a and 2b. 'Resilience as recovery' would classify as resilient households A, D and F, and perhaps also B and C, depending on the convergence

criterion used. But ‘resilience and recovery relative to a normative outcome’ (here food security) would only classify households A and F as resilient.

Unlike in ecology and engineering, where resilience involves return to a *desirable* initial state, development resilience is motivated by the need to address a normatively *undesirable* initial state. The SES literature on sustainable development has also identified the need to “break resilience of one development path and transform to another” (Folke 2016, p. 8), and in response increasingly recognizes that “adaptation and transformation are a part of system resilience” (Reyers et al. 2018, p. 277). A conceptualization of ‘resilience as transformability’ may serve as a useful complement to ‘resilience as return to equilibrium’ in future development resilience scholarship.

4. The empirical literature on development resilience: An overview

The development resilience literature is overwhelmingly empirical. Our 291 records included 230 that include original empirical work, as opposed to reviews or theoretical papers. Many of these studies link directly to the rapid proliferation of resilience as an organizing principle behind development and humanitarian programming since 2008. This manifests in the authorship and publication timing patterns, as well as the geographic and stressor/shock foci of the literature. In this section we describe these patterns, as backdrop to more detailed exploration of the quantitative and qualitative empirical literatures in the subsequent sections.

(a) Scope and characteristics of the empirical literature

The rapid proliferation of resilience as a concept is clear from the pattern of publication dates shown in Figure 3. More than half of all studies have been published since 2016. As reflected in

Table 1, most are found in refereed journal articles (78%), followed by book chapters (11%).

The vast majority study a single country (90%). They are dominated by work undertaken in rural areas (90%, including the 16% that include both urban and rural localities).

Figure 4 offers a deeper look at the geographical distribution of these empirical studies.¹⁶ Flood-prone Bangladesh and drought-prone Kenya have received extensive attention, 29 and 25 studies, respectively. There are more than twice as many empirical studies (140) of resilience in sub-Saharan Africa as in twice-as-populous south Asia (64). And nearly half of the studies undertaken in sub-Saharan Africa focus on just four east African countries – Ethiopia, Kenya, Tanzania and Uganda – that comprise less than one-quarter of the region’s population, and are neither the poorest nor most violence or disease-affected nations. Meanwhile, perhaps not surprisingly given the immense difficulties of working there, one or fewer studies of resilience exist for Angola, the Central African Republic, Chad, the Democratic Republic of the Congo, Liberia, Mauritania, Sierra Leone, Somalia, South Sudan, and Sudan, whose populations have faced recurrent climatic and/or conflict-related shocks. With 29 studies, natural-hazard prone Bangladesh is the most-studied country in South Asia, while Pakistan, with a similar population, has only four studies. Afghanistan, Laos and Myanmar and have just one or none. There are nearly as many studies of resilience focusing on Vietnam (18) as for all of Latin America and the Caribbean (22). Only two published studies cover Haiti, the poorest country in the Americas. There were only 17 studies that address resilience in any of the small island developing states found across the Pacific, despite the fact that these countries are especially

¹⁶ In the case of multi-country studies, each country is counted separately. So the number of observations on the map exceed the 230 empirical studies we synthesize here.

vulnerable to sea level rise associated with climate change and to tropical cyclones. The literature's heavy geographic concentration raises questions about the generalizability of its empirical regularities.

The best empirical studies offer an explicit conceptualization or definition of resilience and employ methods that expressly operationalize the concept they use. Given the diversity of conceptualizations in play in this literature, as explained in section 3, we find a wide range of methods in use. These are roughly equally divided among those using quantitative versus qualitative methods, with a nontrivial share using both (Table 1). Although empirical analyses of resilience should, by definition, be dynamic in nature, an astonishing 73% of studies cover a year or less (Table 1), with 16% covering a study period of three or more years (Figure 5). Among quantitative studies, 73% use only cross-sectional data, and just 16% use panels that offer repeated observations on the same individuals or households. This almost surely reflects the fact that most studies emerge from short duration project cycles imposed by donors or are bootstrapped by researchers operating with research budgets insufficient to bear the considerable costs of fielding repeated surveys. The problem, as noted by Wineman et al. (2017, p. 294), is that "analysis of short-term welfare effects does not capture households' longer-term capacity to either recover from a shock or maintain themselves through the next shock." This is of particular concern in studies that consider only the trajectory of shock response, because "behaviors that reduce risk (e.g., a low-risk but low-return income portfolio) may be associated with lesser welfare in the long run" (Wineman et al. 2017, p. 294).

Table 2 provides additional information on 161 of the 164 quantitative studies (a few did not provide sufficient sample information), separated by the scale – communities,

households, and/or individuals – studied. Although the mean sample sizes of households and individuals appear large (2,077 and 16,800, respectively), the large standard deviation suggests considerable dispersion. The median sample sizes are just 366 households and 546 individuals. Despite more than 25 years of work on intra-household resource allocation, only 4 quantitative studies assess resilience at both a household and individual level, while 59 discuss both households and their communities. Given that resilience measurement should consider multiple scales (Constas et al. 2014), the dearth of multi-scalar assessments (individual or household along with a larger scale such as community or region) is notable.

We categorized the indicators on which these studies focus, which sometimes reflects the well-being indicator(s) that operationalizes a resilience as normative condition or as return to equilibrium conceptualization, and other times represents the indicators thought to capture key capacities under a resilience as capacity framing (Table 3). Ninety percent of all studies focus on assets or asset indicators, with flow indicators (e.g., income, consumption expenditure, yields) considered in 81 percent. Many studies also pay attention to well-being indicators that are more difficult to categorize, such as access to various services or social attributes categorized as “social capital”. When we focus in specifically on 5C studies, disaggregated by study type (quantitative or qualitative), we find that these more amorphous well-being measures are predominantly addressed in qualitative studies. Otherwise the trends are similar, with the exception that human capital and food security indicators appear significantly more often in quantitative 5C studies.

Table 4 categorizes the shocks and stressors considered both by all empirical studies and by 5C papers. Virtually all explicitly consider one or more shocks. Natural shocks are the focus

of most attention: climatological, primarily drought and climate change (45%); hydrological, mainly floods (43%); and meteorological, most notably extreme temperature and rainfall events (34%). Social or political shocks, such as violent conflict, represent only 19% of empirical studies of resilience, even though resilience appears an especially useful lens in such settings (Brück and d’Errico 2019).

Finally, we briefly note who produces these studies based on authors’ affiliations: private non-academic organizations (including international and national non-governmental organizations, and consultants); public sector or government-affiliated institutes, including multilateral (e.g., United Nations) organizations; academic institutions; and CGIAR centers. Of the studies that satisfy our inclusion criteria, academics co-author the overwhelming majority, 81%. Over half of the studies (52%) come from a single type of institution, with a large majority (78%) of those authored only by academics. Among academic-authored studies, 40% have a non-academic co-author. CGIAR affiliated authors were involved in 15% of studies, all in collaboration with authors affiliated with other institutional categories. CGIAR authors are the only ones who collaboratively publish somewhat more frequently with a group other than academics (private non-academic partners, 78% vs. 70% with academics). More than half of all the empirical studies involve at least one academic or CGIAR author.

5. A selective review of empirical resilience studies

Our review of the empirical literature suggests that the modal quantitative study of resilience employs a cross-sectional household data set from somewhere in east Africa, focused on drought response, with a relatively small sample size and no ability to assess intra-household or

gendered resilience. The majority of qualitative studies do not present clear or replicable methods to address the concept of resilience, and at least half do not discuss the impacts of shocks in relation to any identifiable metric for well-being. This suggests that while there exist many empirical studies of resilience, most are quite limited in scope, content, or external validity. Consequently, we focus our review of empirical resilience studies on the studies that meet the five key criteria described in section 2; we therefore call these 5C studies.

(a) The 5C quantitative resilience studies

Only 12 of the 164 quantitative empirical studies that satisfied our inclusion criteria met our five criteria (5C studies). Table 5 summarizes the coverage of these studies in terms of both well-being and shocks, exploring the resilience “of what,” “to what.” All of these studies explicitly look at a well-being indicator or indicators as outcomes and also explicitly address or attempt to measure shocks. We see clearly here that the actual focus of the evidence is even narrower than it initially seems, in terms of well-being indicators and shocks explored as well as geography. The preponderance of evidence focuses on resilience with respect to food security indicators, usually impacted by natural shocks and hazards. Four focus on resilience to drought and other weather extremes specifically in rural Kenya (Cissé and Barrett 2018; Ngigi et al. 2015; Upton et al. 2016; Wineman et al. 2017), underscoring the concentration of attention on a small number of places and shocks. Other countries covered by 5C studies are Bangladesh (Smith and Frankenberger 2018), Ethiopia (Vaitla et al. 2019; Knippenberg and Hoddinott 2017), Malawi (Knippenberg et al. 2019), Palestine (Brück et al. 2019), Russia (Gordeev et al. 2016), Tanzania (D’Errico et al. 2018), Uganda (D’Errico and Di Giuseppe 2018), and Zambia (Phadera et al. 2019). Only one study addresses economic shocks, by classifying households for analysis

as employed or not (Gordeev et al. 2016), and only Bruck et al. (2016) address conflict. The small number of 5C studies and the highly non-representative nature of the places and shocks covered limits the generalizability of the literature's empirical findings. Much of this sub-literature's contributions are methodological.

i. To what problems is development resilience being applied?

5C quantitative resilience studies employ longitudinal data to analyze relationships between individual- or household-level attributes, capabilities and/or interventions and resilience in the face of shocks or stressors. All define resilience in reference to individual or household well-being, most often proxied by measures of food security but sometimes also or instead by income, assets, poverty status, and/or health.

How the relationship between resilience and well-being is conceptualized and measured varies among studies, reflecting the varied conceptualizations discussed in section 3. The most frequently referenced definitions of resilience are those by Conostas et al. (2014; Brück et al. 2019; D'Errico et al. 2018; Knippenberg and Hoddinott 2017; Knippenberg et al. 2019; Smith and Frankenberger 2018) and Barrett and Conostas (2014; Cissé and Barrett 2018; Knippenberg and Hoddinott 2017; Knippenberg et al. 2019; Phadera et al. 2019; Upton et al. 2016; Wineman et al. 2017). Both definitions, as well as a similar characterization offered by Wineman et al. (2017), conceptualize resilience as the capacity to withstand stressors or shocks over time. There are two key distinctions, however. The first is whether the well-being threshold is a normatively defined poverty line or food security standard ('resilience as a normative condition') or the pre-shock level of an individual or household ('resilience as return to

equilibrium’). The second is whether resilience is estimated as a capacity and used as an explanatory variable (‘resilience as capacity’) or not.

ii. *Purposes and findings of analyses*

All 5C quantitative studies sought to advance our understanding of who is resilient and why. While many tested for associational relationships between resilience and individual measures of shocks, household characteristics, and hypothesized indicators of capacity, none of the 5C quantitative studies claimed causal identification of the characteristics and/or capacities that comprise resilience. Two studies, however, employ credible causal identification methods to evaluate the impacts of a project on participants’ resilience. Phadera et al. (2019) study the impacts of Heifer International’s Copperbelt Rural Livelihoods Enhancement Support Project on household resilience in Zambia. Knippenberg and Hoddinott (2017) study how Ethiopia’s Productive Safety Net Program impacts household resilience to drought. Several papers use data collected in relation to a specific intervention but do not attempt an evaluation explicitly (Upton et al. 2016; Cissé and Barrett 2018; Smith and Frankenberger 2018; Vaitla et al. 2019). Like these four, most 5C quantitative resilience papers explicitly state that their analysis is not causal. Thus, this literature remains largely descriptive in nature.

The largest cluster of 5C quantitative studies have presented quantitative resilience measurement methods and used these to illustrate properties of the measure and findings about the population under study. Three studies illustrate methods for estimating ‘resilience capacities indices’ (RCI) in the ‘resilience as capacity’ tradition (Brück et al. 2019; D’Errico et al. 2018; Smith and Frankenberger 2018). Smith and Frankenberger (2018) estimate three RCI and then test their association with the period-on-period change in the food security indicators –

‘realized resilience’ measures – arising from a flood event in Bangladesh using two waves of panel data, and independent of shock exposure and the baseline value of the dependent variable. Their empirical findings are broadly consistent with a positive relationship between several specific resilience capacities and lower near-term food security impacts from the flood shock. Smith and Frankenberger (2018) also construct three sub-indices of absorptive, adaptive, and transformative resilience capacities. The authors find the absorptive capacity index to be associated with mitigation of the reduction of impacts from a flood shock in some panel data specifications.

This study also illustrates a major challenge with empirical studies of resilience. Because the two waves of survey data were collected in December of 2012 and 2014, and the flood peaked in September 2014, the Smith and Frankenberger (2018) findings capture only near-term impacts of the flood, not longer-term recovery trajectories. Of greater concern, given the lapse of nearly two years between the first wave of data collection and peak flooding, the pre-shock baseline RCI may not accurately represent conditions at the onset of the event. This is a common problem, even in 5C studies. Hence the emphasis multiple observers place on the value of high frequency data to study resilience carefully (Headey and Barrett 2015; Knippenberg et al. 2019).

D’Errico et al. (2018) study whether FAO’s RIMA RCI and its component pillars are predictive of a household’s welfare and ability to withstand shocks. The authors use three waves of panel data from Tanzania and Uganda to test whether resilience capacity moderates the effects of shock exposure on food security. They employ two basic indicators of shock-response dynamics: whether a household’s food security declines following a shock and, if so,

whether it recovers in the following period. D’Errico et al. (2018) find some evidence that RCI is predictive of a moderating effect on shocks, but acknowledge that the analysis is constrained by the “linearity and the static nature of the analytical framework” as well as the limited extent of shocks experienced by households in the reference period. Brück et al. (2019) also employ the FAO-RIMA methodology, but using the RCI as an outcome variable. Specifically, they test how food security, the RCI and its component pillars and measures respond to conflict in the Gaza Strip.

Cissé and Barrett (2018) introduced the moments-based approach to estimation of resilience as a normative condition. They apply the method to five annual rounds of household panel data from northern Kenyan pastoralists and illustrate how the method can be used to study the association between, for example, a household’s herd size and its resilience. They also demonstrate the group decomposability of the resulting aggregate resilience measure, for example showing the pronounced difference in resilience between settled and migratory households. And they illustrate how agencies might adjust the thresholds used in the measure – a poverty line or its analog for other well-being measures, and especially the minimum probability of reaching that normative threshold – to adjust between errors of exclusion (i.e., not including intended beneficiaries) and errors of inclusion (i.e., providing benefits inadvertently to less needy recipients) when using the tool for household targeting based on predicted resilience. Other studies have also applied the Cissé and Barrett method to data from Ethiopia, Kenya, Malawi, South Africa, and Zambia (Upton et al. 2016, Alloush 2019, Knippenberg et al. 2019, Phadera et al. 2019, Vaitla et al. 2019).

Knippenberg et al. (2019) introduced a high frequency Measuring Indicators for Resilience Analysis (MIRA) measure in the ‘resilience as return to equilibrium’ tradition. They use monthly data from rural Malawi to identify the persistence of self-reported shocks and the correlates that identify those likely to report recovering from a shock fastest. They also use the Cissé and Barrett (2018) and a novel machine learning method on the same data set and consistently find that shocks and food insecurity are very persistent, that geographically targetable households (those living in the flood plains) are more resilient, and that gender of the household head is strongly associated with resilience. Knippenberg et al. (2019) is the only 5C quantitative empirical paper we found that explicitly compares among alternative measurement methods.¹⁷

iii. Limitations of the 5C quantitative resilience studies

High quality longitudinal data, of a span and frequency suitable for observing the long-term responses of individuals and households to shocks, is a prerequisite for the careful study of resilience. These panels would ideally include data on the variables hypothesized to be important components or drivers of resilience, well-being, and shock intensity and exposure. The absence of such data constrains even the 5C studies we profile. While all employ panel data, they are typically limited either in frequency and/or duration. They relied on between two and five rounds of data, typically with waves spaced at least one year apart. The notable exception to this is the twelve rounds of monthly panel data in Knippenberg et al. (2019). That study of rural Malawi clearly illustrates how the annual or multi-year structure of most panel

¹⁷ Alloush (2019) and Upton et al. (2020) likewise offer performance comparisons among resilience measurement methods but did not fully satisfy our inclusion criteria.

datasets likely overlooks important short-term (including seasonal) well-being dynamics. Further, efforts to test theories of resilience on well-being outcomes with only two waves of panel data (e.g., Gordeev et al. 2016; Smith and Frankenberger 2018; D’Errico et al. 2018; Brück et al. 2019; Ngigi et al. 2015) are limited to testing how these measures perform against outcomes that more closely resemble vulnerability rather than resilience, since they cannot disentangle the likelihood and magnitude of suffering an adverse shock from the recovery trajectory towards the ex ante condition, recalling the earlier distinction between Figures 2b and 2c.

The infrequency with which longitudinal data are available may be particularly problematic when waves are not propitiously timed in relation to major shocks (e.g., Smith and Frankenberger 2018; Brück et al. 2019). This can be an issue even for studies with several waves of panel data. If we are interested in resilience to large covariate shocks such as extreme weather events, violent conflict, or economic crises, whether and when these shocks occur in the data matters. This poses a particular challenge given the stochastic nature of these events; they cannot be anticipated when planning data collection, which is an argument favoring high frequency data collection in long-running sentinel sites (Headey and Barrett 2015). Even when large shocks do occur during the study period, it is not obvious that even multi-year panels cover a sufficient time span to truly observe the long-term effects of a severe shock to well-being and to separate vulnerability to the shock from resilience manifest in recovery (Upton et al. 2016; Knippenberg and Hoddinott 2017; Cissé and Barrett 2018).

The availability of high quality and comprehensive data on shocks is yet another challenge. The 5C quantitative resilience studies rely heavily on self-reported data for

measuring shocks, and exclusively so in the case of idiosyncratic shocks such as job loss, theft, illness or death of a family member. The way self-reported shocks are measured often implicitly or explicitly blends information on shock exposure and effects. For example, in one household survey respondents were asked “[h]as this household been affected by a serious shock — an event that led to a serious reduction in your asset holdings, caused your household income to fall substantially, or resulted in a significant reduction in consumption?” (Knippenberg and Hoddinott 2017). Smith and Frankenberger (2018) combine self-reported exposure with measures of downstream impacts into a single shock exposure variable. The problem is that self-reported data on shocks are likely to suffer from non-classical measurement error, as individuals or households with lower resilience may feel the effects of a shock more acutely, and therefore be more likely to report it. This will necessarily bias estimated associations between resilience and household or community characteristics, but in an unknown direction.

For covariate weather shocks, satellite-based weather data at high spatial and temporal resolutions are increasingly available and used as an alternative or supplement to self-reported shock measures. Half of the quantitative 5C studies reviewed employ some objective measure of weather shocks, either in their main analysis or as a robustness check on self-reported data (Upton et al. 2016; Knippenberg and Hoddinott 2017; Wineman et al. 2017; Cissé and Barrett 2018; D’Errico et al. 2018; Smith and Frankenberger 2018). These consist mainly of binary or continuous variables for anomalously wet or dry conditions (Upton et al. 2016; Knippenberg and Hoddinott 2017; Cissé and Barrett 2018; D’Errico et al. 2018; Smith and Frankenberger 2018). While drought and flooding are perhaps the most important weather shocks experienced in many of the study contexts, future analyses might benefit from integrating

additional weather variables and doing more to accommodate the potentially non-linear nature of relationships between weather anomalies and welfare. For example, Wineman et al. (2017) construct sophisticated measures of rainfall, temperature and wind in an analysis that illustrates the heterogeneous impacts of weather shocks on household welfare by agro-ecological zones in rural Kenya. Evidence of how sensitive empirical studies of resilience are to the use of objective versus subjectively measured weather shocks is limited. For example, D’Errico et al. (2018) find that their results are sensitive to this choice while Knippenberg and Hoddinott (2017) find that the main results of their analysis are robust to the use of self-reported versus objective shocks data. Only two 5C studies include objective data on conflict (Brück et al. 2019; d’Errico et al. 2018) and two on positive shocks from program interventions (Knippenberg and Hoddinott 2017; Phadera et al. 2019).

(b) The 5C qualitative resilience studies

Out of 155 qualitative empirical studies that satisfied our pre-registered inclusion criteria, only 30 met our five key criteria (“5C studies”). This literature is somewhat larger – in both absolute and proportional terms – and richer than the quantitative literature, yielding some key insights not yet manifest in the 5C quantitative studies.

i. To what problems is development resilience being applied?

5C qualitative studies employ a range of definitions of resilience. A plurality follow the ‘resilience as return to equilibrium’ approach, defining resilience as the ability of a system, and of individuals and households within that system, to ‘bounce back’ from shocks. Many cite Walker et al. (2006)’s definition of (ecological) resilience as the “capacity of a system to experience shocks while retaining essentially the same function, structure, feedbacks, and

therefore identity,” (Bateman et al. 2016; Goulden et al. 2013; Sallu et al. 2010). This systems-oriented approach often reflects an interest in understanding the resilience of the structures of communities as much as of the well-being of individual members themselves. Quantitative studies struggle to handle multi-scalar analysis at levels more aggregate than the household; none of the 5C quantitative studies did this very effectively.

Other studies that do not use a systems perspective nonetheless also invoke multiple scales (i.e., individuals, households, communities, systems) or definitions that do not specify scale (Ahmed et al. 2016; Garschagen et al. 2011; Woolf et al. 2016). A number cite ecological or social-ecological systems resilience definitions but then also adopt resilience definitions or terminology more closely aligned with individual well-being and positive transformation, including social resilience (Amoako 2018; Mozumder et al. 2018), general resilience (Waters and Adger 2017) and household disaster resilience (Galarza-Villamar et al. 2018). In an effort to capture the need for positive transformation, other studies distinguish between the coping and adaptive aspects of resilience (Jordan 2019; Solorzano 2016). Some studies also use the term livelihood resilience (Galarza-Villamar et al. 2018; Quandt et al. 2017, 2019).

While formal definitions vary, the limitations of systems resilience for informing policy and practice concerned with individual well-being is a central focus of this literature. It stresses that (1) individual well-being is highly heterogeneous within a system, and (2) that there is a need for systems to ‘bounce back better’ if many individuals or households are likely to recover from shocks. Consistent with the ‘resilience as a normative condition’ tradition, many studies emphasize that transformation, versus mere recovery to pre-shock states, is desirable given that virtually all study areas are characterized by high levels of poverty and/or inequality. Some

studies address this in their definitions of resilience, others by combining the study of systems resilience with well-being analysis, sustainable livelihoods approaches, political ecology, and other constructs and techniques in order to illustrate and investigate these themes.

ii. Purposes and findings of the analyses

In keeping with these concerns, one contribution of this literature is to illustrate complex relationships between system-level dynamics and trajectories of well-being at the household and individual levels (Ahmed et al. 2016; Duncan et al. 2017; Garschagen et al. 2011; Gordon and Enfors 2008; Goulden et al. 2013; Hoque et al. 2017; Mozumder et al. 2018; Waters and Adger 2017). One focus is the resilience of natural-resource dependent livelihoods to climatic shocks and environmental degradation (Duncan et al. 2017; Hirons et al. 2018; Hoque et al. 2017; Gordon and Enfors 2008; Goulden et al. 2013). The use of qualitative methods allows more easily for the study of multiple scales over longer time periods than do the methods used in the quantitative literature. While the smallest unit of analysis in most studies is the household, heterogeneities within households are also investigated, particularly along the dimensions of age and gender (Ajibade et al. 2013; Jordan 2019).

Applying a range of approaches, this literature also addresses other questions. Consistent with the ‘resilience as capacity’ perspective on resilience, many studies offer descriptive analyses of coping and adaptation strategies, particularly those employed by the poor and the vulnerable (Amoako 2018; Bateman et al. 2016; Chacowry et al. 2018; Cottyn 2018; Fauci et al. 2012; Hirons et al. 2018; Tawodzera 2012; Waters and Adger 2017). The literature also includes studies that pilot participatory techniques to produce highly contextualized characterizations of resilience based on local knowledge (Galarza-Villamar et al.

2018; Quandt et al. 2019; Woolf et al. 2016). A handful assess resilience in the context of specific policies and programs; these are descriptive in nature rather than causal impact assessments (Ahmed et al. 2016; Solorzano 2016; Woolf et al. 2016).

The quantitative resilience studies literature is too thin and focused on a narrow set of places and shocks to confidently extract generalizable empirical findings. By contrast, within the larger body of 5C qualitative studies, several key empirical findings clearly emerge.

The importance of context and of interaction across systems and scales. The use of qualitative methods to connect multiple scales of analysis can nicely complement quantitative empirical evidence that typically focuses on individual- and household- resilience and less commonly makes cross-scale connections. Several studies illustrate how the broader context can impact how individuals and households experience and respond to shocks (Cottyn 2018; Duncan et al. 2017; Garschagen et al. 2011; Gordon and Enfors 2008; Goulden et al. 2013; Hirons et al. 2018; Hoque et al. 2017; Sallu et al. 2010; Solorzano 2016). For example, Cottyn (2018) describes how the ability of Rwandan households to rebuild their livelihoods following repeated displacements varied based on the large differences in access to land following each shock. Goulden et al. (2013) illustrate how the factors that contribute to household resilience depend upon broader dynamics of lake social-ecological systems in Uganda, arguing that “not all sources of resilience to all types of climate stress are equally available to households at all times” (p. 921). Hoque et al. (2017) describe how individuals’ livelihood strategies and resilience in coastal Bangladesh are heavily constrained by interactions between natural

hazards and collective action at multiple scales.¹⁸ These studies suggest that the individual and household characteristics that impact well-being trajectories in response to shocks may vary substantially across different contexts. This highlights another possible reason for the lack of convergence in quantitative empirical findings on the micro-level characteristics that contribute to individual and household resilience: there might not be a generalizable pattern.

Evidence on the state of resilience. These studies largely describe communities, households, and individuals that exhibit little resilience to the shocks and stressors they face. This may be partly explained by the small sample sizes and use of study areas often purposefully selected for their perceived poverty or vulnerability. However, while the study areas are not representative and our ability to generalize from these findings is limited, the lack of development resilience observed in these qualitative studies is striking. Studies describe whole communities or study populations whose well-being is on average low and even declining over time in the face of myriad shocks, as indicated by self-reported measures including food security, livelihoods, and subjective quality of life (Bateman et al. 2016; Cottyn 2018; Duncan et al. 2017; Garschagen et al. 2011; Gordon and Enfors 2008; Hoque et al. 2017; Moshy et al. 2015; Tawodzera 2012). There is little evidence of poor households adopting transformative adaptations that are shown, or may be reasonably expected, to substantially improve well-being and resilience in the longer-term. Descriptive studies of household-level strategies for responding to shocks emphasize the prevalence of short-term ‘negative’ coping

¹⁸ For example, Hoque et al. (2017) describe how brackish water shrimp cultivation, an activity which reduces soil fertility and therefore negatively impacts other livelihoods, was banned in Kamarkhola, Bangladesh in 2008 in response to farmer protests supported by local officials and NGOs. Shortly after the ban, the community was severely affected by cyclone Aila and the external response, including relief and materials for infrastructure development, supported the community during the period of recovery and transition back to agricultural activities.

strategies, such as reducing food intake, selling assets, or overexploiting natural resources, that are likely to harm well-being in the long-term (Bateman et al. 2016; Nuorteva et al. 2010; Duncan et al. 2017; Garschagen et al. 2011; Moshy et al. 2015; Tawodzera 2012). In some cases household level coping and adaptation strategies are maladaptive at the community or group scale, or over longer time horizons (Chacowry et al. 2018; Gordon and Enfors 2008; Hirons et al. 2018; Moshy et al. 2015; Mozumder et al. 2018). Most studies indicate that households prefer not to relocate from physically vulnerable geographies, due to the value they attach to place and community or the costs, risks, and livelihood disruption associated with relocation (Amoako 2018; Nuorteva et al. 2010; Chacowry et al. 2018; Ha'apio et al. 2018; Tawodzera 2012; Waters and Adger 2017).¹⁹

The literature also highlights the agency and resourcefulness of poor households and communities, including the rural poor and urban slum-dwellers (Amoako 2018; Tawodzera 2012). Note that this is not simply individual agency but equally the governance structures that empower or disempower groups of people to influence the policies, markets and institutions that regulate their lives. Similarly, the literature on gender and resilience emphasizes that simply labeling women as vulnerable overlooks their strength and resourcefulness in adverse circumstances (Ajibade et al. 2013; Corbin and Hall 2018).

Evidence of policy interventions on resilience. Although a few studies of specific interventions are more positive (Ahmed et al. 2016; Woolf et al. 2016), most highlight substantial barriers to transformative shifts in resilience. For example, Solorzano (2016) describe the resilience implications of Oportunidades, a cash transfer program the government

¹⁹ Exceptions are Ajibade et al. (2013) and Ha'apio et al. (2018).

of Mexico designed to incentivize education and therefore address intergenerational poverty. While Oportunidades transfers appear to reduce negative coping strategies (e.g., reducing food consumption, selling assets, and taking children out of school), they find that the transfers are insufficient to promote investment in adaptation, such as acquiring more climate-proof productive assets (Solorzano 2016). In a study of peri-urban households in Vietnam, Garschagen et al. (2011) illustrate how the small differences in the design of compensation and resettlement programs can have large implications for household resilience. Moshy et al. (2015) and Mozumder et al. (2018) describe how conservation programs can have mixed or negative socioeconomic impacts, particularly when implementation is not sensitive to the needs of poor, resource-dependent communities.²⁰

A feature of some programs studied is investment in education, with the goal of fostering intergenerational resilience (Solorzano 2016; Moshy et al. 2015). There is evidence that supporting education is an important feature of resilience, particularly because it enhances entrepreneurship and enables access to less resource-dependent livelihoods (Goulden et al. 2013). However, Solorzano (2016) argues that, particularly amongst the poorer households, the increased education supported by Oportunidades does not translate to improved employment prospects due to a lack of labor market and because formal education reduces knowledge of traditional livelihoods. This again highlights the importance of systems-level context for understanding individual drivers of resilience.

Inter-household heterogeneity in resilience. While many qualitative studies of resilience include a systems focus, by construction our selected studies also consider well-being over time

²⁰ It is unclear how outcomes would compare with a counterfactual of continued environmental degradation.

at the household or individual level. Like the quantitative literature, many of these studies are concerned with describing and explaining heterogeneity in resilience of human well-being within their study area. Consistent with the quantitative literature, resilience often appears to be lowest amongst the poorest (Nuorteva et al. 2010; Chacowry et al. 2018; Garschagen et al. 2011; Goulden et al. 2013; Hoque et al. 2017; Moshy et al. 2015; Solorzano 2016). The ‘success’ stories are typically the elite, whose resilience may depend on preferential access to power and resources or actions that may be maladaptive at the community scale (Moshy et al. 2015; Sallu et al. 2010).

Relationships between the resilience of social and ecological systems. This literature emphasizes the interconnectedness of social-ecological systems and the importance of ecosystem services to the resilience of poor households, particularly in rural settings (Cottyn 2018; Gordon and Enfors 2008; Goulden et al. 2013; Hoque et al. 2017; Moshy et al. 2015). Gordon and Enfors (2008) find that among rural Tanzanian farmers, “land degradation deepens the poverty trap, decreasing the likelihood of a shift to a higher welfare equilibrium.” Yet the authors highlight that restoring the land would not necessarily result in a state of development resilience, which may require a shift in the system, for example toward less resource-dependent and therefore climate-vulnerable livelihoods (Gordon and Enfors 2008). The highest quality qualitative studies also illustrate the potential tensions between ecological resilience and the resilience of household and individual well-being, particularly over longer time horizons. For example, conservation programs may be successful in achieving ecological resilience while negatively impacting development resilience, particularly for the poor (Moshy et al. 2015; Mozumder et al. 2018). Hirons et al. (2018) describe how strategies that enable

coping in drought-affected Ghanaian cocoa farming communities, for example the farming of wetlands, may also decrease resilience in the long-term.

Intra-household heterogeneity in resilience. Most studies use the household as the unit of analysis, but some provide evidence that the resilience of individual well-being is heterogeneous within households. In particular, studies highlight how gender and age interact with cultural norms and household-level characteristics, such as socioeconomic status and geographic vulnerability, in ways that matter for individual resilience (Ajibade et al. 2013; Cottyn 2018; Goulden et al. 2013; Jordan 2019). For example, the distribution of food within households is not necessarily equitable (Bateman et al. 2016; Jordan 2019). In times of food insecurity elderly widows in rural Bangladesh may be ‘starved,’ as they eat only if food is left after the men, other women, and children have eaten (Jordan 2015, 2019). Ajibade et al. (2013) describe how gender intersects with socioeconomic and geographic conditions, resulting in low resilience amongst poor women living in an informal settlement in Lagos, Nigeria. There are also examples of women’s strength and resourcefulness, such as Corbin and Hall (2018) who describe how women cope and adapt to post-conflict resettlement in northern Uganda. Advanced age is also associated with decreased resilience, as older individuals may have a stronger attachment to place and are often unable to rely on wage labor and migration to cope or recover from a shock as younger individuals might do (Chacowry et al. 2018; Cottyn 2018; Ha’apio et al. 2018).

Livelihoods: Concepts and methods related to livelihoods feature throughout the qualitative empirical literature on resilience, typically in one of two ways. The first is the study of the resilience of livelihoods (Daskon 2010; Galarza-Villamar et al. 2018; Quandt et al. 2017,

2019; Sallu et al. 2010). In these studies, various characteristics of livelihoods (i.e., diversity, stability, stocks of 'livelihood capitals') are treated as the outcome variables of interest. The second investigate how various features of livelihoods contribute to resilience in human well-being. These indicate that well-adapted livelihoods can contribute to development resilience, but emphasize that these associations are complex and contextual (Ahmed et al. 2016; Bateman et al. 2016; Nuorteva et al. 2010; Cottyn 2018; Duncan et al. 2017; Goulden et al. 2013; Sallu et al. 2010; Tawodzera 2012). For example, Goulden et al. (2013) find that diversification of livelihoods improves resilience to climatic shocks only if the additional livelihoods are not similarly impacted by the event. Further, to characterize "diversifying to survive" (Tawodzera 2012) as a sign of resilience is problematic (Nuorteva et al. 2010; Cottyn 2018; Tawodzera 2012). Diversification strategies employed as a last resort may include high-risk or low-reward activities such as unskilled labor, migration, begging, or illegal trade or occupations (Cottyn 2018; Garschagen et al. 2011; Tawodzera 2012). Diversification or shifts toward livelihoods that are less likely to covary with climatic shocks are viewed more favorably, but may be inaccessible to the poor and uneducated (Ajibade et al. 2013; Nuorteva et al. 2010; Duncan et al. 2017; Gordon and Enfors 2008; Goulden et al. 2013; Hoque et al. 2017; Solorzano 2016). This suggests that livelihood diversity is important, but that the uncritical use of livelihood diversity as a proxy for well-being or resilience is problematic.

Social Capital: The role of social capital in fostering resilience is similarly nuanced and far more fully developed in the qualitative literature than in the quantitative studies. The gifts and informal loans that occur across social networks are an important household coping mechanism when shocks occur (Amoako 2018; Goulden et al. 2013; Galarza-Villamar et al. 2018; Jordan

2015; Moshy et al. 2015; Tawodzera 2012). Support networks can help individuals to recover psychologically from traumatic shocks (Fauci et al. 2012). Social capital also facilitates the coordination of collective risk-reduction activities, particularly in informal urban settlements that lack government services (Amoako 2018; Waters and Adger 2017). However, the modest scope of these transfers and collective efforts are unlikely to enable adaptation strategies that will foster normatively acceptable levels of well-being and resilience (Jordan 2015; Tawodzera 2012). They also come at a cost to the giving and lending households (Goulden et al. 2013). Further, social capital may be least available to the poorest members of a community. Jordan (2015, p. 22) argue that “social capital is important, but less potent unless it is linked to other forms of capital.” The existence of strong social networks may also be harmful to those who are excluded, particularly when these networks influence the flow of external resources (Mozumder et al. 2018; Schuermann and Lauer 2016). Informal safety nets also tend to break down in the case of covariate shocks that negatively impact the entire network, suggesting the importance of spatial diversity (Cottyn 2018; Goulden et al. 2013; Tawodzera 2012).

iii. Limitations of the 5C qualitative resilience studies

The ability to combine multiple data sources, including narrative qualitative data, is useful for elucidating information about shocks, responses, and well-being over longer time periods and across more aggregate scales than one finds in the quantitative literature. At the household- and individual-level, the highest quality mixed methods and qualitative literature relies heavily on data collected for purpose via multiple sources: household surveys, interviews, focus groups, life histories, story-telling, and participant observation. The use of primary data collection allows researchers to customize the data collected to the study of resilience and their specific

research questions. However, most studies rely on a single wave of data collection, with a few exceptions (Bateman et al. 2016; Hirons et al. 2018). Data on trends and changes over time at the individual- and household-level, including well-being dynamics, are therefore based on various forms of recall with no checks on measurement error, attrition or survivorship bias, or formal construction of a counterfactual. Further, the use of specially-collected-for-purpose data also means that sample sizes are typically quite small and difficult to reproduce.

The best qualitative studies triangulate their primary data with secondary data and document analysis employed at more aggregate scales to describe the political, economic and ecological context as well as the nature of system-level covariate shocks (Jordan 2019; Garschagen et al. 2011; Goulden et al. 2013; Tawodzera 2012). These largely rely on household self-reports, exceptions being Gordon and Enfors (2008), Hirons et al. (2018) and Sallu et al. (2010).

6. A Limited Update

Our initial search was based on papers published between January 2008 and October 2018, with additional studies through 2019 included based on expert consultation. As seen in Figure 3, the literature on development resilience continues to expand at a rapid pace. This, combined with the usual peer-reviewed journal publication and indexing delays, meant that any attempt to fully update this systematic review was doomed to miss published work that appeared after we completed our screening. That said, we wanted to ensure that the broad conclusions that we draw from the original, comprehensive search are not made obsolete by more recent work. With this in mind, we did the following. We selected the five refereed

journals that accounted for the largest number of papers selected for inclusion in our original review: *Climate and Development*; *Ecology and Society*; *International Journal of Disaster Risk Reduction*; *Natural Disasters*; and *World Development*. We followed a modified version of the study screening and selection process used in our initial review. On November 16, 2020, we searched Scopus for all papers in those five journals that included the word “resilience” either in the title or abstract to capture additional relevant literature published and indexed between January 1, 2018, and November 16, 2020. This generated a list of 546 papers. Each abstract was screened by one reviewer, using the same inclusion/exclusion criteria as applied in initial screening. This generated a list of 84 papers. We undertook a full text review of each of these papers, again checking them against the criteria as well as assessing whether they had an explicit focus on resilience and whether they explicitly linked resilience to a measure of human well-being at household or individual level. This resulted in a final list of only 10 papers out of the 546 that we initially considered.

With respect to region of focus, these studies expand the variety of countries covered, with studies focusing on five south and east Asian countries (one each on Bangladesh, India, Indonesia, Pakistan, and three on the Philippines) and three from the sub-Saharan African countries of Kenya, Niger, and Tanzania. There were no studies from Latin America. Rural localities were the exclusive subject of six papers with another two covering both rural and urban areas. There were seven quantitative studies: six used a single round of cross-sectional data and the seventh combined a cross-sectional survey with recall data. Of the three that met all five of our 5C criteria, two were qualitative studies and one was mixed methods (qualitative and quantitative), but none were quantitative only.

The three qualitative papers provided additional results relating to the concept of resilience as capacity. Pacoma and Delda (2019) emphasize the role played by social capital – what they call local and “translocal” ties – in building household resilience capacity in the Philippines. Kwan (2020) also emphasizes social capital, specifically kinship relations, as contributing to resilience capacity. In her sample of elderly widows in the Philippines, the ability to generate income is identified as an important component of resilience, but this is constrained both by gender norms and poor tenure security. Sina et al (2019) used a mixed-methods approach in their study of livelihood resilience among Indonesian households resettled after the 2004 Indian Ocean tsunami. A novel methodological feature of their study is the use of survey instruments that allowed households to self-identify which characteristics contributed to their resilience capacity. Two interesting findings that emerge from this work include the importance of home ownership (an observation consistent with Kwan’s finding), and physical and mental health. Overall, this limited update reinforces the core findings of the more comprehensive analysis reported in the previous sections.

7. Summary and an Agenda for Development Resilience Research

Over the past decade or so, a large literature has emerged around the concept of resilience as applied in international development. Using a formal scoping review method to summarize this literature, we find that the strongest contributions demonstrate that shocks can have large, heterogeneous, and lasting impacts on well-being, and that the rate and degree of recovery varies across sub-populations in identifiable ways. The insights from these studies, especially the more established qualitative empirical literature, suggest that the concept of resilience can

add value to the study and pursuit of human well-being in the long-term, in the face of myriad stressors and shocks.

That said, the vast majority of studies invoke the term ‘resilience’ without anchoring it in clear conceptualization or measurement of the relationship between stressors, shocks, and the multi-scalar dynamics of human well-being. Even studies that meet carefully selected criteria invoke disparate definitions and methods. Resilience studies have been heavily concentrated in just a few locations – especially east Africa and south Asia – and on a few natural shocks – mainly droughts and floods – and typically study time horizons of no more than two years. It is unclear how generalizable specific findings are to other regions and sources of risk nor whether longer run conclusions can be safely drawn. The imbalance in the literature’s geographic coverage, along with the limited range of shocks and stressors on which the empirical research to date has concentrated, suggests an opportunistic focus on places where data and funding are relatively abundant rather than where resilience is most relevant. As a result, what at first appears as a large empirical literature turns out to be more like a thicket around a small core of papers that draw on several related but distinct theoretical foundations and associated methods. Further, there is limited application of resilience measures in the context of rigorous impact evaluations. We lack solid, replicated evidence as to whether or how agencies can build resilience among target populations. This is especially concerning given the emphasis donor and operational agencies currently place on resilience in development and humanitarian programming. Donors and practitioners have gotten far out ahead of rigorous attempts to define, measure, and monitor and evaluate interventions’ impacts on individual, household, and community resilience.

Redressing the many weaknesses in the literature on development resilience will require overcoming several key challenges. There are many directions one could go. We suggest trying to anchor the next wave of development resilience research around answering the question, “How can we build reliable, replicated evidence to inform whether and how agencies can build resilience among populations vulnerable to shocks and stressors?” The 5C studies we reviewed cause us to suspect that much of that evidence will be deeply contextualized, such that scholars might fruitfully identify specific conditions under which different subpopulations or systems appear resilient to specific types of shocks, rather than for fully generalizable findings.

Toward this end, the first is to reconcile the various principles articulated by the RMTWG (Constas et al. 2014), both in conceptualizations of resilience and in the measures that follow from the different theoretical foundations. We hypothesize that development resilience will follow a path similar to that of the food security literature. The concept holds powerful appeal to donors, practitioners, and scholars alike. But as a latent variable, its conceptualization and measurement remain contested.

To be clear, we are not advocating for development of a unified theory of development resilience. We suspect that is neither feasible nor desirable, as it seems unlikely that any one method will satisfy all users’ needs. But it would help, for example, to develop more clearly the relationships among the three distinct conceptualizations found in the current literature: of development resilience as a capacity, as a normative condition, and as a return to equilibrium, and potentially to integrate a fourth, found more in the SES literature, resilience as transformation. The development resilience practitioner community needs researchers to

clearly identify the strengths and weaknesses of each approach and how to synthesize them so as to pick the right concept and measure for a given task and to triangulate across measures where feasible and appropriate.²¹ We fear the risks of malpractice are high right now, as allegiance to concepts and methods seems more a function of funding sources than of fitness for purpose. The focus should not be on theory for theory's sake, but rather to use theory to provide a firmer foundation for agencies to assess rigorously if and how they can build resilience. The history of thought on poverty and its measurement may prove instructive, as the dialogue among competing conceptualizations and associated measures – each rooted in an explicit aspiration to figure out what works – has fostered steady advances in both the production and use of poverty research (Foster, Greer & Thorbecke 1984, Alkire et al. 2015, Ravallion 2015, Barrett, Carter & Chavas 2019). This applied theory task is a high priority if resilience is to prove an enduring, useful concept for the development and humanitarian communities.

The second challenge concerns data availability. Theories only get us so far unless and until appropriate data emerge to test the theories' predictions and to operationalize their measures. The dearth of quantitative studies satisfying a modest number of criteria one would want in rigorous resilience studies signals a significant shortfall in the data infrastructure for quantitative resilience analysis. Progress in this field likely requires remedying that deficiency. We see this as the highest priority in the future development resilience research agenda.

²¹ Knippenberg et al. (2019), Vaitla et al. (2019), and Upton et al. (2020) all illustrate how conceptual and methodological choices can heavily impact empirical findings. These studies underscore the value of synthesis rather than reliance on a single concept and measurement approach.

This will require a significant shift from the short-term, project-based data collection model that underpins most studies to date, especially the quantitative empirical literature. It is a challenge to measure a dynamic concept that is only observable in the presence of shocks and stressors. This likely requires higher frequency repeated measures than has been commonplace (Headey and Barrett 2015; Knippenberg et al. 2019), and in a more diverse array of locations than the literature has studied thus far. It is likewise a challenge to undertake rigorous cross-scale measurement to capture the linkages among phenomena at individual, household, community, landscape, and larger scales.

This is not a problem unique to development resilience. The development and humanitarian community could perhaps learn from the ecologists and poverty scholars whose earlier work has helped shape development resilience research. The longstanding ecological resilience literature has advanced empirically in large part due to sustained investment, by the United States' National Science Foundation and others, in the data collection throughout the Long Term Ecological Research (LTER) network (<https://lternet.edu/>). Launched in 1980, LTER encompasses 28 sites across diverse rural and urban ecosystems worldwide, supported by a global collaboration of more than 1800 scientists and students studying ecological processes over extended temporal and spatial scales. The World Bank's Living Standards Measurement Study (LSMS) program – also launched in 1980 – has similarly built a data collection platform coordinated across countries (Grosh and Glewwe 2000). LSMS has accelerated and improve the quality of longitudinal poverty research –and other phenomena – over time, substantially enhancing the value of the research to policymakers and practitioners. A more permanent and collaborative data architecture would likely quickly pay for itself in massive savings on

expensive, disjointed, opportunistic, and too-often-low-quality studies based on one-off data collection exercises. Such platforms would also naturally induce development and use of improved, objective measures of shocks and stressors that can help focus the theorizing and reduce the measurement error problems pervasive in this literature.

A third challenge emerges from the observation that the qualitative empirical literature on development resilience seems far more developed and coherent than the quantitative literature. Our analysis of the literature strongly suggests the importance of deeply contextual factors related to power, agency, social structure and norms, and institutional functioning (or dysfunction) that are most effectively revealed in qualitative studies thus far. Context-based qualitative studies that explain how resilience emerges and evolves can effectively complement quantitative resilience measurement studies that monitor individuals, households, and communities pre- and post-shock. This finding echoes recent reviews of the social-ecological systems literature on resilience, which emphasize the importance of social, economic, and environmental feedbacks across multiple scales for understanding the dynamics of poverty and wellbeing (Folke 2016, Lade et al. 2017, Reyers et al. 2018).

Without losing focus on the dynamics of individual and household well-being as the outcome of concern, quantitative development resilience researchers may be well positioned to build on insights from the SES literature. Increased use of objective and subjective data on ecosystem services can support the detection of trends (e.g., autocorrelation and increased variance) indicative of changes to systems that support human well-being (Reyers et al. 2018). In the context of program evaluation, this can help researchers determine when interventions positively or negatively impact environmental support systems with implications for long-term

well-being (Lade et al. 2017). Mixed methods research holds particular promise for development resilience research, much as has been done quite fruitfully in poverty research (White 2002, Kanbur 2003, Barrett et al. 2006, Howe and McKay 2007, Davis and Baulch 2011, Shaffer 2013). Increased attention to the question “under what conditions” will support progress in identifying generalizable patterns appropriate to guide policy and programming. This will likely depend on building up an adequate, rigorous empirical evidence base drawn from more diverse locations using more frequent, repeated observations, and the tools of multiple disciplines.

A limitation of our study is that it covers papers published up to December 2019. In November 2020, we undertook a limited additional systematic literature review. While our updated review suggests that geographic coverage is beginning to widen somewhat, although not to the Latin America and Caribbean region, many of the concerns identified in our initial search remain. While the initial screening generated a large number of additional papers (546), less than five percent met our criteria for inclusion and even fewer (only three) were 5C studies. The quantitative studies were nearly all based on single cross-sections. While our update for 2020 was not comprehensive, this limited additional literature review suggests that many of the problems we identified remain unaddressed. As the development resilience research agenda matures, students and scholars might usefully learn from the major advances made in the ecology, food security, and poverty literatures on which development resilience expressly builds. Those advances emerged from efforts to synthesize and refine best use practices of theory-based measures developed with a clear focus on operationalizability, accompanied by sustained data collection efforts to generate comparable, longitudinal measures, increasingly

augmented by rich qualitative research built directly into mixed methods research designs. The same progression is possible for development resilience. But this emergent field of research is still at the early, somewhat noisy and disjointed stage of that potentially fruitful journey.

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Table 1: Overview of empirical studies

		Share	#Observations
Publication Type (proportion)	Refereed Journal Article	78%	230
	Book Chapter	11%	230
	Report	4%	230
	Thesis/Dissertation	1%	230
	Other	2%	230
Countries of Study	Countries of study, number	1.38	230
	Single country of study	90%	230
	Comparative (2-3 countries)	6%	230
	Four or more countries of study	4%	230
Regional Focus [^]	Urban focus	27%	201
	Rural focus	90%	208
Length of Study [^]	Length of data collection period (years)	1.78	223
	Study period one year or less	73%	223
	Study period of about two years	11%	223
	Study period three years or longer	16%	223
Study Type	Qualitative empirical study	67%	230
	Quantitative empirical study	71%	230
Quantitative Data Type ^{^^}	Cross-sectional data (quant)	73%	161
	Repeated cross-section (quant)	6%	161
	Panel data (quant)	16%	161
	Other data type (quant)	1%	161
	Data type unclear (quant)	4%	161

[^] A few of studies did not provide sufficient information to ascertain the urban/rural focus, reflected in a lower number of observations. Likewise for length of study, for some studies this information was either not provided or not applicable (such as in the case of papers providing models with parameters drawn from multiple data sets).

^{^^} While we identified 164 quantitative studies, three did not provide information on sample sizes.

**Table 2: Summary of 161 quantitative studies
(including sizes of other scales within groups)**

	Community- Level	Household- Level	Individual- Level
<i>No. of Studies</i>	63	134	28
Sample Size:			
Mean	604	2077	16800
Min	20	8	20
Median	300	366	546
Max	8415	58390	391868
SD	1189	6686	78153
<i>Number of Individuals Sampled</i>			
Mean	912	2710	
SD	1630	2502	
Observations	7	4	
<i>Number of Households Sampled</i>			
Mean	643		
SD	1231		
Observations	59		

Notes : Three identified quantitative studies did not provide sufficient information on sample size.

Some studies enumerate more than one scale, and thus appear under more than one column in enumerating units of observation at different scales.

Table 3: Indicators considered

	All Studies	5C Studies		
		All	Quantitative	Qualitative
'Flow' indicator (e.g., income, profits, yields)	81%	76%	67%	80%
Health or nutrition indicator	54%	60%	50%	63%
Food security indicator (e.g., dietary diversity, coping strategies)	68%	71%	83%	67%
Assets (items, stocks, or indices)	90%	100%	100%	100%
Livelihood diversity or security	51%	52%	42%	57%
Subjective wellbeing measures	18%	21%	17%	23%
Human capital indicator (e.g., education, training)	73%	83%	100%	77%
Other categories (e.g., access to services, social capital...)	83%	79%	42%	93%
Number of studies	230	42	12	30

Table 4: Shocks considered in empirical studies

	All Studies	5C Studies		
		All	Quantitative	Qualitative
No Shock Considered	3%	2%	0%	3%
Economic Shock	23%	21%	42%	13%
Social or Political Shock	19%	26%	17%	30%
Health / Life-Cycle Shock	11%	17%	33%	10%
Environmental / pollution shock	6%	5%	0%	7%
<i>Natural Hazards (by category)</i>				
General category	1%	2%	8%	0%
Geophysical Shock	5%	2%	0%	3%
Meteorological Shock	34%	40%	33%	43%
Hydrological Shock	43%	50%	50%	50%
Climatological Shock	45%	40%	58%	33%
Biological Shock	10%	12%	25%	7%
Observations	230	42	12	30

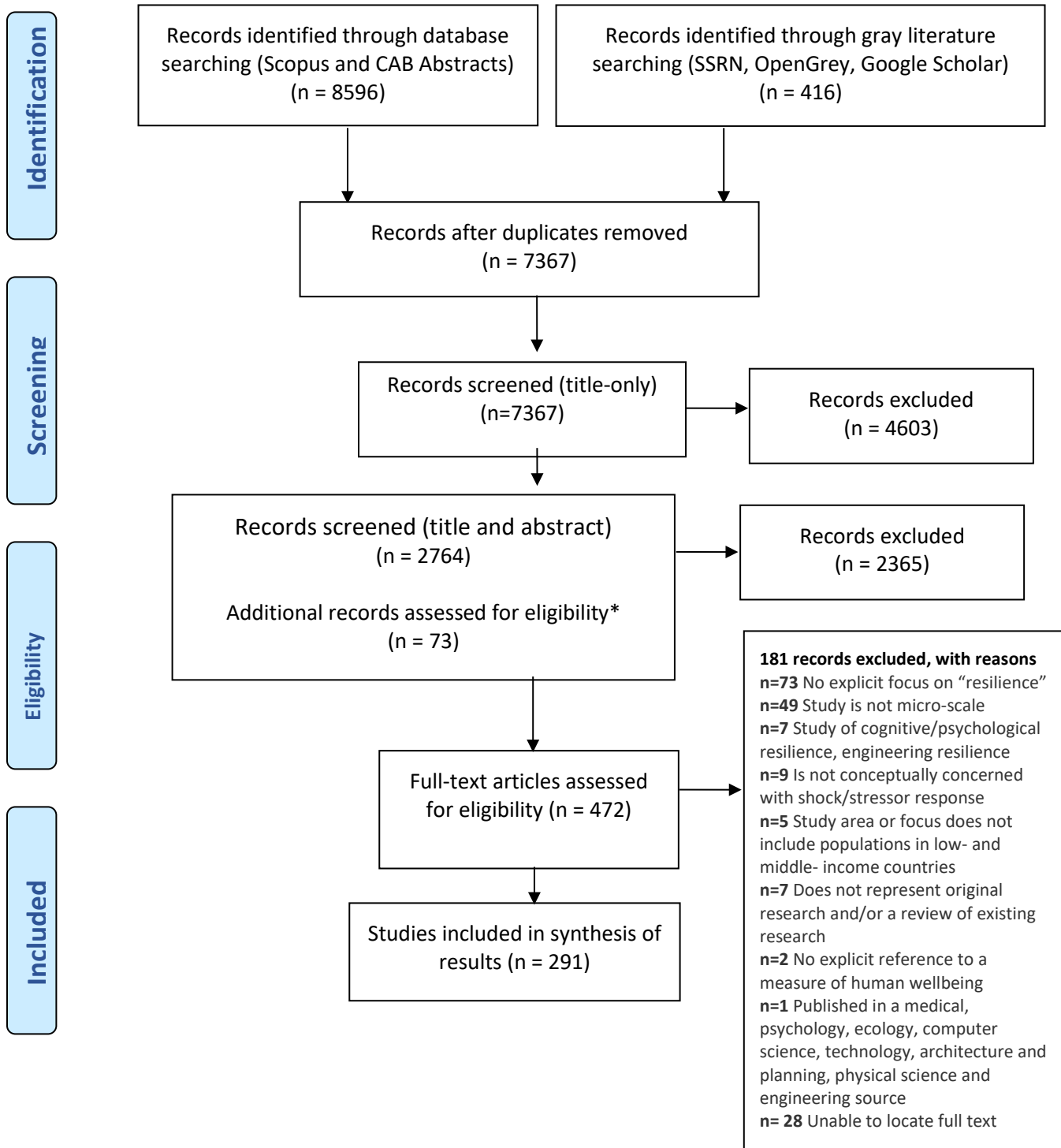
Notes: Environmental shocks include environmental degradation and/or pollution. Among “natural hazards”: “geophysical” refers to solid earth-based shocks, such as earthquakes; “meteorological” includes short-lived micro- to meso-scale extreme weather, such as extreme temperatures and rainfall; “hydrological” refers to surface-water movements such as floods and tsunamis; “climatological” refers to more long-term changes such as droughts or wildfires caused by climate change; and “biological” includes exposures to living organisms, such as epidemics or insect infestations.

Table 5: Wellbeing and shocks: Resilience of what, to what, and where (in the 5C quantitative studies)

Wellbeing Indicator (as outcome)	None explicitly measured	Economic Shock (Unemployment)	Social / Political Shock (Distance to border)	Natural: Meteorological (Temp, Wind, Rain)	Natural: Hydrological (flooding)	Natural: Climatological (drought, NDVI)	Self-reported (several shocks)	Program Impact
Flow Indicators: Income				Wineman et al. 2017 (Kenya)				
Health or Nutrition Indicators: Self-Reported Health		Gordeev et al. 2016 (Russia)						
Food Security: Dietary Diversity	Vaitla et al. 2019 (Ethiopia)		Brück et al. 2018 (Palestine))			Upton et al. 2016 (Kenya)	d'Errico et al. 2018 (Tanzania))	
Food Security: Coping Strategies	<i>Vaitla et al. 2019 (Ethiopia)</i>						Ngigi et al. 2015 (Kenya); Knippenberg et al. 2019 (Malawi)	
Food Security: Months food secure					Smith & Frankenberger 2018 (Bangladesh)		<i>Smith & Frankenberger 2018 (Bangladesh); Knippenberg & Hoddinott 2017 (Ethiopia)</i>	<i>Knippenberg & Hoddinott 2017 (Ethiopia)</i>
Food Security: Caloric intake				<i>Wineman et al. 2017 (Kenya)</i>			<i>d'Errico et al. 2018 (Tanzania)</i>	
Assets: Livestock						Cissé & Barrett 2018 (Kenya)		Phadera et al. 2019 (Zambia)
Assets: Other			<i>Brück et al. 2018 (Palestine))</i>				<i>Brück et al. 2018 (Palestine)</i>	<i>Phadera et al. 2019 (Zambia)</i>

Notes: 12 5C Quantitative Studies included; repeated occurrence (due to multiple outcomes/shocks considered) italicized.

Figure 1. PRISMA flow diagram



*individual chapters from included books, and studies recommended by expert advisors

Figure 2a: Initial food security outcomes for six households

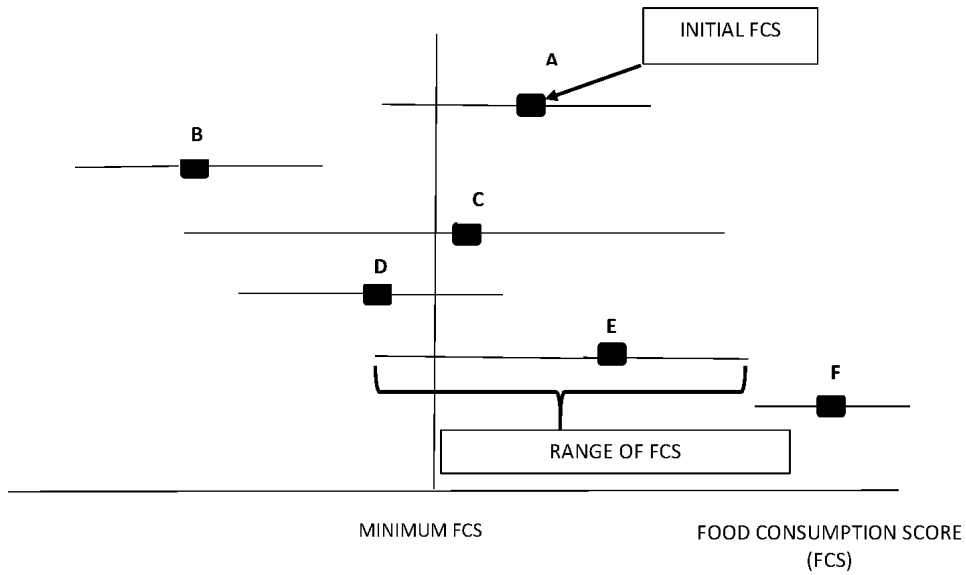


Figure 2b: Food security outcomes for six households following an adverse shock

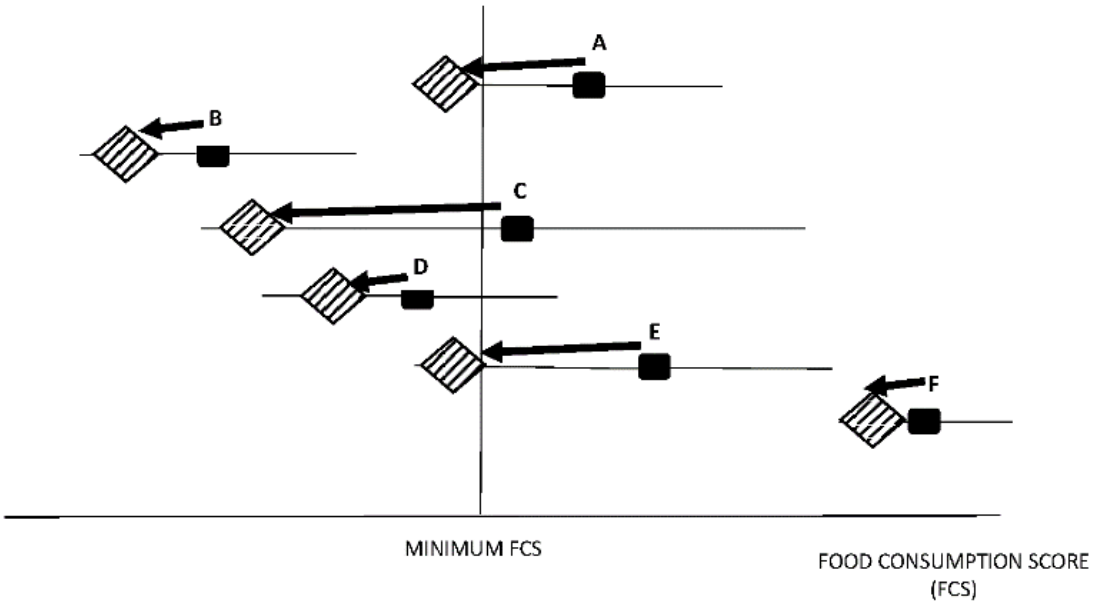
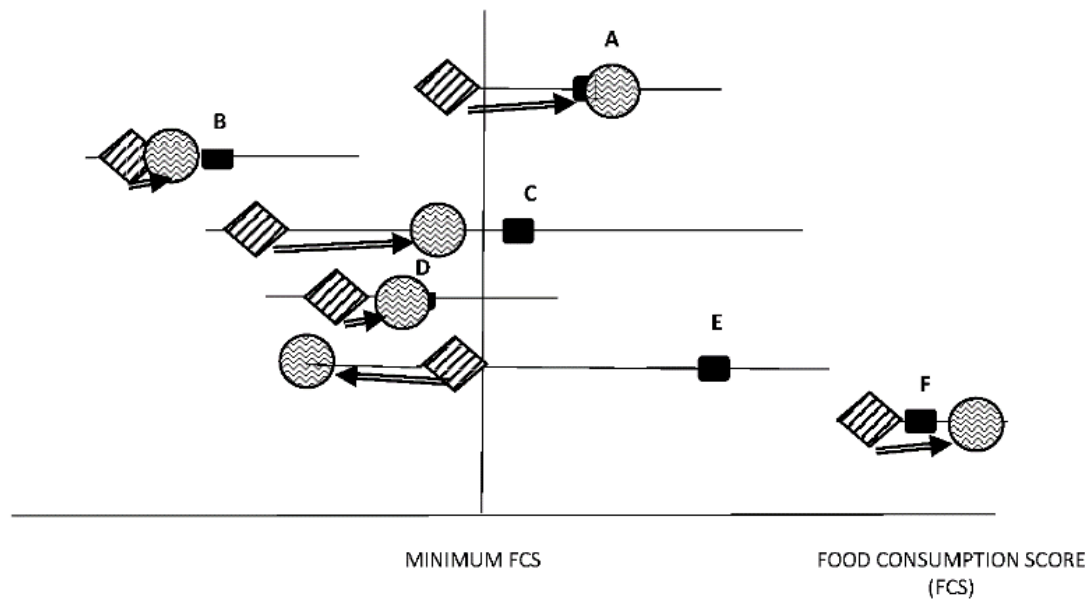
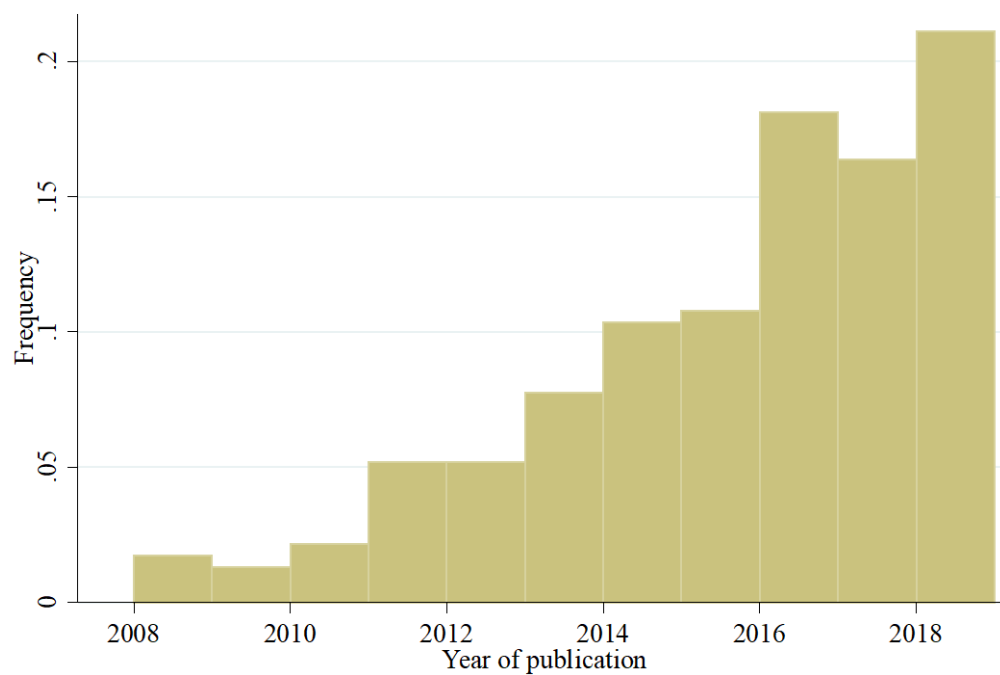


Figure 2c: Food security outcomes for six households during recovery



Source: Hoddinott (2014).

Figure 3: Year of publication of empirical studies, 2008 – 2019



Notes: Data from 230 empirical studies; 2018-2019 are under-represented, as the complete search was executed on Oct 29, 2018, with subsequent studies identified only by expert query, launched April-June 2019

Figure 4: Distribution of empirical studies by country

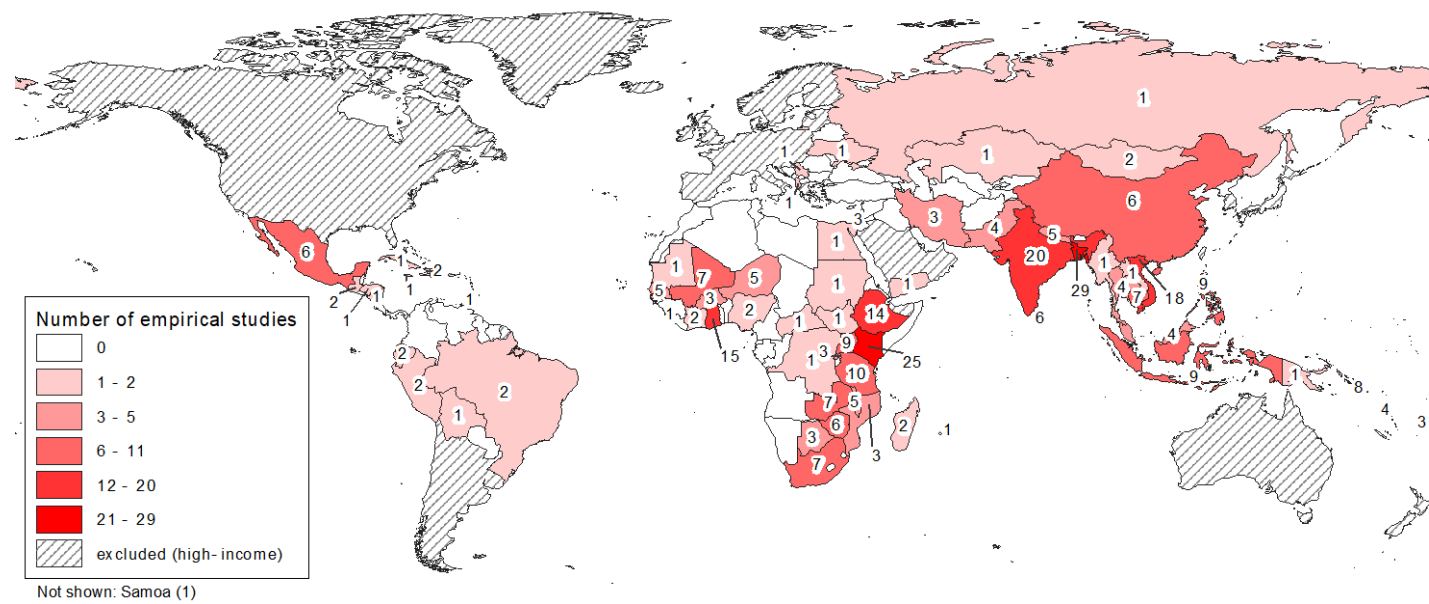
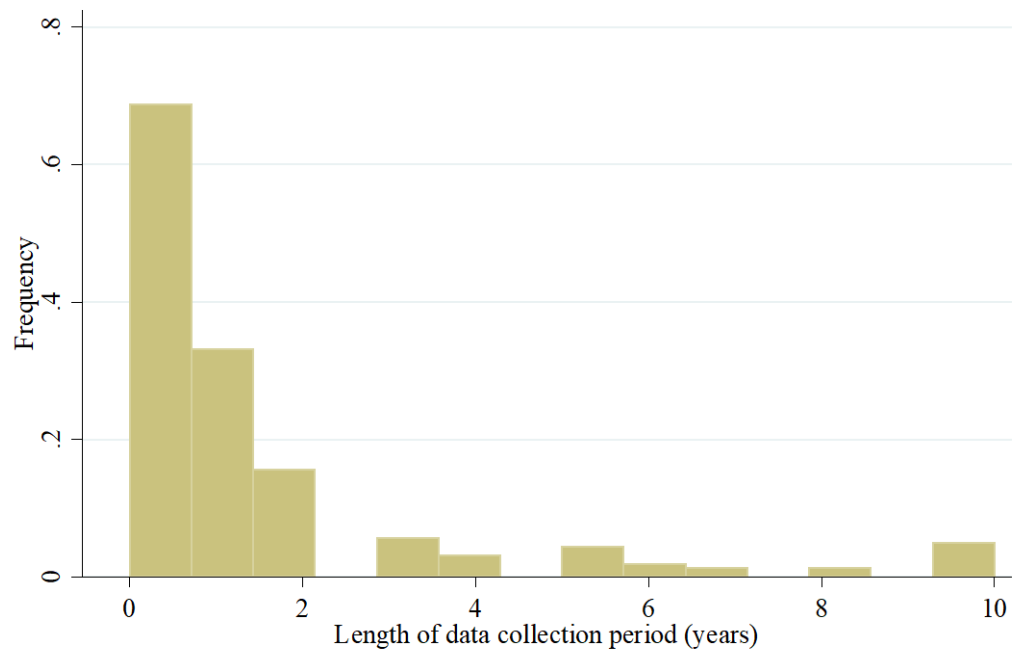


Figure 5: Distribution of empirical studies, by duration of data collection



Notes: Data from 224 studies; for the remainder dates were not applicable or not provided;
Period reflects time lapse between first and last data collection (frequency varying), rounded up;
10 includes all studies running 10 or more years (five studies run 10-18 years, one 36, and one 40)