



A higher-order model of community resilience potential: development and assessment through confirmatory composite analysis based on partial least squares

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Abstract

The topic of community resilience attracts as much academic research as it does social media. Understanding the drivers of change and community adaptation in the face of critical events is a key clue to governance actions and local measures. However, both academia and the media often provide partial definitions of community resilience. Beginning with an integration of theory-driven and data-driven knowledge, the study aims to uncover and operationalize the building blocks of community resilience potential within a measurement tool. An assessment study, conducted on 1278 participants from diverse communities statistically supported a broad, inclusive model: Community Resilience Potential is composed of four main constituents (social capital, community competence, structural-functional potential, socio-economic potential). The Confirmatory Composite Analysis formalized for Partial Least-Squares Structural Equation Modeling revealed its good psychometric properties and measurement invariance. Although the study has limitations, it provides researchers with a valuable, theoretically grounded, widely-applicable tool for the investigation of the community resilience potential.

Keywords Community resilience · Scale validation · PLS-CCA · Higher order latent variables

1 Introduction

In both academic research and the public debate driven by media and political discourses community resilience (CR) represents a highly debated topic. At the social level the notion of resilience has been applied to describe the adaptive capacities of communities (e.g., (Brown and Kulig 1996; Sonn and Fisher 1998); in the face of disturbance, stress, or

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adversity, and it has mainly been investigated in relations to natural disasters (Bravo et al. 1990; Paton et al. 2001; Tobin and Whiteford 2002) and disruptive events such as terroristic attacks and war (Kendra and Wachtendorf 2003; Abramowitz 2005; Kimhi and Shamai 2004). In the psychosocial community literature, community resilience is actually conceived of as a multi-scalar nested construct (e.g., individual, community, regional; Buikstra et al. 2010; Holling and Gunderson 2002; Wilson 2012), composed by several interdependent dimensions (e.g., physical, socio-cultural, and economics; Adger 2000). The plurality of conceptualizations that have been proposed (Bonanno et al. 2015; CARRI 2013; Norris et al. 2008; Patel et al. 2017) has been pointed at as a weakness of this construct (Carpenter et al. 2001; Klein et al. 2003; Matarrita-Cascante et al. 2017), and the lack of consensus on a single model has left unanswered questions such as what CR's basic characteristics are (Patel et al. 2017). One more limitation in CR research lies in focusing so far only on some specific type of stressors, namely acute adversities, while neglecting chronic stressors (Bonanno et al. 2015). Indeed, the most mentioned models (Bonanno et al. 2015; CARRI 2013; Norris et al. 2008) conceived of CR as the adaptive response to unfortunate events, mainly emergencies and acute traumas, which can hardly be generalized. In so doing they neglected to frame resilience as a process that underlies all community responses to adversities, including those that extend over time and have long-term impact, such as multi-cultural low-intensity conflicts, trust and social capital decline, progressive deterioration of natural resources and its effects on public health (Davis et al. 2005). Moreover, a further limitation in CR research is the partial lack of measurement instruments that integrate different community features involved in the resilience process itself. For example, inspired by Norris et al. (2008) who hypothesized that CR emerges from four primary sets of adaptive capacities—Economic Development, Social Capital, Information and Communication, and Community Competence—Sherrieb et al. (2010) developed a measure, which, however, only accounts for two out of the four originally theorized dimensions. Formalizing the multifaceted concept of CR into a comprehensive measurement instrument is the challenge that the present study intends to address. Based on the notion of CR as a set of multiple interdependent dimensions (i.e., social, cultural, and structural) that compose the potential of communities to function and adapt in the face of chronic stressors, the present work intends to propose a measure of the community resilience potential through a mixed research design. A first explorative study (Study 1), based on a data-driven approach, was implemented so as to shed light on the community dimensions that may facilitate communities to cope with chronic long-term adversities. In this study, the knowledge and perspective of community members were purposefully used to provide insight on some yet unknown constituents of community resilience. The findings of this preliminary investigation were operationalized in Study 2, whose goals were (a) the development of a measurement instrument and (b) the statistical validation of a model that organizes those dimensions at both the theoretical and psychometric level.

2 Study 1

The goal of study 1 was to develop a model of community resilience potential based on a data-driven approach, that is, exploring a variety of dimensions that help communities to function and respond adaptively to progressive changes and long-term stressors. Specifically, the main research question that guided the design of the study and the analysis was

to identify the constituents of CR across different communities and based on the everyday experience of community members.

2.1 Method

2.1.1 Participants and procedures

Semi-structured interviews were conducted with 52 residents ($females = 17$, $mean_{AGE} = 46.96$, $sd_{AGE} = 14.40$) of 11 local communities all sited in the same geographical Italian area named Salento (Table 1), which was also the research team location. The sample size was determined in relation to interviewees' 'information power' (Malterud et al. 2016), meaning that the more information the participants hold, the lower number of participants is required. Participants were selected as key informants based on their professional, institutional or social role and their particular knowledge and in-depth understanding of the community where they lived (Patton 1990). In particular, following the Community Profiling method (Francescato and Tomai 2002), a preliminary analysis of secondary data was carried out to build up a picture of problems and resources of the communities, so as to identify residents who were in a position to provide detailed information on local issues (Marshall 1996). As for their roles within the community, participants were public servants, (14), members of local associations active in various fields (13) (e.g., culture, sport, local promotion and volunteering), professionals (11) (e.g., doctors, journalists, architects, psychologists), priests and members of religious associations (4), social and political activists (5), owners of local companies (5). (Patton 1990).

The vast majority of participants were recruited through people belonging to the same communities.

2.1.2 Instruments

Semi-structured interviews covered the following topics: (a) global overview of the community (information about the basic functioning of the community in both its potentialities and its weaknesses); (b) identification of the stressor(s), that is, a specific community issue that challenges community development; (b₁) details and concrete implications, hypotheses

Table 1 Number of respondents in each community

Community	N
Arnesano	4
Brindisi	4
Gallipoli	2
Grottaglie	5
Lecce	11
Leverano	3
Massafra	4
Parabita	7
San Cesario	4
Surbo	4
Taranto	4
	52

on solution strategies and hindrances; (b_2) reasoning on the resources thought to be fundamental for problem solving; (c) review of strategies the community already used in the past.

2.1.3 Analysis

Interviews were verbatim transcribed, uploaded into the Atlas.ti software, and subjected to a qualitative content analysis through an iterative coding process (Braun and Clarke 2006). The codebook resulted from the integration of a deductive, theory-driven approach (i.e., relevant codes already present in the literature on community resilience) and an inductive, data-driven approach (i.e., relevant, new, not yet coded categories emerging from data). The final codebook was made up of 87 codes of which 58 were data driven and 29 were theory driven. The content analysis was conducted by two independent researchers who coded the transcripts separately and then compared their coding results and discussed discrepancies so as to reach a final agreement. Memos about the analytic content were taken to ensure coding remained consistent across the analysis process. Constant comparison among the two independent researchers and discussion within the research team consented to verify the accuracy of the coding and enhanced reliability (Silverman 2013).

2.2 Results

For the specific purpose of the present paper, the focus of the analysis was on the extrapolation of the community adaptive capacities and assets (and the lack of thereof, or hindrances, that is, factors negatively affecting them) that interviewees identified across communities and issues as key factors for coping with chronic adversities at the collective level (Table 2).

These adaptive capacities and assets, which were framed as the emergent dimensions of the community resilience potential, were grouped in 4 macro-dimensions: social capital, community competence, socio-economic aspects and structural and functional aspects.

Social capital. Key informants stressed the importance of sense of belonging to the community and feelings of place attachment. The opportunity to fulfill individual needs in the community was also mentioned, the more achievable the smaller the community. A sense of emotional connection emerged both from the remembrance of a better (compared to present times) past and related to current religious and lay collective events. All these three elements contribute to create a sense of community. Networking among local agencies, groups and institutions, was pointed at as a condition that promotes social contacts and citizen involvement, as well as a mean to build solutions to community issues by sharing material and immaterial resources. Respondents also referred to the centrality of formal and informal social support - the latter especially available in small communities where personal acquaintance among members makes them more willing to help one another. Lack of community networking and social support were seen as resulting in social isolation of individuals and groups. Community participation and engagement were identified as a further asset, especially as for young people, who are supposed to be key for the development of communities. Some considered participation to be locally increasing compared to the past, mostly as for the engagement in cultural activities. However, some also complained about people completely disengaging from community life. Connected to participation, respondents highlighted how community settings such as organized groups and associations have empowering effects for the community and its members, not only because of the

Table 2 Community capacities/assets and hindrances

	Capacities/Assets	Hindrances
Social capital	Sense of belonging and attachment	– (13)
	Need fulfillment	– (1)
	Shared emotional connection	– (17)
	Community networking	(5)
	Perceived social support	(9)
	Youth participation	(9)
	Empowering community settings	(16)
	Positive changes	(17)
	Leadership continuity	(1)
	Supportive leadership	(1)
Community competence	Collective efficacy	(1)
	Tourism development	(16)
	Wealth	(13)
	Entrepreneurship	(6)
Socio-economic aspects		
Structural and functional aspects		

services they might provide, but because they allow people, and young people in particular, to experience community in a collective way.

Community competence. Respondents addressed the issue of community change highlighting both positive and negative attitudes towards transformation. Positive variations in the status quo were on the one hand promoted, for instance by policies aimed at addressing relevant problems (such as crime, urban planning issues, quantity and quality of community services). On the other hand, transformations were also the result of structural factors, such as increased education among the population. In addition, involution (negative change) was mentioned as the consequence of resistance to innovation. Effective institutional leadership in local government, and its capacity to support citizens, was considered key, along with continuity over time, for addressing community issues. Key informants also referred to collective efficacy, that is, the capacity of meeting citizens' needs collectively rather than individually.

Socio-economic aspects. A variety of economic and social factors emerged in the respondents' discourses as either helping communities to respond adaptively or hindering a functional response to challenges. Among the former, favorable economic conditions, such as investments in the tourism sector, entrepreneurship, and wealth were presented as assets, even though the difficulties were voiced as well. Poverty, unemployment, and illegal work were listed as the main economic issues communities had to deal with. Social factors considered as undermining community wellbeing were petty crime and social barriers that ended up in the ghettoization of minority groups.

Structural and functional aspects. As for socio-economic aspects, also structural and functional elements were identified as enabling or disabling community wellbeing. Landscape characteristics were highly valued, while criticality emerged as for infrastructures (transport, mainly) and community facilities and services, considered insufficient and often inadequate to meet the population needs.

2.3 Discussion

The four components empirically emerged from the study, which were conceived of as the constituents of the community resilience potential, echoed the model proposed by Norris et al. (2008), yet with two salient differences: Norris et al.'s model did not consider (1) socio-economic assets playing a potential role in the face of long-term criticalities and stressors, but rather focused on economic resources necessary to respond to disasters; moreover (2), Norris' model only considered infrastructural factors as part of information and communication, leaving out general systemic and infrastructural qualities such as those captured through our exploration (e.g. landscape, facilities and services). All CR dimensions surfaced across all the different communities under study, and they all were referred to by participants in connection with different community issues, that is, different chronic stressors.

3 Study 2

Findings of Study 1 suggest that taking cues from existing CR theoretical models to understand how communities cope with and respond to long-term issues may not be enough. The aim of study 2 was to extend, integrate and assess a model of Community Resilience Potential. In order to do so, we took advantage of a modeling strategy particularly suitable

for theoretical development and validation, the Structural Equation Modeling based on Partial Least Squares (PLS-SEM).

3.1 Method

3.1.1 Participants and procedures

Our convenience sample consisted of 1278 participants from 10 Italian cities. Additional information about the cities refers to the year 2017 and is shown in table 3.

The sample was collected and balanced according to several criteria: an even geographical area including North, Centre and Southern cities; an even span for community dimension, socio-economic asset (e.g., population density, number of foreigners, per capita income, etc.), gender (*females* = 661, *males* = 618) and age ($m_{AGE} = 38.51$, $sd_{AGE} = 18.33$). The rationale for these choices was to test the model on different territorial communities regardless of their dimension, economy and possible stressors. Participants were recruited in various ways: some were contacted individually and asked to take part to the research; others were recruited through social network posts; lastly, in order to reach and recruit older participants, territorial associations gave their support. Although the Central Italy sample included a lower number of participants ($n = 285$), it was still sufficient for exploratory examination purpose. 52% of participants got a bachelor's degree or higher (grad school, doctorate, specialization), while 48% had a diploma or lower grade. Data were collected between January 2018 and September 2018.

3.1.2 Instruments

Table 4 represents the common thread between the previous and the current study.

Table 3 Descriptives of the selected cities (year 2017)

City	Area	Resident population ¹	Population density	Per capita income ²	Number of foreigners ³	Inhabitants/ foreigners ratio
Bologna	North	390,636	2,780.21	28.048 €	60,352	15.45%
Milan	North	1,385,023	7,623.84	34.046 €	268,215	19.37%
Padua	North	212,244	2,281.46	28.252 €	34,619	16.31%
Turin	North	875,698	6,735.62	25.015 €	133,099	15.2%
Florence	Centre	379,563	3,709.57	26.500 €	60,101	15.83%
Rome	Centre	2,856,133	2,218.60	28.241 €	382,577	13.39%
Matera	South	60,404	154.02	20.589 €	2,794	4.63%
Lecce	South	95,269	398.81	23.420 €	7,895	8.29%
Taranto	South	196,702	783.70	21.058 €	4,075	2.07%
Naples	South	959,188	8,179.31	22.434 €	60,260	6.28%

¹ Data source: http://dati.istat.it/Index.aspx?DataSetCode=DCIS_POPSTRRES

² Data source: ilSole24Ore <https://lab24.ilssole24ore.com/mappaRedditi/index.html>

³ Data source: http://dati.istat.it/Index.aspx?DataSetCode=DCIS_POPSTRRES

Table 4 Community resilience potential: Dimensions emerged in Study 1 and operational variables used in Study 2

Study 1		Study 2	
<i>Macro-dimensions</i>	<i>Dimensions of the Community Resilience Potential</i>	<i>Scales available in literature</i>	<i>Scales proposed</i>
Social capital	Sense of belonging and attachment	Sense of community (Peterson et al. 2008)	-
	Need fulfillment		
Community competence	Shared emotional connection	Perceived social support (Zimet et al. 1988)	-
	Community networking/Social isolation		
	Perceived social support		
	Youth participation/Disengagement	Community participation (Talo and Mammari 2015)	-
	Empowering community settings		
	Positive/negative changes	-	-
	Leadership continuity/discontinuity		
	Supportive/ineffective leadership		
	Collective efficacy	Collective efficacy (Carroll and Reese 2003)	-
	Socio-economic aspects	Tourism development	-
Wealth			
Structural and functional aspects	Entrepreneurship	-	Structural and functional potential
	Ghettoization and social barriers		
	Petty crime		
	Poverty, unemployment, illegal work		
	Landscape		
Structural and functional aspects	Infrastructures	-	Structural and functional potential
	Community facilities and services		

The previously emerged dimensions of the community resilience potential were operationalized into 9 measurable psychological and social variables, namely:

1. Sense of belonging and attachment, need fulfillment and shared emotional connection were traced back to the multidimensional concept of *sense of community* (Sarason 1974), a pillar construct in community psychology. According to McMillan and Chavis (1986), sense of community comprises 4 dimensions: *sense of belonging* to an organized collectivity; *shared emotional connection* (collective history and memory, as well as norms, symbols and shared experiences); *needs' satisfaction* (the expectation that one's own needs can be met within the community and its members); and *influence* (the feeling of being both a source and an object of influence within the community and its members). In operational terms, it can be appropriately measured by the *Brief Sense of Community Scale (BSCS)* (Peterson et al. 2008) ($\alpha = 0.886$), an 8 item scale on a 5-point Likert scale (1 = Totally disagree; 5 = Totally agree) reflecting the 4 main components. An item example is "In my community, I find what I need".
2. Community participation which, in line with the taxonomy proposed by Ekman and Amnå (2012), comprises political and civic engagement actions. Civic participation (including involvement and civic commitment) as well as political participation (formal participation, as well as more or less legal forms of activism) translate into either individual or collective actions as expression of taking part and of being part, respectively. An innovative aspect of the taxonomy is the inclusion of disengagement as a participation type, being it passive (e.g. lack of interest in politics, lack of opinion, tendency to delegate decisions) or active (e.g. people actively choosing to avoid involvement in politics).
The *Participatory Behaviour Scale (PBS)* by Talò and Mannarini (2015) ($\alpha = 0.748$) meets this measurement need: it is made up of 12 items on a 5-point Likert scale (1 = Never; 5 = Many times), in turn reflecting *formal political participation*, *civic participation*, *activism* and *disengagement*. Instructions state: "Following is a list of social, civic and/or political engagement behaviours. Considering your overall adult life, could you tell how often you acted each one of them?". An example of item is "Volunteering in a social/civic/religious organization";
3. Perceived social support was directly identifiable as such. It represents the set of instrumental and expressive resources the individual gets from the community, the social networks in which he/she lives, as well as from his/her confidants (Lin 1986). Starting from mid 1970s, several studies showed that social support acts as a resource, mitigating the negative consequences of stressful events (Andrews et al. 1978; Barrera et al. 1981; Brandt and Weinert 1981). The *Multidimensional Scale of Perceived Social Support (SPSS)* and, in particular, the subscale referred to *significant others'* worked best (Zimet et al. 1988) ($\alpha = 0.939$). It comprises 4 items on a 5-point Likert scale (1 = Totally disagree; 5 = Totally agree). An example is: "In the community where I live there are people who are available when I need some help";
4. Leadership continuity/discontinuity and, supportive/ineffective leadership were reproduced via the concept of *institutional leadership*, that is, a feeling of trust in policy makers and in institutions, specific trust in local administrators and the perception that local authorities are effective and fair when they provide services and deal with the community functioning (Leykin et al. 2013). The *Institutional Leadership (INLEAD)* (subscale of the *Cojoint Community Resiliency Assessment Measure* developed by Leykin et al. in the context of disruptive events; $\alpha = 0.961$) appropriately measures this construct.

Among the items of the community resilience measurement tool, only 6 items measuring reliability of the *institutional leadership* were used (5-point Likert scale ranging from 1 = Totally disagree to 5 = Totally agree). To mention an example “The municipal administration in my city works well”.

5. Collective efficacy was directly identifiable as such. Self-efficacy is the individual belief of being able to achieve goals even in the face of hindrances (Bandura et al. 1997). The construct of *collective efficacy* extends personal beliefs to a collective level, defining the shared collective abilities to jointly achieve goals (Goddard et al. 2004). An existing tool from measuring *Collective Efficacy (COLEFF)* comes from Carroll and Reese (2003; $\alpha = 0.931$). It is made up of 13 items on a 5-point Likert scale (where 1 = Totally disagree and 5 = Totally agree) and concerning participants’ beliefs about the ability of their own community to be effective with respect to different aspects and sectors of community life (e.g. tourism, infrastructure improvement, life quality, educational quality, etc.). An example of item is “Our community can improve the quality of educational services (e.g. schools) without region or government help”.

Moreover, some measurement instruments were built ad-hoc. Particularly:

6. Networks between groups, associations and institutions, as well as social isolation, were conglobated in the notion of *community networking*, that is, a social tissue in which individuals, institutions and groups are connected in networks that enable them to share goals and resources. *Community networking (COMNET)* ($\alpha = 0.724$) comprises 5 items on a 5-point Likert scale (1 = Never; 5 = Always), that is, statements about the propensity of individuals, groups, associations and institutions to network, to share goals and resources, to collaborate and set aside competition or conflict.
7. Positive/negative changes were associated to the notion of *transformative Competence* of the community. It refers to the ability to collectively adjust and change in the face of a challenge or the need of an evolutionary leap. *Transformative Competence (TRANSF)* ($\alpha = 0.828$), consists of 4 items on a 5-point Likert scale (1 = Totally disagree; 5 = Totally agree) about the ability of the community to adapt to change and quickly evolve;
8. Tourism development wealth, and entrepreneurship; poverty, unemployment, and illegal labour market, along with ghettoization and social barriers were operationalized as *socio-economic potential*, including information on the main socio-economic strengths and weaknesses of the community. Here, *Socio-economic potential (SEP)* ($\alpha = 0.837$) is made up of 9 items on a 7-point Likert scale, regarding the variety of economic sectors, illegal work, private enterprises, the overall economic situation, tourism, prospects of employment for young people, poverty, social marginalization and cultural barriers. Two examples of items with their respective answer points are: “In my community, illegal work is” 1 = widespread to 7 = completely absent; “All in all, the economy in my community is” 1 = in a crisis to 7 = growing;
9. Landscape, infrastructures, and community facilities and services were operationalized as *structural and functional potential*, which includes the main territorial, functional and infrastructural strengths and weaknesses of the community. *Structural and Functional Potential (SFP)* ($\alpha = 0.820$) consists of 9 items on a 5-point Likert scale (1 = Totally disagree; 5 = Totally agree). It touches themes such as accessibility and care for green spaces and historical areas; infrastructures; connections and public transportation; basic activities and services; waste management; pollution; urban degradation; insecurity; cultural and entertaining activities.

The above-mentioned constructs took the concrete form of our overall data collection tool, that is, a 70-item self-report questionnaire.

3.1.3 Analyses

Although the sample size is large ensuring, at the very least, the fulfilment of the classical 10 times rule (Barclay et al. 1995), the limits of the research design led us to opt for non-parametric statistical analyses, precisely Structural Equation Modeling based on Partial Least Squares (PLS-SEM) (Wold 1966, 1975, 1985; Hair et al. 2017a; Tenenhaus et al. 2005; Sarstedt et al. 2016; Aria et al. 2018; Signore et al. 2019). As often happens in social research, particularly in this study which combines top down and bottom up methods for theory development, the entire theoretical model is not formulated a priori, making a probabilistic research design impossible. In view of various studies, which shed light on some shortcomings of PLS (Evermann and Rönkkö 2021), a more recently improved version has been adopted: consistent PLS (Dijkstra and Henseler 2015) which is more robust and less prone to different types of errors under non-normal data conditions. The theoretical model proposed is illustrated in figure 1:

It includes different layers of abstraction, operationalized through a *Hierarchical Components Model* (HCM; Lohmöller 2013). HCMs are particularly appropriate when the goal is to shed light on broadly defined theoretical concepts, as in our case. In addition, they facilitate model parsimony (Polites et al. 2012) and protect from the *jungle fallacy*, that is, the risk to examine one single phenomenon under the guise of differently labeled variables (Hair et al. 2017b). The model comprises nine 1st order constructs made of indicators mostly established in the literature (Peterson et al. 2008; Talò and Mannarini 2015; Zimet et al. 1988; Leykin et al. 2013; Carroll and Reese 2003), two 2nd order variables and one 3rd order variable, the latter two specified with the repeated indicators approach. 1st order variables are: Socio-Economic Potential - ξ_{SEP}^I (9 item); INstitutional LEADership - ξ_{INLEAD}^I (6 item); COMMunity PARTICIPATION - ξ_{PBS}^I (16 item); COMMunity NETWORKing - ξ_{COMNET}^I (4 item); Perceived Social Support from significant others - ξ_{MPSS}^I (4 item); Sense of Community - ξ_{BSCS}^I (6 item); TRANSformative COmpetence - ξ_{TRANSF}^I (10 item); COLlective EFFiciency - ξ_{COLEFF}^I (10 item); and STructural and FUnctional POTential - ξ_{SFP}^I (4 item).

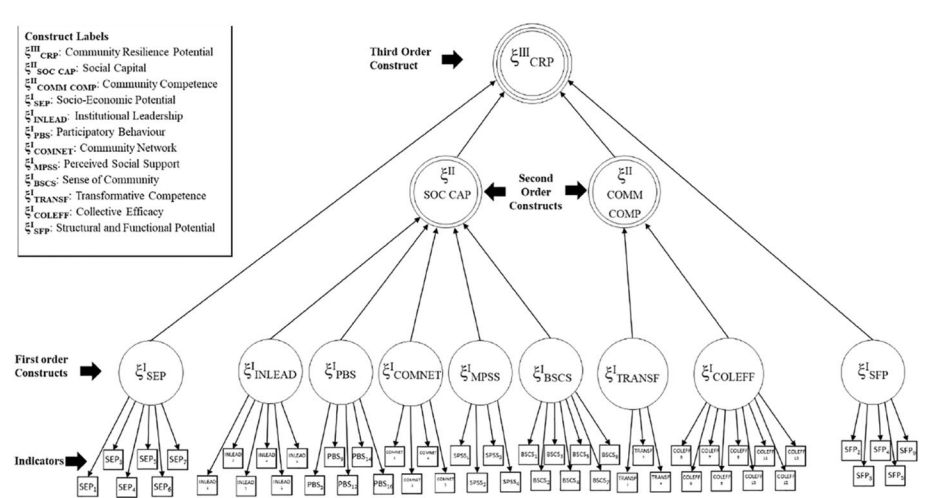


Fig. 1 Full theoretical model specified in a reflective-formative way

of Community - ξ_{BSCS}^I (8 item); TRANSFormative Competence - ξ_{TRANSF}^I (4 item); COLlective EFFicacy - ξ_{COLEFF}^I (13 item); Structural and Functional Potential - ξ_{SFP}^I (9 item). 2nd order variables are SOCIAL CAPital - ξ_{SOCCAP}^{II} (made up of INLEAD, PBS, COMNET, SPSS, BSCS) and COMMunity COMPetence - $\xi_{COMMCOMP}^{II}$ (made up of TRANSF and COLEFF). The 3rd order variable is Community Resilience Potential - ξ_{CRP}^{III} consisting, in its turn, of ξ_{SEP}^I , ξ_{SOCCAP}^{II} , $\xi_{COMMCOMP}^{II}$ and ξ_{SFP}^I . The higher order constructs ξ_{SOCCAP}^{II} and $\xi_{COMMCOMP}^{II}$, along with their respective 1st order constituents, already characterise Norris' model of community resilience (Norris et al. 2008), while the other latent variables result from the operationalization of the qualitative insights emerged from Study 1. To hypothesize that Community Resilience Potential is characterized by the presence of some or all of its constituents (Socio-Economic Potential, Social capital, Community Competence, and Structural and Functional aspects) at different strength means that even though the latter may be unrelated, they all contribute to characterize the latent construct. In other words, the epistemic relationship between the constructs is formative: for this reason, the higher order constructs (HOCs) were specified as reflective-formative (Becker et al. 2012; Cheah et al. 2019; Sarstedt et al. 2019). In particular, construct specification and estimation was carried out through the repeated indicators approach (Ciavolino and Nitti 2013; Nitti and Ciavolino 2014), the one producing the smallest bias in HOC measurement model (Sarstedt et al. 2019), while the relations between constructs are conceptualized as formative. A preliminary evaluation of the measurement model has been carried out through a step-by-step procedure, Confirmatory Composite Analysis based on PLS (PLS-CCA; Hair et al. 2020; Ciavolino et al. 2022; Hubona et al. 2021; Schubert 2021), for the evaluation of the reflective and formative part of the measurement model.

When it comes to theoretical development, measurement invariance assumes great importance (Hair et al. 2017b): in order to ensure good psychometric properties and prior to any group-specific investigation (Ciavolino et al. 2015, 2019) the hypothesized latent variables should be the same across groups which, in the present study, are represented by participants' geographical area (North, Centre, South). Henseler et al. (2015b) formalized the MICOM procedure, consisting of 3 hierarchically interrelated steps:

1. *configural invariance* (step 1), that is, the use of the same indicators, scales and data treatment across groups;
2. *compositional invariance* (step 2), assessed through a correlation score c and confirmed when the composite scores of the latent variables are the same across groups;
3. *equality of composite mean values and variances* (step 3), that is, the final step to confirm full measurement invariance and therefore that any effect will not be due to different meanings attributed to the items of the scale;

In the present study, configural invariance can be confirmed by the research design setup, while step 2 and step 3 were carried out in SmartPLS, just as the above mentioned analyses (Ringle et al. 2015).

4 Results

In PLS-CCA, the evaluation steps vary depending on whether models to be assessed are reflective or formative (Hair et al. 2020).

Assessment of the reflective measurement model. As the 1st order LVs were specified reflectively, composite reliability, convergent validity, indicator reliability and discriminant validity should be evaluated. Composite reliability can be evaluated through the Dijkstra-Henseler's ρ_A which, in the present case, is always above the suggested threshold of 0.7 (Nunnally 1994). Indicator reliability can be assessed through the outer loading estimates: values between 0.40 and 0.70 were considered for removal from the scale only when deleting the indicator led to an increase in the composite reliability above the suggested threshold value. In particular, items 2, 8 and 9 of SEP; the *formal political participation* and *disengagement* sub-dimensions of the PBS, which now consists of *civic participation* and *activism*. It is interesting to note how the retained PBS dimensions and items reflect commitment and activism in a general institutional, associational and organizational context rather than in politics. Other items removed after thorough analyses were item 2 from the COMNET scale; item 6 from the BSCS scale; item 2 and 4 from the TRASF scale; items 1, 2, 3, 4 of the COLEFF scale; lastly, items 1, 6, 7 and 8 of the SFP scale. Items retained are further investigated by means of a bootstrapping procedure: 5000 bootstrap sub-samples drawn from the original data are used to compute model's estimates. The estimates distribution allows the calculation of standard errors ($\min_{SE} = 0.021$ and $\max_{SE} = 0.064$) and bias corrected confidence intervals (none of which containing 0). Results are illustrated in Table 5: their loadings are acceptable and are all statistically significant.

Discriminant validity assesses whether latent variables represent theoretically and statistically different concepts. In accordance with the proposed model, discriminant validity has been assessed through the HTMT2 ratio, recently developed by Roemer et al. (2021): in simple terms, it represents correlations between constructs as if they were perfectly measured. However, unlike the older version (Henseler et al. 2015a), it does not assume tau-equivalence for the measurement model and thus represents a consistent measure. As it can be noted in Table 6, all the indexes are far below the most strict recommended threshold of 0.85 (Henseler and Sarstedt 2013); in addition, the HTMT inference test (Franke and Sarstedt 2019) further corroborates discriminant validity.

Assessment of the formative measurement model. For the formative higher-order constructs, Confirmatory Composite Analysis based on PLS consisted of three different steps (Hair et al. 2020, 2017b). In the first step, we assessed the higher-order construct's convergent validity by running a redundancy analysis (Chin 1998) in which the higher-order constructs ξ_{SOCCAP}^{II} , $\xi_{COMMCOMP}^{II}$ and ξ_{CRP}^{III} are related to reflective measures of the same constructs: the redundancy analyses, each of which obtained by the bootstrap routine with 5000 samples (Aguirre-Urreta and Rönkkö 2018) yielded path coefficient estimates of $0.999_{[0.943;1.065]}$, $0.930_{[0.909;0.944]}$ and $0.993_{[0.950;1.009]}$. These results support the strong convergent validity of the higher-order LVs, as they are above the 0.7 threshold (Hair et al. 2017b). The second step involved a check for potential collinearity issues among the lower order components of ξ_{CRP}^{III} . The analysis of the model shown in Fig. 1 produced VIF values of 2.059 for ξ_{SEP}^I , 2.840 for ξ_{SOCCAP}^{II} , 2.181 for $\xi_{COMMCOMP}^{II}$ and 2.059 for ξ_{SFP}^I , which are lower than the (conservative) threshold of 3 (Hair et al. 2019). Lastly, we ran bootstrapping (5000 subsamples, no sign changes) to assess the significance and relevance of the relationships between the lower-order components and their higher-order component. These relationships represent the higher-order construct's weights, but appear as path coefficients in the PLS path model. As it can be noted in Fig. 2, weights range from being small (0.188) to pronounced (0.687) and statistically significant in all cases ($p < 0.001$).

Measurement Invariance. Results of the assessment of measurement invariance across the geographical areas (North vs South) are reported in Table 7. Step 2 tests the hypothesis of equality to 1 for the correlation between composite scores for each

Table 5 Evaluation of the reflective measurement model obtained with PLS: reliability and validity statistics (5000 bootstrap samples)

Code	Construct/indicator	ρ_A	Weight	Loading
Collective Efficacy (COLEFF)		0.931		
COLEFF5			0.140 ***	0.782 ***
COLEFF6			0.153 ***	0.855 ***
COLEFF7			0.133 ***	0.747 ***
COLEFF8			0.148 ***	0.827 ***
COLEFF9			0.137 ***	0.769 ***
COLEFF10			0.141 ***	0.788 ***
COLEFF11			0.129 ***	0.721 ***
COLEFF12			0.130 ***	0.727 ***
COLEFF13			0.134 ***	0.748 ***
Institutional Leadership (INLEAD)		0.961		
INLEAD1			0.185 ***	0.913 ***
INLEAD2			0.182 ***	0.896 ***
INLEAD3			0.182 ***	0.896 ***
INLEAD4			0.180 ***	0.890 ***
INLEAD5			0.181 ***	0.894 ***
INLEAD6			0.182 ***	0.898 ***
Community Participation (PBS)		0.734		
PBS5			0.226 ***	0.476 ***
PBS9			0.305 ***	0.641 ***
PBS12			0.359 ***	0.756 ***
PBS14			0.321 ***	0.676 ***
PBS16			0.192 ***	0.405 ***
Perceived Social Support (MPSS)		0.939		
SPSS1			0.275 ***	0.859 ***
SPSS2			0.279 ***	0.943 ***
SPSS3			0.275 ***	0.950 ***
SPSS4			0.259 ***	0.925 ***
Sense of Community (BSCS)		0.888		
BSCS1			0.202 ***	0.798 ***
BSCS2			0.205 ***	0.810 ***
BSCS3			0.203 ***	0.803 ***
BSCS4			0.199 ***	0.786 ***
BSCS5			0.154 ***	0.609 ***
BSCS7			0.183 ***	0.722 ***
BSCS8			0.137 ***	0.541 ***
Community Network (COMNET)		0.712		
COMNET1			0.414 ***	0.759 ***
COMNET3			0.194 ***	0.357 ***
COMNET4			0.356 ***	0.653 ***
COMNET5			0.367 ***	0.674 ***
Socio-Economic Potential (SEP)		0.839		
SEP1			0.221 ***	0.676 ***

Table 5 (continued)

Code	Construct/indicator	ρ_A	Weight	Loading
SEP3			0.205 ***	0.625 ***
SEP4			0.278 ***	0.849 ***
SEP5			0.196 ***	0.599 ***
SEP6			0.238 ***	0.726 ***
SEP7			0.196 ***	0.599 ***
Structural and Functional Potential (SFP)		0.831		
SFP2			0.292 ***	0.774 ***
SFP3			0.281 ***	0.744 ***
SFP4			0.208 ***	0.551 ***
SFP5			0.237 ***	0.626 ***
SFP9			0.284 ***	0.750 ***
Transformative Competence (TRANSF)		0.828		
TRANSF1			0.536 ***	0.833 ***
TRANSF3			0.546 ***	0.848 ***

*** $p < 0.001$

Table 6 Discriminant validity assessment using the HTMT2 criterion

	1	2	3	4	5	6	7	8	9
1 COLEFF	1								
2 INLEAD	0.585	1							
3 PBS	0.132	–	1						
4 SPSS	0.247	0.268	0.178	1					
5 BSCS	0.434	0.380	0.255	0.473	1				
6 COMNET	0.575	0.561	0.117	0.444	0.476	1			
7 SEP	0.474	0.539	0.239	0.244	0.480	0.404	1		
8 SFP	0.572	0.618	0.258	0.226	0.600	0.563	0.652	1	
9 TRANSF	0.657	0.669	0.208	0.351	0.549	0.594	0.677	0.665	1

As recommended by Franke and Sarstedt (2019) the HTMT ratio were further assessed through a significance testing. The 95% bias-corrected and accelerated confidence intervals of the HTMT values obtained by running the bootstrapping routine with 5,000 samples confirm statistical significance

construct, c . If c is equal or higher than the 5% quantile of c_u , a distribution of correlations generated through a permutation procedure and sorted in descending order, then compositional invariance is confirmed (Henseler et al. 2015b). As the c values are all equal or above the 5% quantile

of c_u , therefore confirming compositional invariance. Furthermore, Step 3, based on a permutation test as well, allows us to confirm full geographical area invariance for all the constructs involved. Full invariance holds in pairwise comparisons where the

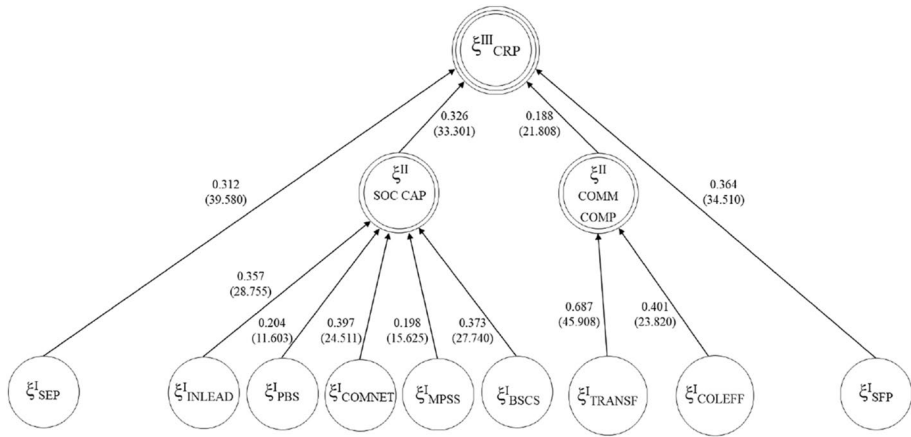


Fig. 2 Theoretical model: path coefficients and *t* statistics

Table 7 Results of the MICOM procedure (1000 permutations)

VL	Compositional (step 2)			Means and variances (step 3)			
	North vs. South			North vs. South			
	<i>c</i>	5% quantile of <i>c_u</i>	Compositional Invariance	Mean difference and CI _{95%}	Equal means	Variance difference and CI _{95%}	Equal variances
COLEFF	1.000	1.000	Yes	0.177 [− 0.125; 0.125]	Yes	− 0.039 [− 0.165; 0.175]	Yes
INLEAD	1.000	1.000	Yes	0.272 [− 0.122; 0.120]	Yes	0.143 [− 0.119; 0.123]	Yes
PBS	0.991	0.984	Yes	0.164 [− 0.131; 0.121]	Yes	− 0.036 [− 0.137; 0.145]	Yes
SPSS	1.000	1.000	Yes	0.093 [− 0.127; 0.115]	Yes	− 0.142 [− 0.163; 0.162]	Yes
BSCS	1.000	0.999	Yes	0.151 [− 0.112; 0.122]	Yes	0.060 [− 0.145; 0.141]	Yes
COMNET	0.997	0.994	Yes	0.161 [− 0.125; 0.118]	Yes	0.022 [− 0.180; 0.167]	Yes
SEP	1.000	0.999	Yes	0.474 [− 0.126; 0.128]	Yes	0.072 [− 0.118; 0.135]	Yes
SFP	0.999	0.999	Yes	0.408 [− 0.125; 0.132]	Yes	0.298 [− 0.135; 0.146]	Yes
TRANSF	0.996	0.998	Yes	0.376 [− 0.122; 0.124]	Yes	0.121 [− 0.136; 0.139]	Yes

Centre geographical area is considered as well (North vs Centre and South vs Centre, respectively).

Table 8 Structural model evaluation

Relationship	β	SE	t statistic	CI _{LOWER}	CI _{UPPER}
COMM COMP → CRP	0.188	0.009	21.808 ***	0.172	0.205
SOC CAP → CRP	0.326	0.010	33.301 ***	0.306	0.344
SEP → CRP	0.312	0.008	39.580 ***	0.299	0.329
SFP → CRP	0.364	0.011	34.510 ***	0.345	0.387
INLEAD → SOC CAP	0.357	0.012	28.755 ***	0.335	0.384
BSCS → SOC CAP	0.373	0.013	27.740 ***	0.348	0.400
SPSS → SOC CAP	0.198	0.013	15.625 ***	0.175	0.224
COMNET → SOC CAP	0.397	0.016	24.511 ***	0.367	0.430
PBS → SOC CAP	0.204	0.018	11.603 ***	0.168	0.237
COLEFF → COMM COMP	0.401	0.017	23.820 ***	0.367	0.433
TRANSF → COMM COMP	0.687	0.015	45.908 ***	0.655	0.714
R^2_{CRP}	1				
R^2_{SOCCAP}	1				
$R^2_{COMMCOMP}$	0.994				

Numbers in brackets display the 95% bias-corrected percentile confidence intervals derived from bootstrapping with 5000 subsamples. *** $p < 0.001$

Assessment of the structural model. For what concerns the evaluation of the structural model, Sarstedt et al. (2019) recommend to examine the relevance and significance of the path coefficients, which are reported in Table 8.

Given that no collinearity issues among them are present, all the subcomponents (both 1st and 2nd order) consistently and significantly contribute to form Community Resilience Potential.

5 Discussion

Aim of the present study was to develop a more general, widely applicable model of the Community Resilience Potential (CRP) by integrating theory-driven and data-driven knowledge. In line with this aim, Study 1 involved participants belonging to different Italian communities, regardless of context differences or community event typology faced. A qualitative additional insight complemented the existing theory, unveiling new components of community resilience: both were operationalized, examined and assessed in Study 2. Community Resilience appears to be defined by Socio-Economic assets, Structural and Functional Potential, Social Capital and Community Competence. Results confirmed that a unified, theory-grounded model of Community Resilience exists and is now available to the scientific community to be used, deepened and improved. Even though the study provides value to the theoretical framework of community resilience, it has some limitations. First, the convenience nature of our sample: although PLS-SEM implies neither a minimum sample size nor any assumption on the data distribution, future research could rely on more robust and a priori planned research designs. Second, the self-report nature of the data: more objective measurements (e.g. secondary data collected for local administration reports) as well as the integration of different data types (Boyd et al. 2020) may help substantiate construct-related information, thus contributing to concurrent validity. Moreover,

there is room for improvement of the model: the setup of a longitudinal data collection, as well as the inclusion of criterion variables (e.g. outcomes) to substantiate concurrent and predictive validity. This last aspect represents a future direction for the present work. All in all, the manifest and latent construct showed good psychometric properties. Results support the suitability of the hypothesized theoretical model: all the subcomponents (both 1st and 2nd order) consistently and significantly contribute to build up the Community Resilience Potential. It is interesting to note that only participatory behaviours such as civic participation and activism have emerged as particularly relevant within the theoretical framework, in spite of more formal political involvement or disengagement. Perhaps forms of community engagement in which the members are (or feel themselves to be) leading actors of community change (e.g., signing petitions, being informed and active in movements, volunteering, taking part to street demonstrations) are more characterizing aspects. Overall, the model confirms that the resilience potential in local communities can be measured by the components emerged and formalized in this study.

6 Conclusions

In light of data-driven findings provided by Study 1 and in accordance to the existing literature, we proposed an integrated, formalized theoretical model of community resilience potential. In it, the *Community Resilience Potential* is made up of four main constituents: socio-economic assets, social capital (concerning relationships that community members at various levels have with each other and with the community itself); community competence (concerning efficacy and change) and structural and functional potential. A series of consistent PLS-SEM analyses led to the final model, in which the importance of every construct emerged appears to be significantly and consistently confirmed. The model proposed integrated objective and subjective factors, and innovated Norris' et al. (2008) by including specific social and structural community factors, which had never previously been considered. The components were identified according to a bottom up approach, based on primary data gathered in a variety of territorial communities unaffected by extraordinary events, emergencies, traumas or acute crises. Results supplemented the already known components of community resilience. In addition, they enabled to think of a model of Community Resilience Potential that applies to the ordinary state of community functioning, and takes into account long-term challenges that communities have to face as consequence of local or global trends (e.g., immigration flows, climate change). Results showed how a model that encloses theory-driven and data-driven knowledge unfolded and unified relevant components of the community resilience potential in a single scale. The latter represents a valid instrument to be tested and applied to a variety of territorial communities.

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Declarations

Conflicts of interest The authors have no conflicts of interest to declare that are relevant to the content of this article.

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