An SEM Analysis of Perceived Urban Community Resilience of Citizens from Shanghai and Wuhan in Post Covid Era

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Abstract. Ever since the post Covid era to enhance the capacity of urban community resilience and level of emergency governance has been a major concern for local government and rose on top of national agenda. This essay employed the SEM analysis to research how the perception of urban community resilience by citizens in metropolitans exhibited in different facets. A questionnaire including 6 latent variables and 40 items have been designed and tested by a theory model incorporating variants like baseline community resilience, crisis learning, conflict resolution, community leadership as well as services provided by community civil organizations. A second-order construct termed post Covid community resilience is coined to evaluate how citizens may evolve after learning from coping with persistent strikes of crises and adapt with continuously changing regulations. By disseminating the questionnaire online in Shanghai and Wuhan, the researchers collected and trimmed the data, compared the SEM models by using Amos 24 and suggested a significant positive correlation between the former three variables (baseline community resilience, crisis learning, post Covid community resilience). The crisis learning is emphasized and this research contribute by initiating an innate perspective of resilience to adapt and invent new ways from local resources and personnel.

Keywords: Structural Equation model; Urban Community Resilience; Crisis learning, Shanghai, Wuhan

1. Introduction

Ever since the post Covid era, it is a urgent need of the whole country of China to elevate its state capacity to deal with compound crisis . The apparent safety may not bode well for crisis learning since there is a surging tendency for citizens to forget about the pandemic illness as well as other latent hazards when living environment and social policy all directed to a halt. This is especially true when it comes to the myth of safety in metropolis and the seemingly all-encompassing infrastructure may paralyze citizens' capacities to reconsider the hazards and loopholes of safety around. Luckily, the buzzword "resilience" as well as "community resilience "has caught the attention of the academic world in China and the world. A calling for reconsidering the concept of coping with urgency and systematic mitigation of compound crises has been a needy concern for disciplines across sociology, public administration, environmental studies.

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1.1 Background and literature review

Currently the academic study of **resilience in social sciences** , ie. how a social body may sustain, absorb and further to thrive from crises is defined and conflated the concept of *resilience* persistently. There are two strands of tradition , one concerned with evaluating physical aspects of how the social body may sustain and survives from crisis. The other strand has incorporated the aspects of institutions, safety cultures, social networks as well as the "soft power" which may exhibits mostly in the mitigation and post-crisis learning periods. Both these strands have produced indexes for different levels of social agencies like the enterprises, the local communities or other social entities. Influential indexes and frameworks like Susan Cutter' community baseline resilience index[1], Blanchard's crisis index for community[2], Norris' model of community resilience[3] were adopted and extended .

However, Pandemic illness posed new challenge for all encompassing indexes. In contrast with a vital part played in local community reviving in quick spaces, there is still a relatively low emphasize on the capacities of crisis learning for the local communities .Though there are ample studies on community resilience during the Covid in Jilin[4], Wuhan[5], Xi'an [6].Most of them use the generalized all-encompassing framework including social resilience, economic resilience, political resilience and infrastructure resilience with a much emphasized on Entropy-weighting TOPSIS method , and only a few used SEM analysis[7] [8]. Yet underestimating the surging ability of crisis learning capacity is a major loss for future study of this filed. Partly due to a survival of unexpected striking hazards of pandemic, partly due to the continuously changing orders of local governments during intra-crisis and inter-crisis periods, citizens of urban communities enduring four years off and on lockdowns find themselves particularly good at dealing with crisis even as laypersons. It is intended in this research to build a framework to formulate how crisis learning capacity has been developed from a basic level of baseline community resilience largely rely on outside aid, through three major policy fields of hazards prevention and mitigation ,finally result in a heighted awareness of post Covid community resilience.

First, the conflict and mediation of local communities, often practiced by community mediators, resident committee CPC members or *manager of the buildings* (Lou'Zhang), it dealt with lots of conflicts like negotiation of housing fees, relocation of parking lots, law suits of high altitude of falling objects for retribution of responsibilities.

Second, the demographic and basic light keeping works of residents' committees, including helping the street level government for routine checks and policy propagandas to enhancement of community elevators and elimination of local minor crimes.

Third, community based civil organizations including social worker organizations and volunteer organizations or associations of laid-off female workers, which prevented poverty and aging from deteriorating of the morale. It is at the moment of lockdowns that compound hazards of nursing capacity loss, shortage of medication, broken chain of supply can be remedied using relatively confined community resources and skills accumulated in the three major policy arenas. Yet in regular times they are so fit in the background of everyday life that few have noticed the facts the crisis learning capacities are leveled up sine the personnel and skills they obtained by coping with hazards and crisis from minute level to medium level in the communities.

This research developed a framework including the **baseline resilience**, three policy arenas of resilience development **(conflict resolution; community leadership ;services of community civil organization**). **crisis learning** should also be categorized by processes in coding the potential patients , keeping social order during the everyday Covid acid test, leadership of residents communities to adapt to new skills and regulations policies, social workers cooperated with new protocols in Covid-19 to provide services, the leadership and follower ability of civil organizations to provide goods and services, and the ability of conflicts mediators in community to ease the burden of rumors and protect Covid-19 patients from being stigmatized by neighbors.

This research fill the literature gap by emphasizing on crisis learning for urban community resilience. It is not to build an all-encompassing index or model for most asset based and skill based aspects of urban community resilience, but built a crisis learning based applicable framework to evaluate post Covid-19 community order. Quite different from regular periods when outside professional aid for emergencies flashed in and out quickly ,the coping capacities of local community have limited chances to learn from experienced practitioners of crisis coping agents. They have to confront with the task of developing skills and solutions when outside aid being obsolete. Which means during and after Covid-19 their crisis coping resources are **not adding up** but constantly being imbalanced and deprived or even counter effective. Besides, the **organizational forgetfulness** may happen due to a systematic enroll and transfer of volunteers and social workers which render community memory (personnel, resources, emergency moments)scattered and lost[9]. But in Post Covid periods there is a tendency to remember rather than to forget compared with regular periods.

1.2. Hypotheses and proposed model

The research developed six hypotheses as an urban community resilience framework including the aspects mentioned above. There is a **triple hypotheses** and three derivative hypotheses. The framework starts from **baseline community resilience**. It is mainly evaluated by questions like “available of regular checks of lifeline infrastructures, vulnerability maps, inventory of resources, publicity of charity funds in crisis , as well as visibility of emergency plans.”, It is “baseline ”since they are what in common periods when citizens may have accesses to but bot fully dealt with. They held a **general awareness** of safety around regular checks and common environment just because the “baseline” is fundamental but yet to be tested.

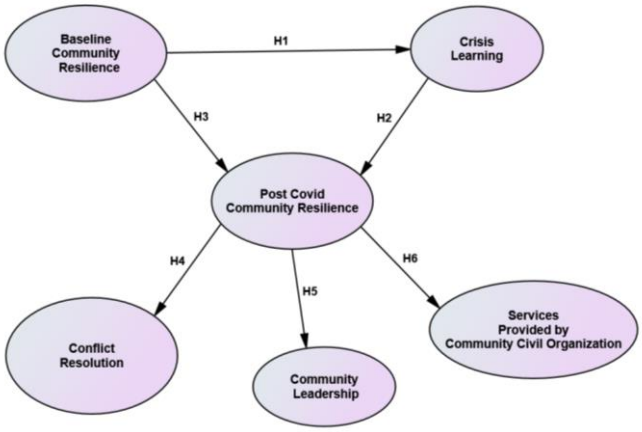

Figure 1. Proposed theory model

The dependent variable **Post Covid Community Resilience** is posited as a **second-order construct** reflected by three first-order constructs (**conflict resolution, community leadership, services provided by community civil organization**) . It is tested after the two cities come back to normal paces of working and living . By the term ***Post*** it is only to remind the citizens they have to recall the just passing nervous periods when they have to react to different life styles, but also that they would began to look in retrospection of the community in mended collective trust , safety and mutual support rather than just "lived through "it. It is to be noted that the second-order construct is not measured through data but **"reflected"** by lower level construct, so it is only a spurious cause rather than to establish one[10],it means it is not necessary to prove a causal relation between **baseline community resilience** and **post Covid community resilience** .The six hypotheses are stated as follow:

Hypothesis1: Perceived **Baseline community resilience** is positively correlated with **crisis learning.**

Hypothesis2:Crisis learning is positively correlated with perceived **post Covid community resilience.**

Hypothesis 3: Perceived **Baseline community resilience** is positively correlated with perceived **post Covid community resilience.**

It is not necessarily as commonly seen that the more attention and resources devoted to perceived baseline community resilience, the more likely **post Covid community resilience** are perceived by citizens to be heightened. Since there are revers evidence not only in Covid lockdowns for too stringent regulations and conflicting rules of different level of governments may reduce the citizens perceived reliability of community resident committee but also may lead to over anxiety of individual towards knowledge and information about future crisis that individuals may deem the local community resilience as under-prepared[11], which also may lead to a distorting process of crisis learning for individuals, but a lower level of perception of post Covid community resilience.

Hypothesis 4: Perceived **post Covid community resilience** (second-order construct)is

positively correlated with **conflict resolution** (first-order construct).

Hypothesis5: Perceived **post Covid community resilience** (second-order construct)is positively correlated with **community leadership** (first-order construct).

Hypothesis6: Perceived **post Covid community resilience** (second-order construct)is positively correlated with **services provided by community civil organization** (first-order construct).

As is shown in theory model **(Figure 1)**of the six hypothesis, The three policy arenas may overlapping with each other but all reflected by **post Covid community resilience** . The post Covid community resilience as the dependent variable is deemed as a perspective of citizens in process of learning and coping with crisis during Covid-19. The more they perceive the community as full of equity and trust , the more likely they are keen to deliberate and accept the negotiations and eager to sustain citizenship behaviors with neighborhood feelings [12] . **(H4)**The more citizens believe community resilience is protected by wise leadership equipped with local knowledge and being resourceful to barging with the street level governments (Jie'Dao) for remedying the hazards, the more citizens trust the leadership in crisis.**(H5)**The more conspicuously higher of the perceived community resilience after Covid, there is a tendency for community civil organizations to participate in helping with mitigation of crisis**(H6)**.

2. Research Design and Method

2.1. Data Collection

As a pilot survey **50** people in Shanghai answered online questionnaire which modified by scholars and community officials to enhance its readability. The study was further conducted from April to July of 2023 in Shanghai and Wuhan by disseminating online questionnaire . The modified version of the questionnaire including 40 items.(The questionnaire will be made available on request.)

Both of the metropolitan cities are chosen not only because the communities are mostly well equipped with ample resources of medication and safety measures. But also that (1)Citizens are well versed in civil rights and concerned with equity in crisis, eager to voice their opinion by monitoring community governance online.(2) For local governments' officials the elevating of Covid crisis has been deeply intertwined with aging , personnel and other societal problems besetting metropolitans, which also turn on the nerves of community leadership since theses problems may be catalyst of emerging social instability.

Data with extreme values, too long or too short are trimmed .Finally, **521** qualified Shanghai samples and **256** Wuhan samples are collected. The demographic information of Shanghai sample's respondents are listed in **Table 1.** Among the respondents there was a high ratio of citizens who served safety functions as professionals or laypeople in different walks of life. Therefore, we consider this a good sample for the research into crisis learning on their behalf as frontline workers of COVID-19 and good learners in memorizing of crisis experiences, as personnel shortage typically occurred in such communities. In the sample, 7.1% served as doctors or nurses; 4.6% served as policemen, policewomen, or other safety personnel; a high

number of individuals served as volunteers, possibly due to the fact that quite a lot of the respondents were either relatively young or middle-aged (91.8%) and partly due to the fact there was a high level of participatory citizenship among the citizens of Shanghai and 2.9% of the sample had experience with the information agent of hazards—a state-sponsored system provided by the National Emergency Department skillful in finding clues of emergent natural disasters and obliged to report to the government. Those who have served as community leaders (including temporary group leaders of volunteers and rescue teams)occupies 11.9% of the sample, while 2.3% of respondents had experience as a mediator of legal aid.

Table 1. Demographic Characteristics of the Sample(Shanghai Sample, Sample Size, N=521)

Gender	Number Of population	percentage
female	228	43.8%
male	293	56.2%
Age group		
15－25years old	73	14%
26－35 years old	291	55.8%
36－45 years old	107	20.5%
46—55 years old	27	5.2%
56－65 years old	6	1.2%
Above 65 years old	1	0.3%
Refuse to tell	16	3.1%
Educational Background		
Not Graduated from high school	3	0.6%
Graduated from high school	30	5.8%
Graduated from college	376	72.3%
Refuse to tell	112	21.%
Whether the respondent has experience as a crisis-coping agent		
As police or safety service	24	4.6%
As doctors and nurses	37	7.1%
As management team of the community (residents committee, manager of the building, grid worker)	62	11.9%
As Volunteers	426	91.8%
As Information agent for community hazards	15	2.9%
As legal aid or community mediator	12	2.3%
As members of community enterprises	82	15.7%

Author's calculation using SPSS25

2.2.Measures and data analysis

The questionnaire used in this research was developed by applying traditional metrics of of leadership and crisis leadership for variable ***community leadership***[13][14]. The metric of **Crisis**

learning was adapted by Argyris' organizational learning metric and Ladi Tsarouhas' inter-crisis and intra-crisis learning metric[15] [16].

The metrics of variables **baseline community resilience** and **post Covid community resilience** were adapted from metrics of Norris（2008）,Susan Cutter(2010) and Liu caiyun (2022) and modified to be accessible to local readers[1][3][17]. Descriptive statistics like reliability and correlations are computed by SPSS25 and other procedures like CFA and test the fit of measurement model are processed with Amos 24.

3. Results

3.1. Test the validity and reliability of measurement model

The correlations among all the key variables are reported in **Table 2**(without the second-order construct). The correlations between any two variables were significant. Most of the correlation coefficients ranging between 0.682–0.75 (p< 0.01).The VIF values were little higher above 3,indicating a tolerable degree of multi-collinearity. In the process of evaluating the reliability of the sub-scales, items with factor loadings lower than 0.5 and those with poor convergent reliability were dropped. The remaining items are provided in **Table 2** column 2.

Table 2. Correlation Matrix of the Key Variables and the Collinearity Test (N=521)

Synonyms	Key Variables	Remaining Items	A	B	C	D	E	VIF
A	**Baseline Resilience**	Q5.Community has prepared in advance for crisis and hazards. Q7.Community has a set of special plan for hazards. Q17.The maps of coping with crisis for community have applicable details.	1					2.73
B	**Crisis Learning**	Q33.Community has special areas for retain memory of crisis learning. Q30.The files of coping with crisis are carefully cataloged and stored. Q32.Respond teams in my community are good at reviving their experiences regularly. Q34.Community leaders held special meetings for learning from Covid crisis	0.732**	1				3.05
C	**Conflict Resolution**	Q13.Distribution of crisis mitigation resources are equitable and followed the rule of justice. Q19.There are able personnel in my community to resolve co community conflicts. Q29.Though the Covid lockdown make people nervous, the resolve of conflict in my community are efficient.	0.693**	0.735**	1			2.94

D	**Community Leadership**	Q35.I will rate the community leadership as Q25.The organizational ability of my community leaders are dependable. Q31.Comunity leaders are good at adapting to new skills and gadgets when it comes to changing regulations of crisis.	0.718**	0.745**	0.750**	1	3.24
E	**Services Provided by Community Civil Organization**	Q6.The community has special programs connected with civil organizations to help the vulnerable during crises. Q18.Community civil organizations in my community are bounded by contracts and protocols. Q22.When outside aid being obsolete, the community may develop new civil organizations to provide substantive services.	0.671**	0.667**	0.682**	0.708**	1	2.42

Notes: ***p*<0.01.Q:question item; VIF: variance inflation factor. Source: Author's calculation using SPSS25. The whole questionnaire may be provided upon request from interested readers.

Table 3. Convergent Validity and Composite Reliability of the Measurement Model.

Synonyms	Key Variables	Cronbach's Alpha	AVE	CR
A	**Baseline Community Resilience**	0.81	0.58	0.83
B	**Crisis Learning**	0.84	0.56	0.83
C	**Conflict Resolution**	0.75	0.51	0.753
D	**Community Leadership**	0.79	0.58	0.8
E	**Services Provided by Community Civil Organization**	0.74	0.49	0.743
Recommended Value		>0.6	Better above 0.5,no less than 0.4 [18]	>0.7

Source: Author's Calculation using SPSS 25 and Amos 24.Note.AVE: Average Variance Extracted; CR: Composite Reliability.

By a CFA test the factor loadings are shown in **Table 3**(Synonyms are the same with **Table 2**). The Cronbach's alpha for each sub-scales is above the threshold value of 0.6.The CR values for the key variables are largely good. The variable E has an undesirable AVE value lower than 0.5. Considering that other indicators are fine this flaw may be acceptable[19].Furthermore, according to authoritative textbook on SEM , **second-order reflective variables may allow the first-order reflected variables to have high correlations with each other** [20]**.**

3.2. Evaluation of the Structural Model and Hypothesis Testing

(1)A test of Shanghai sample

Since most skew values of the indicators were greater than 0.8 and nokurtosis valueof all indicator was greater than 3.00 in magnitude ,the data is quarlified standards of a multivariate normal distribution, as demanded by SEM analysis applying maximum likelihood.The model is then processed by Amos 24. The fit indices x^2/df(1.433), GFI(0.972), NFI(0.970), CFI(0.991),

TLI(0.989)and RMSEA(0.049)are all statistically sound according to threshold values [20].The path and coefficients are shown in **Table 4,** also can be seen in **Figure 2.**

Table 4. Summary of Hypothesis Test and Standardized Path Coefficients (Shanghai Sample, N = 521).

Hypothesis	Path	Standardized Path Coefficient	Supported or Not
H1	**A—B**	0.89***	Yes
H2	**B—S**	0.581***	Yes
H3	**A—S**	0.398***	Yes
H4	**S—C**	0.984***	Yes
H5	**S—D**	0.992***	Yes
H6	**S—E**	0.916***	Yes

****p*<0.001.Source: Author's calculation using Amos 24. Synonyms: A, Baseline Community Resilience, Crisis Learning, Conflict Resolution; D, Community Leadership; E, Services Provided by Community Civil Organizations, S,post Covid community resilience

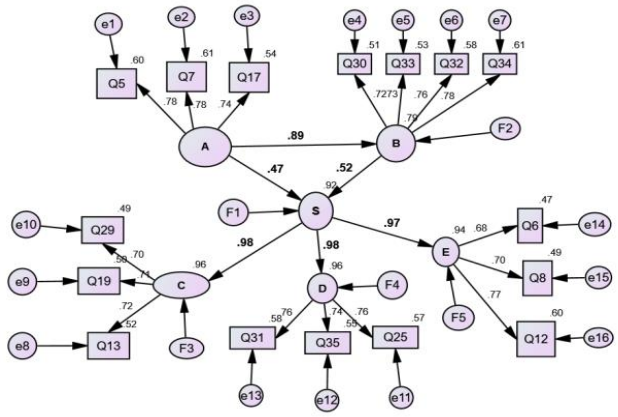

Figure 2. Proposed research model with standardized path coefficients (Shanghai sample)

(2) Draw in Wuhan sample for a comparison of the same model

In order to reduce the common method bias, a test by a trimmed sample from **Wuhan(**N=256) for the same SEM model was conducted. The question ordinance of the questionnaire were changed .(Wuhan Sample **Q18** is Shanghai Sample **Q8** While **Wuhan** Sample **Q22** is **Shanghai** Sample **Q12,**which is shown in **Figure 3.**)The Wuhan sample also has skew and kurtosis values qualified for standards of a multivariate normal distribution, as demanded by SEM analysis applying maximum likelihood. The fit indices are qualified with X^2/df(2.18),NFI(0.904) ,CFI(0.945),RFI(0.883) ,RMSEA(0.068) and TLI(0.933) .The standardized path coefficients were shown in **Table 5**. Aside from **H2** and **H3** have path coefficients significant on P=0.01 level other four paths reach significance of P=0.001.

Table 5. Summary of Hypothesis Test and Standardized Path Coefficients(Wuhan Sample,N = 256)

Hypothesis	Path	Standardized Path Coefficient	Supported or Not
H1	**A—B**	.912***	Yes

H2	**B—S**	.490**	Yes
H3	**A—S**	.507**	Yes
H4	**S—C**	.994***	Yes
H5	**S—D**	.993***	Yes
H6	**S—E**	.997***	Yes

***p<0.001, **p<0.01.Source: Author's calculation using Amos 24.Synonyms: A, Baseline Community Resilience, Crisis Learning, Conflict Resolution; D, Community Leadership; E, Services Provided by Community Civil Organizations, S, Post Covid Community Resilience

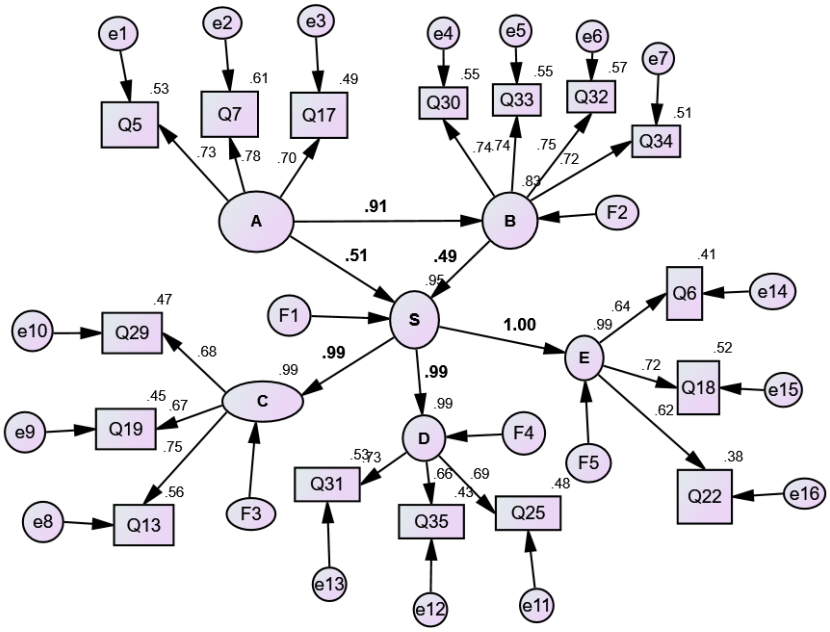

Figure 3. Proposed research model with standardized path coefficients (Wuhan sample)

4. Discussion

More inferences can be drawn to shed light on the proposed model by a comparison of samples from the two metropolitans. First, based on perceived **baseline community resilience**, Shanghai sample has the hierarchical order of Q5=Q7>Q17while Wuhan sample has Q7>Q5>Q17.This may be attributed to the fact that Wuhan was at the first spot of the pandemic with a shocking feeling of unprecedented illness. Shanghai, then is postponed in anti-Covid process so the widespread experiences of lockdown and break down of supply chain of critical resources are less bothered for Shanghai. For citizens the **Q17**(*The maps of coping with crisis for community have applicable details.*) is of low significance since in metropolitan cities that most communities have their hazards maps with lower accessibility among citizens ,aside from the fact that the pandemic may make citizens reconsider where in

the community are less or more “vulnerable” in physical and nonphysical sense.

Second, the comparison of variable **Crisis Learning** shows Shanghai Sample has the hierarchical order of **Q34>Q32>q33>q30** while Wuhan sample has the hierarchical order of **Q32>Q33=Q30>Q34.**Shanghai sample has the highest factor loading in **Q34(***Community leaders held special meetings for learning from Covid crisis)***while Wuhan is the lowest. This may be attributed to the fact that Shanghai residents committees are more sensitive to the visibility of leadership in crisis while Wuhan residents committees may be too worried about their reputation endangered by any minor error that they prefer to keep their special meeting for crisis learning in secret. It is not uncommon in Chinese safety culture called “The Good Omen Preference “(Ji’XiangWen’Hua)partly due to citizens’ tendencies to remain positive but reserved attitude during and after crisis.

Third, the comparison of variable Conflict Resolution shows Shanghai Sample has the hierarchical order of **Q13>Q19>Q29** while Wuhan sample has the hierarchical order of **Q13>Q29>Q19**.In both samples Q13(*Distribution of crisis mitigation resources are equitable and followed the rule of justice.*) bare the highest factor loading in perceiving of resilience. It is due to the fact that distribution of critical resources(COVID acid test tubes; food and other life sustaining resources)and personnel have turned to be the highest concern among other conflicts, though other organizations conflicts may lower citizens attention of community cohesion and resilience(i.e. the city managers treat pet dogs with cruelty and deemed them as one of origins of illness).

Fourth, the comparison of variable **Community Leadership** shows Shanghai Sample has the hierarchical order of **Q31=Q25>Q35** while Wuhan sample has the hierarchical order of **Q31>Q25>Q35**.Dispite similar hierarchical ordinance Shanghai sample show a higher factor loading of Q31(*Community leaders are good at adapting to new skills and gadgets when it comes to changing regulations of crisis*).It should be noted that for Shanghai the work load of community leaders have more time span of coordination of strategies and more error tolerance.

Last but not the least, for the comparison of variable **Services Provided by Community Civil Organization** it shows **Shanghai sample** has the hierarchical order of **Q12>Q8>Q6** while Wuhan sample has the hierarchical order of **Q8>Q6>Q22**.(Wuhan sample Q18 is Shanghai sample Q8; While Wuhan sample Q22 is shanghai sample Q12). Both the factor loadings and the ordinances of significance differed .Though community civil organizations contributed a lot but Wuhan has been famous for incorporating civil organizations into local programs and win quite a sum of prizes and branded for local governance in community based programs. While Shanghai community leaders(especially CPC leaders) slicked to the high visibility of leadership but cautious towards civil organizations by clinging to stringent regulation policies to monitor civil organizations in Covid-19 crisis.

5. Further discussion

This research has tested the SEM model by using samples from two metropolitan cities Shanghai and Wuhan and all six hypotheses has been supported. Quite different from common opinion of urban communities observers that citizens appeared inertia and unreluctantly to

take part in coping with crisis and metropolitan condition aggravated the effect , during the Covid the crisis learning posed an important influence by connecting perceived **baseline community resilience** to perceived **post Covid urban community resilience**.(path coefficients in both samples are 0.49 and 0.52 respectively) This research has posed the theme by showing the **post Covid urban community resilience** can be evaluated through policy areas of conflict resolution, community leadership and services from community civil organizations since they not only functioned in inconveniences by more relying on local community resources but also regulated in special policy restrictions and delays. These findings deviate from the current tendency to emphasize the physical aspects of community resilience(infrastructure, communication)or all-encompassing factors. Even among researches focused on nonphysical aspects[3], it contribute by initiate an innate perspective of resilience to adapt and invent new ways from local resources and personnel. This awareness is important for citizens for they take part and memorize as layperson to deal with persistent crisis, as learner and practitioners to collectively invented a new social order rather than waiting for other professional aid from outside, and by this process they push their limit of coping with crisis as an confined unite to a new horizon other than being passive and self-centered in public illness.

This research can be improved by (1)Interviews showing how citizens may benefit from crisis learning.(2)Samples with diversified combination of age groups and similar crisis of public illness. i.e. those who went through 2008 SARS pandemic.(3)Questions remains for those who lived in rural areas who may not benefit from metropolitan resources but still held a sustainable baseline community resilience, which may enrich the basic framework of what community resilience is .

6. Conclusion

This essay employed the SEM analysis to investigate the perception of urban community resilience of citizens in metropolitans like Shanghai and Wuhan , it suggested significant positive correlations between the three variables baseline community resilience, crisis learning and post Covid community resilience. The variable crisis learning is emphasized and this research contribute to the urban resilience literate by initiating an innate perspective of resilience to adapt and invent new ways from local resources and personnel.

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Author Contribution: Tan Mu designed the survey and wrote the paper. LiMuFai, BoJiaYuan and WangRuiMin helped with revising the paper and check the data.

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