Natural Disasters and Building Resilience

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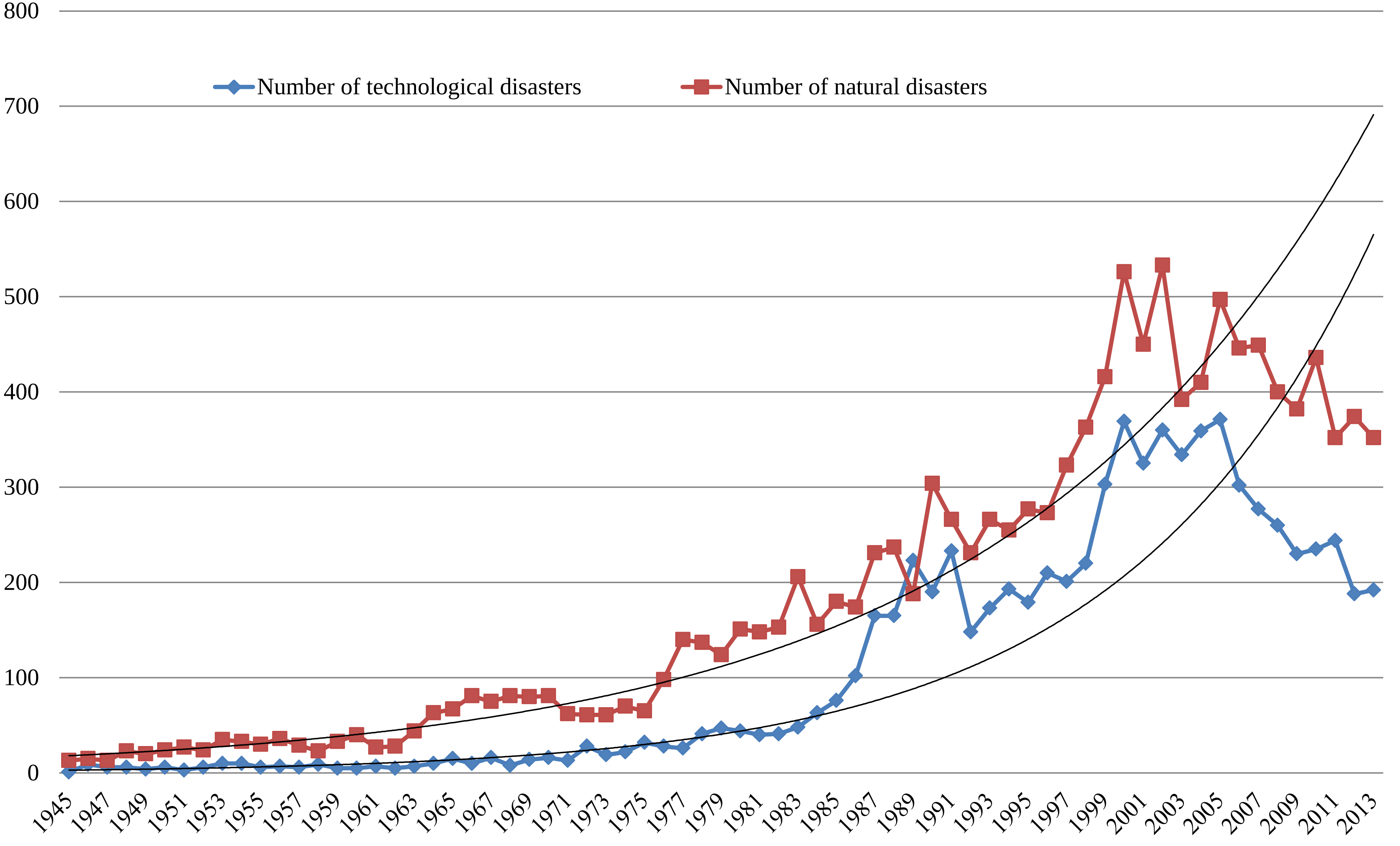
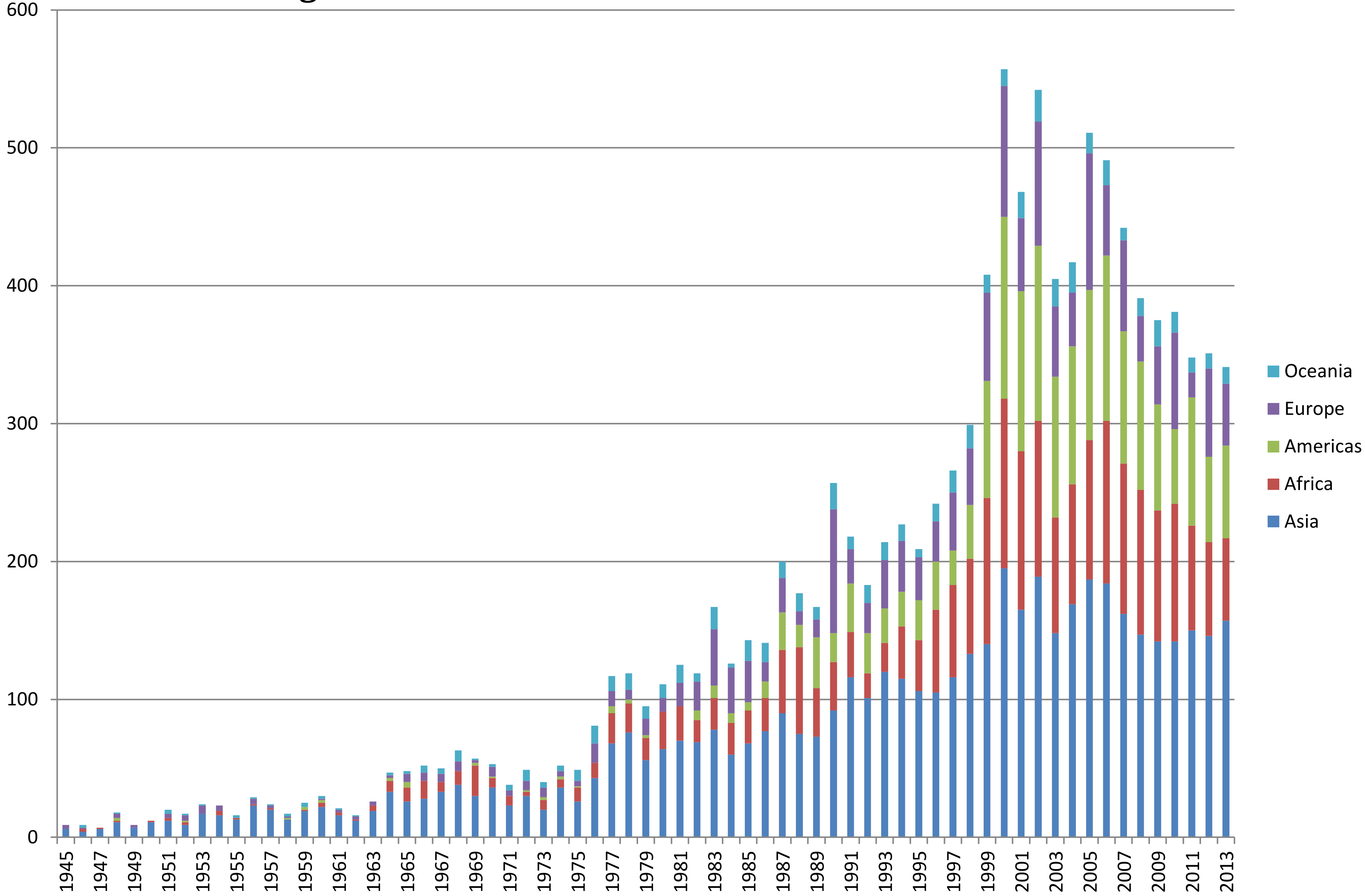
Number of Disasters

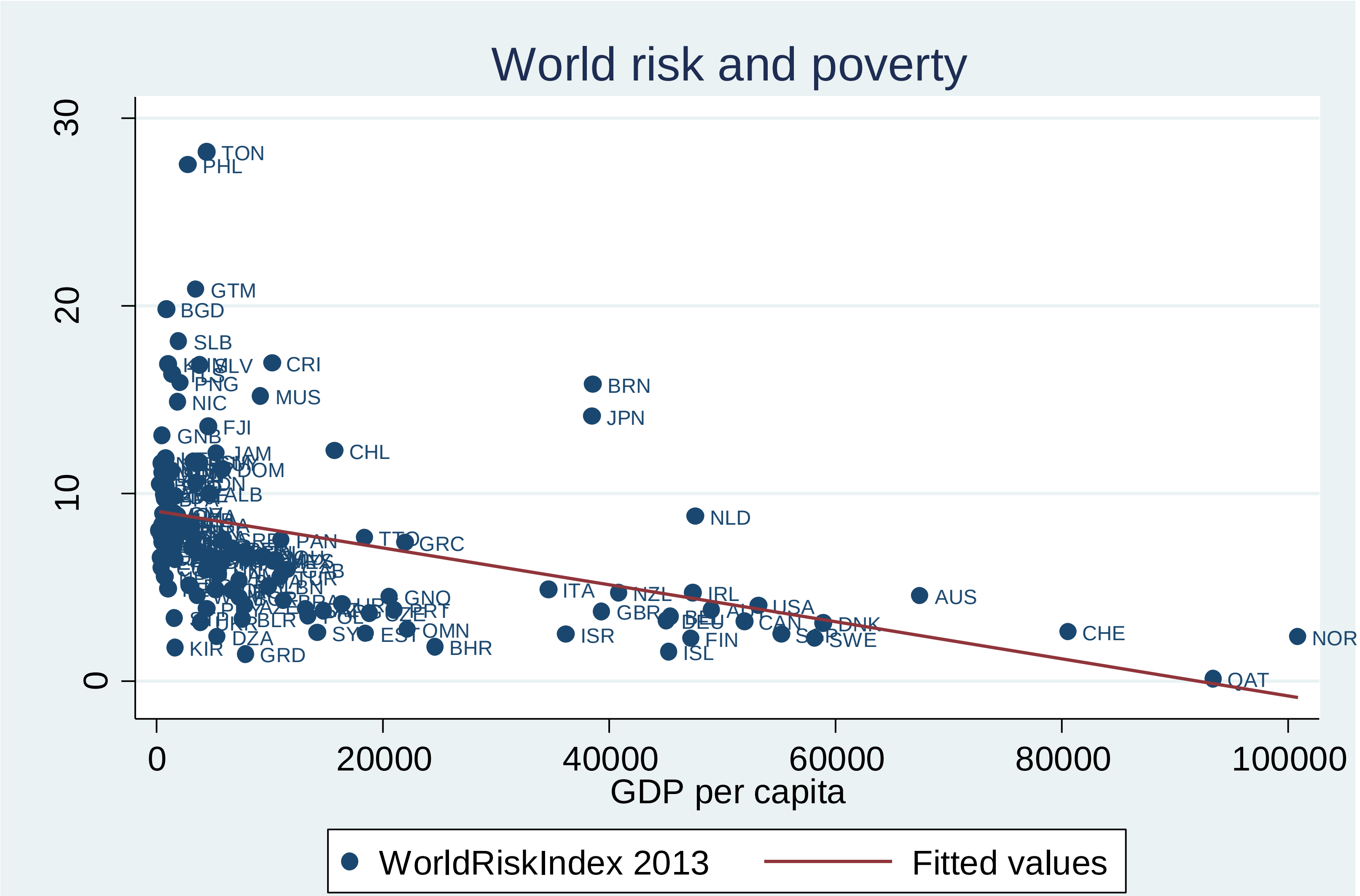


(Source: the author based on the data by the EMDAT/CREDS)

Regional Distribution of the Number of Natural Disasters

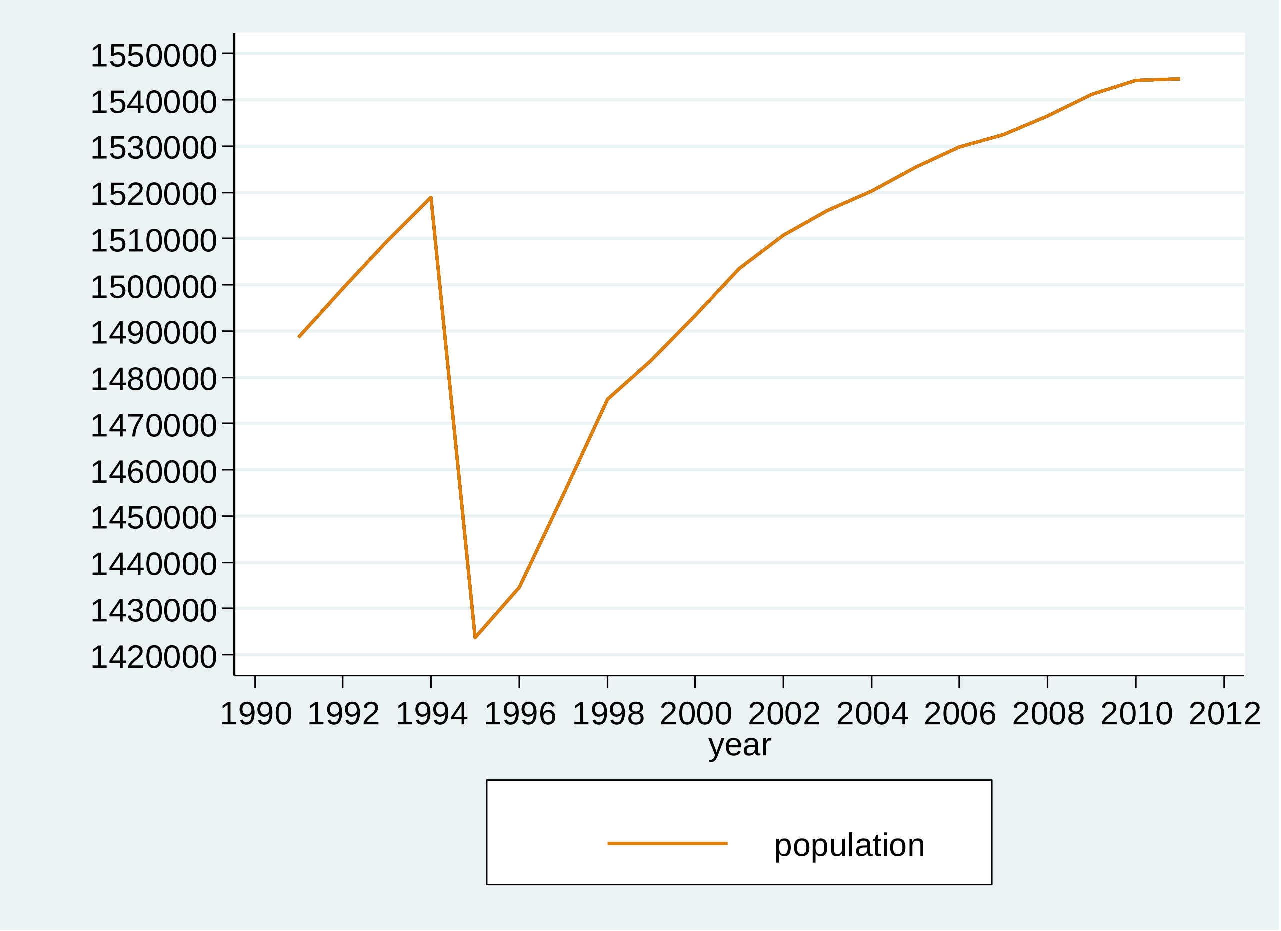


(Source: the author based on the data by the EMDAT/CREDS)

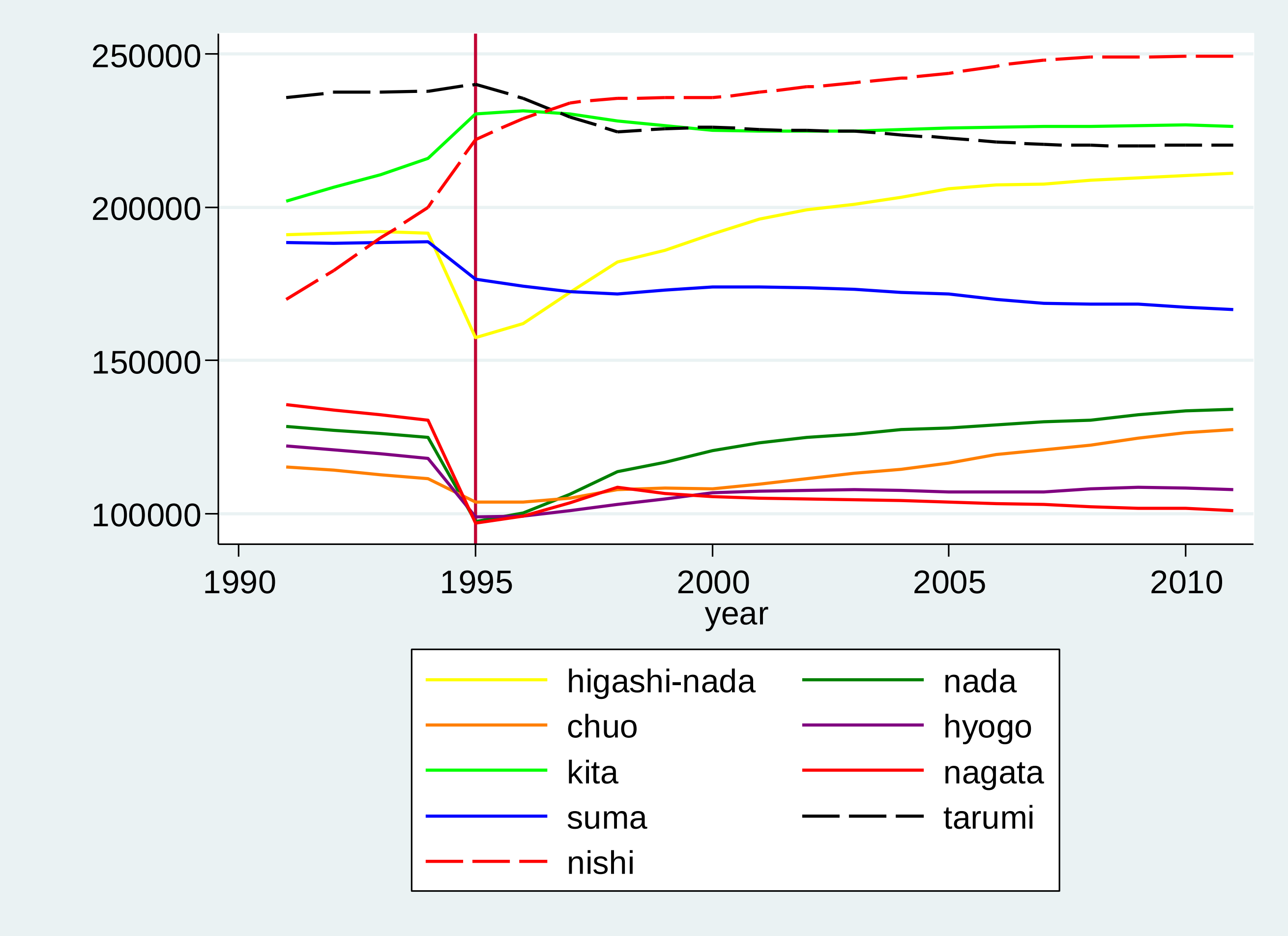


(Source: by the author 2014)

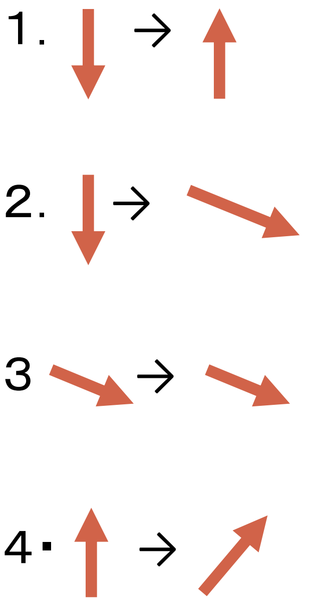
What is resilience? - the Hanshin-Awaji Earthquake 1995



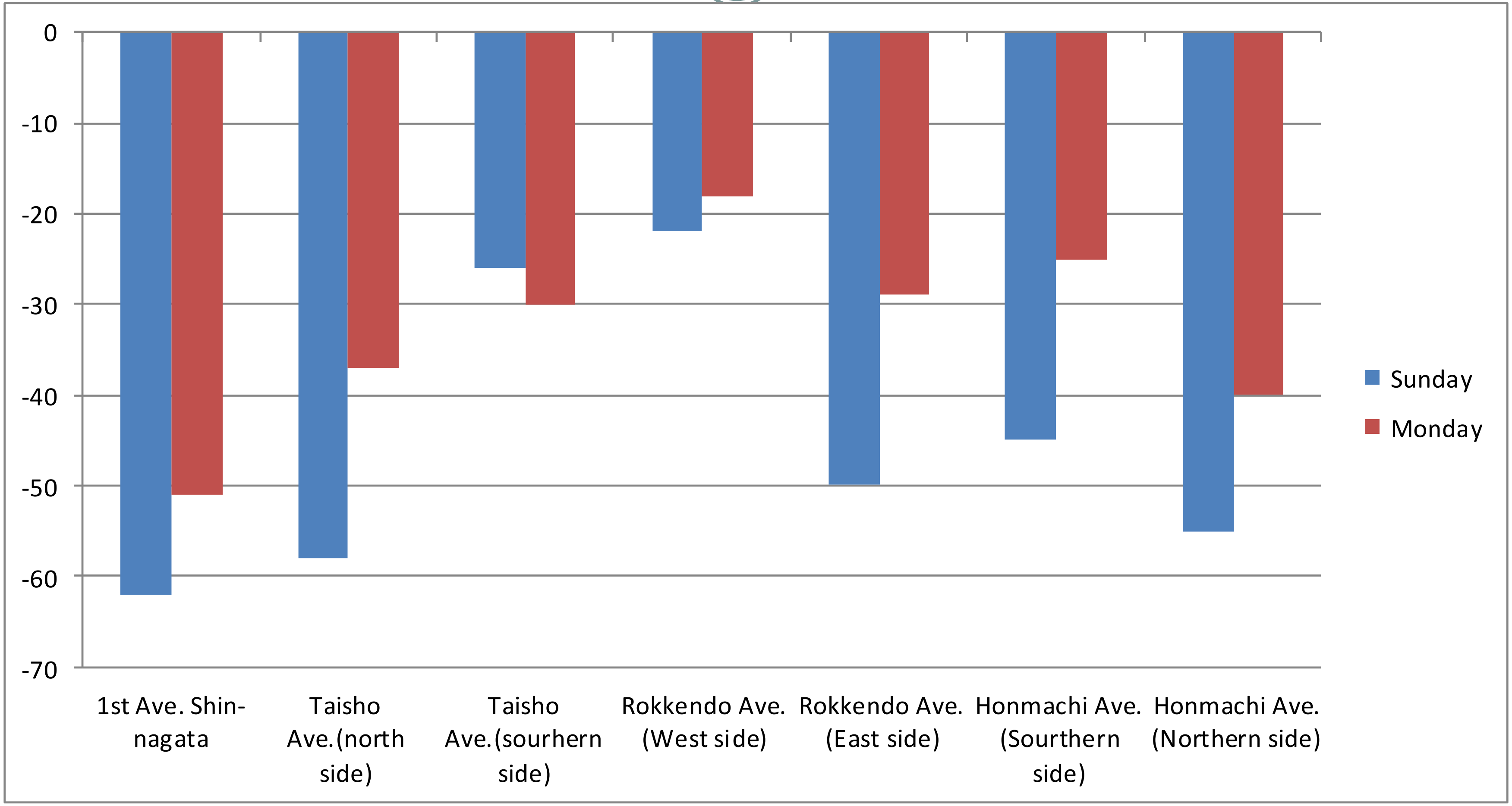
Why are some communities more resilient than others?



4 Patterns



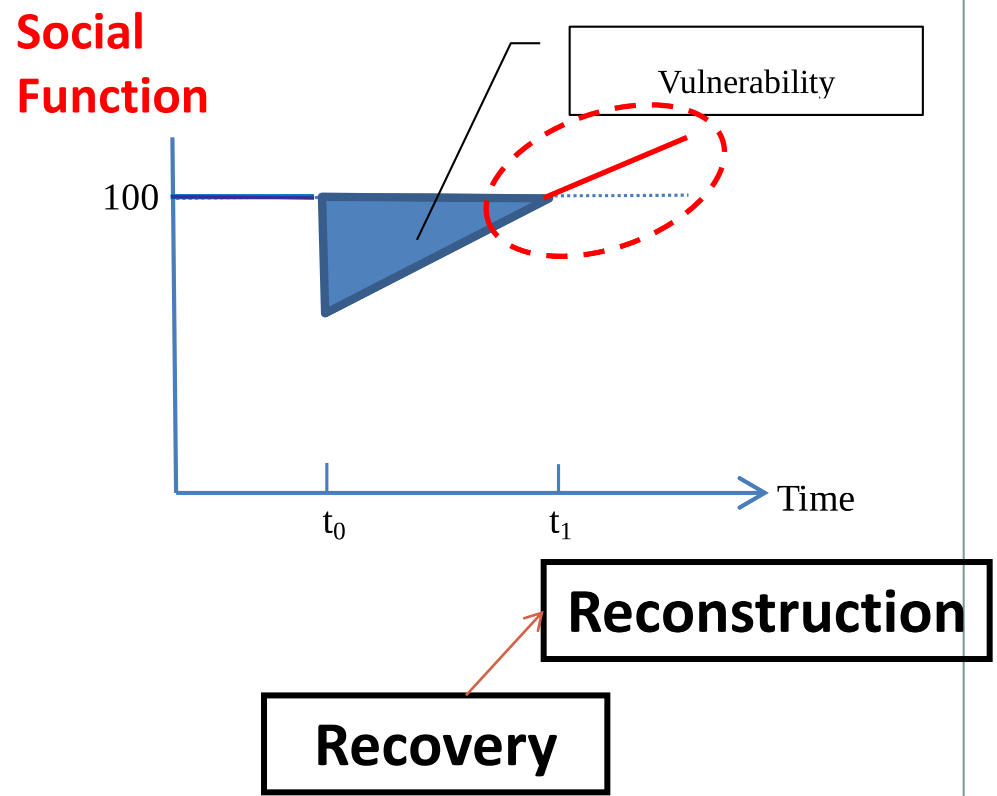
The number of pedestrian



What is resilience?

- Spring back into shape?
- Absolute loss
- Recovery=rest-ore basic social functions
- Long-term

Resilience Framework by MCEER



MCEER: Multidisciplinary Center for Earthquake Engineering Research, United State

Social capital at the time of crisis

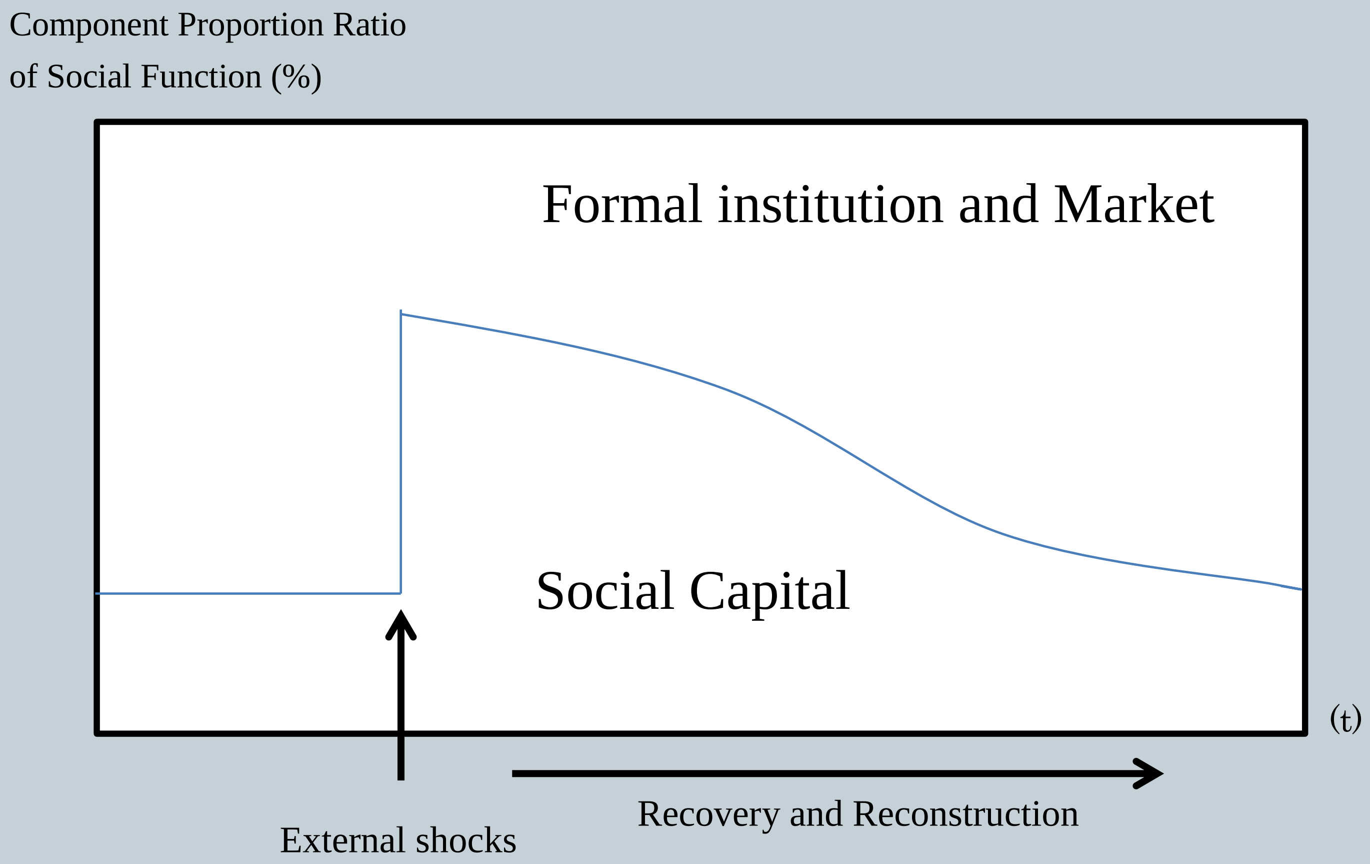


Figure 2-5: Box of Component Proportion ratio of Social Function

Social capital and Recovery/Reconstruction

Table 2-2 Social Capital in Post-Disaster Applications (During Recovery Phase)

Broad Mechanism	Post-Disaster Application
Strong social capital provides information, knowledge, and access to members of the network	Social resources serve as informal insurance and mutual assistance after a disaster.
Strong ties create trust among network members	Strong social capital helps by overcoming collective action problems that stymie recovery and rehabilitation
Social capital builds new norms about compliance and participation	Networks strengthen voices and decrease the probability of exit

Table 2-3 Social Capital in Post-Disaster Application (in the Reconstruction Phase)

Broad Mechanism	Post-Disaster application
Strong social capital provides information, knowledge, and access to members of the network (decreases asymmetry of information)	Social capital promotes job matching between employer and employee, complementing asymmetry of information.
	Social capital promotes knowledge transfer among networks (e.g., technology and business information) to make industrial clusters more competitive
Strong ties create trust among network members (decreases transaction costs)	Strong social capital reduces transaction costs among neighbors and private sector activities.

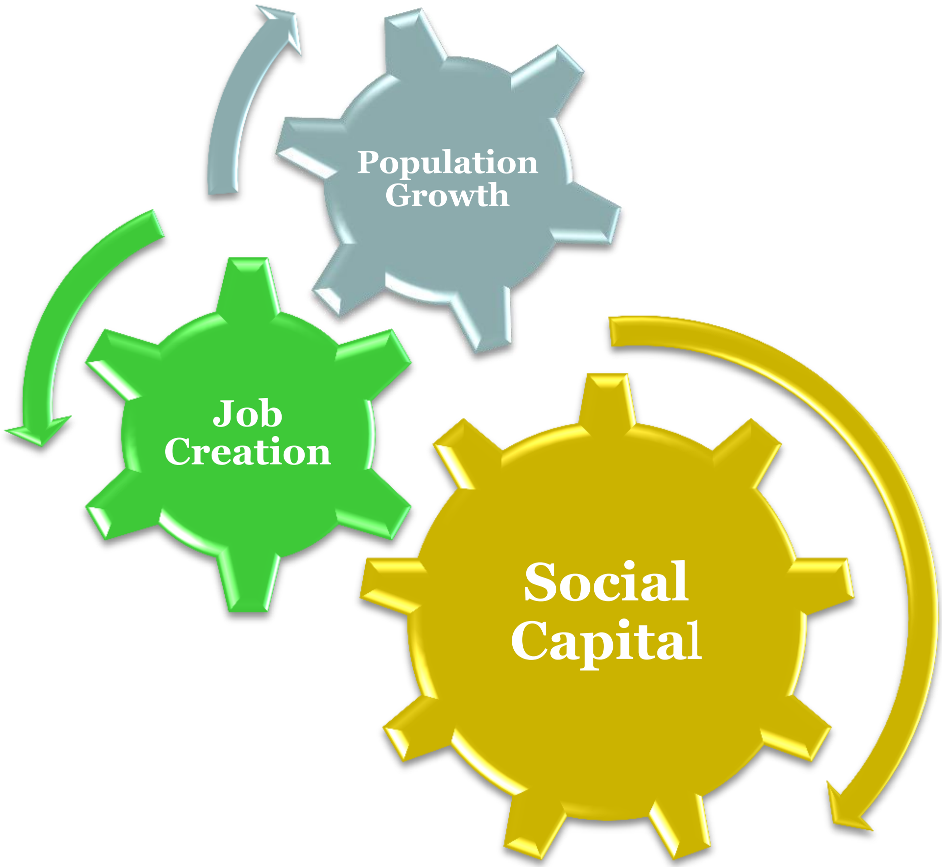
Analytical Framework

$$\Delta Emp_{i,t} = \alpha_i + \beta \Delta Emp_{i,t-1} + \gamma_0 SC_{i,t} + \gamma_1 HC_{i,t} + \gamma_2 \Delta population\_growth_{i,t} + \varepsilon_{i,t}$$

- Employment level is assumed to be sticky following the NKPC (New Keynesian Phillips Curve) (Taylor 1979, Calvo 1983, Beck and Katz 2009)
- HC: Human capita
- Population Growth
- SC:

Bridging	**Bonding**
- Crime rate	Rate of third generation household member living together

Employment is key to reconstruction



Methodology

In order to correct for the bias arising from the presence of lagged dependent variable, this paper also employs the Prais-Winsten estimation, PCSE (panel-corrected standard error), and the system General Method of Moments (GMM) estimator (Noy and Vu 2010; Roodman 2003).

- The Prais-Winsten estimation is a method of multiple linear regression with AR(1) and exogenous explanatory variables. The Prais-Winsten standard errors account for serial correlation; the OLS standard errors do not.
- The PCSE (panel-corrected standard error) handles the issue of cross-section heteroskedasticity (Beck and Katz 2004). The presence of heteroskedasticity makes the OLS standard errors inconsistent. PCSE improves on OLS standard errors with respect to panel heteroskedasticity, but not other issues.
- The system GMM is used to tackle other possible biases by endogeneity and omitted variables in addition to the bias. (Roodman 2003, Brundell and Bond 1998, Bond 2002).

Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Employment growth rate in tertiary industry	36	1.022868	14.42606	-27.88066	49.23398
Population Growth Rate	36	1.305278	12.75325	-29.28	40.1
Share of members of households with three generations living together	36	3.679265	1.647733	1.366254	7.535136
Share of households with three generations living together	36	7.318844	2.6601	3.576982	13.6769
Crime Rate	27	0.0228495	0.0152815	0.0091299	0.0729566
Population rate of graduats from universities	18	15.9988	4.502186	8.613366	25.93723

Estimation Results (Dependent variable: Employment growth rate in tertiary industry)

	FE	RE	pooling	Prais-Winsten	FE	RE	pooling	Prais-Winsten
Employment growth rate in tertiary industry (lagged)	-0.1258 [-1.27]	-0.2827 [-2.88]***	-0.2827 [-2.88]***	-0.2828 [-2.98]**	-0.0748 [-1.28]	-0.0454 [-1.05]	-0.0454 [-1.05]	-0.061 [-1.45]
Population growth	1.0167 [6.27]***	0.9007 [6.08]***	0.9007 [6.08]***	0.8978 [6.25]***	1.001 [5.40]***	1.1604 [11.84]***	1.1604 [11.84]***	1.1762 [14.81]***
Share of households with three generations living together					**4.1397 [3.62]*** **	**1.5247 [3.57]*** **	**1.5247 [3.57]*** **	**1.4519 [4.46]*** **
Share of members of households with three generations living together	**2.6208 [1.80]**	**1.6006 [4.98]*** **	**1.6006 [4.98]*** **	**1.6155 [6.52]*** **				
Population rate of graduates from university	0.0944 [0.07]	**0.465 [2.00]** **	**0.465 [2.00]** **	**0.4777 [2.09]* **				
_cons	-21.8751 [-0.69]	-20.6893 [-4.05]***	-20.6893 [-4.05]***	-20.9307 [-4.30]***	-15.4135 [-4.16]***	-6.9821 [-4.25]***	-6.9821 [-4.25]***	-6.4107 [-5.10]***
N	18	18	18	18	27	27	27	27
R-squared	0.9828	0.9491		1	0.8898			0.9009
Adj-R-squared	0.8762	0.9415		1	0.809			0.888
F test	F(8, 5) = 2.23 Prob > F = 0.1961				F(8, 15) =1.29 Prob > F = 0.3179			
Breusch and Pagan Lagrangian multiplier test for random effects	chibar2(01) = 0.00 Prob > chibar2 = 1.0000				chibar2(01) = 0.00 Prob > chibar2 = 1.0000			
Hausman Test	chi2(4) =27.37 Prob>chi2 = 0.0000				chi2(3) = 5.29 Prob>chi2 = 0.151			

* p<0.1, ** p<0.05, *** p<0.01

Estimation Results (Dependent variable: Employment growth rate in tertiary industry)

	Model 9	Model 10	Model 11	Model 12	Model 13
	RE	pooling	Prais-Winsten	Prais-Winsten	System GMM
Employment growth rate in tertiary industry (lagged)	-0.0394 [-0.89]	-0.0394 [-0.89]	-0.072 [-1.71]	-0.0007 [-0.02]	-0.0276 [-1.03]
Population growth	1.1478 [11.20]***	1.1478 [11.20]***	1.2018 [15.89]***	1.1005 [18.03]***	1.1193 [11.93]***
Crime rate	-1.4083 [-0.03]	-1.4083 [-0.03]	**-60.7822** **[-2.02]***	**-74.9522** **[-3.21]*****	**-89.5034** **[-4.94]*****
Share of members of households with three generations living together	**0.8926** **[3.26]*****	**0.8926** **[3.26]*****	**0.7153** **[3.98]*****		**0.1401** **[2.09]****
Growth rate of members of households with three generations living together				**0.3542** **[5.76]*****	
_cons	-7.8562 [-3.17]***	-7.8562 [-3.17]***	-4.834 [-2.95]***	-30.481 [-5.53]***	
N	27	27	27	27	27
R-squared			0.9174	0.9475	
Adj-R-squared			0.9023	0.9379	
Hansen test					0.999
Sargan test					0.386
Arellano-Bond statistic					0.415

* p<0.1, ** p<0.05, *** p<0.01

Conclusions

- This research studied how social capital worked in Kobe to promote jobs, which are a crucial cog for reconstruction, after the Hanshin Awaji Earthquake in 1995. This study focused on the tertiary sector because after the earthquake there have been a structural shift from secondary sector due to the damages caused by the earthquake. The sector now accounts for 80% of employment, the most important factor for reconstruction in the mid- and long-term.
- The study found both bonding and bridging social capital had statistically significant positive impacts to promote employment in post-disaster phase.

Reference

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