Economic Resilience and Recovery in the U.S. Great Lakes Region: A Socioeconomic and Transportation Infrastructure Perspective

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Sponsored by:
The U.S. Economic Development Administration

Final Project Report

January 28, 2022

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Partners

Funded by the U.S. Economic Development Administration, 2019-2021

Final Technical Report

Lisa Lorena Losada-Rojas, PhD Candidate

Annie Cruz-Porter, PhD

Indraneel Kumar, PhD

Lionel J. Beaulieu, PhD

Konstantina Gkritza, PhD

User Guide What-If Tool?

Andrey Zhalnin, PhD

User Guide Data Dashboard

Benjamin St. Germain

Website

Tyler Wright

Graphics & Report Formatting

Ryan Maluchnik

Acknowledgments

We extend our thanks to a number of people who have provided guidance and support to this project. They include Sarah Adsit for her assistance with Chapter 2 and Yue Ke, PhD for his input on Chapter 4; Tamara Ogle and Daniel Walker, AICP for lending their expertise to the focus group activities; Philip Watson, PhD, for sharing expert insights on economic resilience; Ty Warner, AICP and his team at NIRPC, Susan Craig and her colleagues at SIRPC staff, along with Purdue Extension representatives, for their input and collaboration during various facets of the project; and the Chicago EDA Office team for investing in this important pilot project in Indiana.

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1 Introduction

The U.S. economy has observed recessions regularly since the 1850s, according to the records maintained by the National Bureau of Economic Research (NBER). However, it was the Great Depression, which occurred from August 1929 to March 1933[1], that was termed the "worst economic downturn in the history of industrialized nations"[2]. The reasons included unemployment rates that climbed to more than 25%[3], the failure of more than half of the banks in the U.S., and the millions of households that suffered from bankruptcy. Since the Great Depression, recessionary cycles have been either frequent or sporadic over various decades. For example, 1950 to 1960 observed several recessions followed by a period of calm during the economic boom between 1960 and 1970. Between 1970 and 1990, there was at least one economic recession in each decade. It was followed by the dot com bubble in 2001, the housing bubble in 2008-2009, and the COVID-19 pandemic induced recession in 2020.[4]

The real-estate and housing bubble that occurred during the 2008-2009 recession came to be known as the Great Recession[5] because of the economy contracting continuously for 18 months. It is considered as the worst downturn in the economy after World War II and during 2010, the high unemployment rates established a record in the post-World War II period.[6] A limited amount of research has focused on the structural effects of the Great Recession of 2008-2009. However, scholars have found that despite the growth in jobs openings post-2010, the unemployment rate did not experience a proportional decline (Rothstein 2017). Rothstein (2017) noted that post-Great Recession unemployment rates improved from 10 to 4.9 percent by 2017 but the decline was caused, in part, by the reduction in the labor force participation rate and not an actual increase in employment. For example, the Employment-to-population ratio (EPR) fell almost 5 percentage points between 2006 and 2009 and remained below the pre-recession level even after a decade (Rothstein 2017). Worthy of note is that the U.S. EPR could not recover to the pre-recession level even in 2019 before plummeting further in 2020 due to the COVID-19 pandemic-induced recession (Figure 1.1). One advantage of the EPR is that it better at detecting structural trends than the labor participation and unemployment rates. Moreover, it is easy to track and interpret (Donovan 2015). The author used the Bureau of Labor Statistics (BLS) definition of the EPR as the ratio of civilian employment divided by the civilian noninstitutional population (Donovan 2015).

The reasons for under-performance of the EPR included discouraged workers who left the labor market voluntarily, major skills mismatch between the available labor force and jobs openings, and laid-off workers who were not ready for the job market (Kalleberg and Wachter 2017). The Great Recession did originate with the crash in housing markets and financial institutions, but unprecedented job losses happened in manufacturing and construction industries (Gallagher, Hoang and Keil 2019). Scholars argue

[1] https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions
[2] https://www.history.com/topics/great-depression/great-depression-history
[3] https://www.cnbc.com/2020/05/19/unemployment-today-vs-the-great-depression-how-do-the-eras-compare.html
[4] https://www.nber.org/research/business-cycle-dating
[5] As per NBER, Great Recession started from the peak on December 2007 to the trough on June 2009. The economy contracted from peak to trough for continuous 18 months. https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions
[6] https://www.pewresearch.org/social-trends/2019/12/13/two-recessions-two-recoveries-2/

that these industry sectors have yet to recover from the loss of low-skilled jobs, which were ultimately replaced by higher-skilled positions. Many of the displaced workers found themselves having to change industries and/or occupations (Kalleberg and Wachter 2017). Another feature of the Great Recession was that the impacts were disproportionate by gender, educational level, race, ethnicity, and household wealth. Additionally, the effects of the Great Recession were different across geographical regions of the U.S.

The primary purpose of our EDA project is to study and explore the regional economic resilience or capacity of regions to absorb and recover from the economic shocks in the context of the Great Recession of 2008-2009, along with the post-recovery period up to the year 2018. We do so by lending technical assistance to and engaging with two regional planning organizations in Indiana for the purposes of assessing how well each fared during the time periods of the post Great Recession (2008 to 2009).

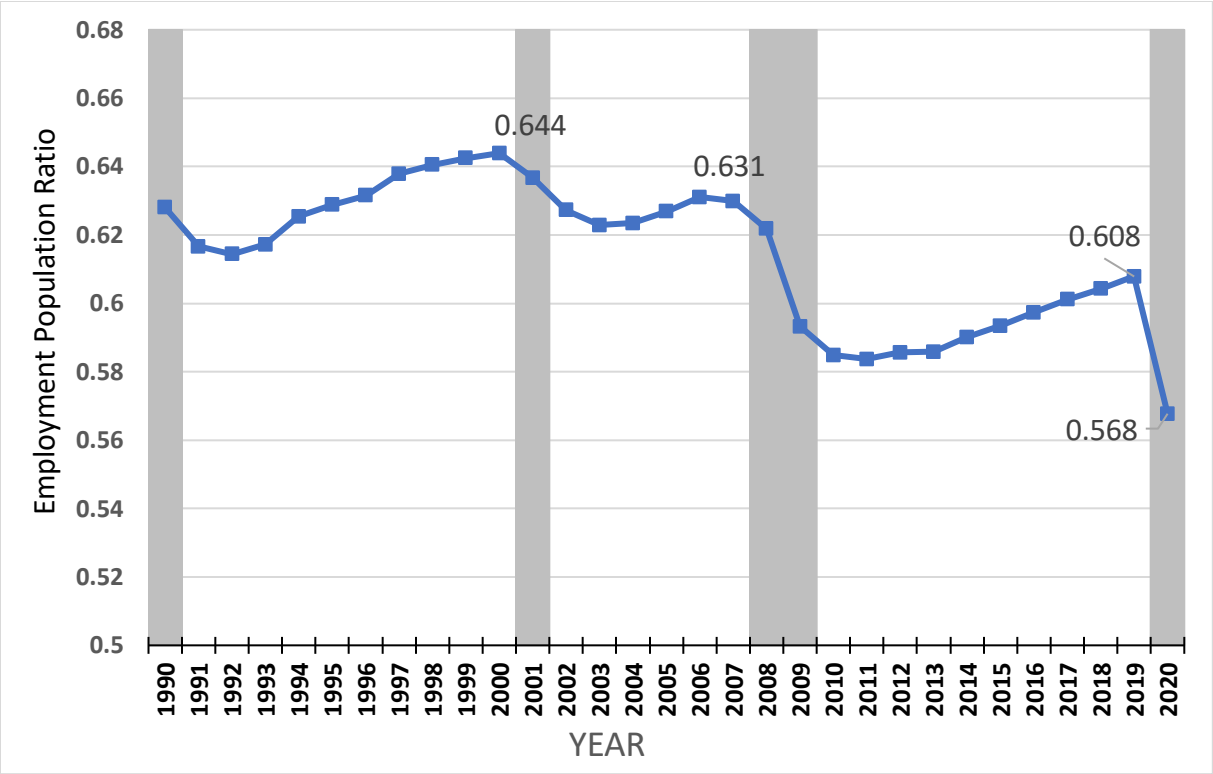

Figure 1.1: Employment Population Ratio 1990 to 2020
Source: BLS and usafacts.org[7]

1.1 Project Background, Purpose, Goals and Objectives

This project was funded by the U.S. Economic Development Administration (EDA) under the local technical assistance program. In light of the Great Recession (December 2007 to June 2009), and the

[7] https://usafacts.org/data/topics/economy/jobs-and-income/jobs-and-wages/jobs-per-working-age-person/

resulting loss of nearly 8.8 million U.S. jobs and sluggish economic recovery during the post-recession period, EDA introduced the need to incorporate economic resilience as one of the elements in the Comprehensive Economic Development Strategies (CEDS) process. As such, our project looks into building economic resilience and capacity for recovery of the regions with an emphasis on the regional transportation and infrastructure elements including other socioeconomic factors. For this project, economic resilience includes the following[8]:

- Ability to anticipate, withstand or absorb a shock
- Ability to recover or bounce back from a shock
- Ability to avoid the shock altogether

The capacity to absorb the recessionary shock is demonstrative of the "resilience capacity" of a region. This is a characteristic that regions aspire to achieve and is typically a less common attribute of many regions. The ability to recover from a shock shows the "rebound capacity" of the region, and regions aspire to recover quickly from the economic shocks. The ability to avoid the shock completely shows the "predictive and adaptive capacity" of the region. Such regions develop capacity for risk and vulnerability assessment and agile strategy building techniques to reconfigure the regional economies. In a real context, regions might have some level of "absorbing, rebounding, and adaptive" traits but only a limited capacity to build economic resilience and steer away from economic shocks. Note that economic recessions or shocks can occur in addition to the structural changes happening in the regional economies. Nuess (2019) stated quoting Kuznets (1973) that structural transformation or structural change is the long-term movement of production and labor from agriculture to manufacturing to services experienced in many global and regional economies. Hence, recessionary shocks might cause additional changes to the industrial and occupational compositions of the regions undergoing structural shifts. However, regions usually employ performance measures such as unemployment rate, jobs openings, etc., that are metrics suitable to capture only the short-term economic recovery, and not suitable to capture the structural social and economic shifts.

The purpose of this project is to uncover the significant socioeconomic and physical infrastructure factors that may influence and build the economic resilience capacity of regions and contribute to the maintenance and expansion of robust regional economies. In particular, the key research questions we examine as follows: (1) What is the definition of regional economic resilience? (2) What socioeconomic and infrastructure variables are significant contributors to economic resilience? And, (3) What are the major socioeconomic and physical concepts, or combinations of variables, that can advance the economic resilience of a region?

The project employs the community capitals framework and the structural economic concepts to explore regional economic resilience. The major steps undertaken for this project are described in a latter section of this report. The deliverables include a final report on research findings and qualitative and quantitative analyses focused on the two specific regions, online data dashboards for both the regions, a tool to conduct "What-If?" types of analyses for both the regions, and a project website. The grant actively involves two regional partners, Northwestern Indiana Regional Planning Commission (NIRPC) and Southeastern Indiana Regional Planning Commission (SIRPC).

[8] https://www.cedscentral.com/resilience.html

1.2 Regional Partners

The project commenced in partnership with two existing regions in Indiana that are members of the Indiana Association of Regional Councils (IARC). They are Northwestern Indiana Regional Planning Commission (NIRPC) and Southeastern Indiana Regional Planning Commission (SIRPC). NIRPC is a regional council of governments and a metropolitan planning organization. It has been serving northwest Indiana since 1966.[9] SIRPC is a regional council of governments and community and economic development agency for southeast Indiana. Both NIRPC and SIRPC were enabled by the State of Indiana statutes to facilitate regional planning in their respective regions.

NIRPC is located to the northwest of Indiana and a gateway to the Greater Chicago Region. It serves three counties in Indiana; Lake, Porter, and LaPorte . All counties in the NIRPC are metropolitan counties based on the U.S. Census Bureau's March 2020 definition[10]. Hence, NIRPC is primarily an urban region. Lake, Porter, and LaPorte counties are part of the Chicago-Naperville, IL-IN-WI combined statistical area (CSA).

SIRPC is located to the southeast of Indiana and is a gateway to the Greater Cincinnati Region. It encompasses nine counties in Indiana, namely, Shelby, Decatur, Franklin, Jennings, Ripley, Dearborn, Jefferson, Switzerland, and Ohio. Out of nine counties, four counties are metropolitan(Shelby, Dearborn, Franklin, and Ohio counties). Decatur, Jefferson, and Jennings are micropolitan counties whereas the remaining two counties, Ripley and Switzerland, are non-core counties. SIRPC is a mixed urban and rural region. The SIRPC Region is part of the two CSAs. Dearborn, Franklin, and Ohio are metropolitan counties and part of the Cincinnati-Wilmington-Maysville, OH-KY-IN CSA. Shelby, a metropolitan county, and Decatur and Jennings, micropolitan counties are part of the Indianapolis-Carmel-Muncie, IN CSA.

Figures 1.2 and 1.3 show the NIRPC and SIRPC locations and the constituent counties.

1.2.1 Northwestern Indiana Regional Planning Commission (NIRPC)

- *Employment Trends*

According to the Bureau of Economic Analysis (BEA), NIRPC had 306,331 full-and-part time jobs in 1970, grew to 336,506 jobs by 1980, and expanded further to 342,058 jobs in 1990. NIRPC added more than 32,000 jobs during the economic growth period in the 1990s resulting in 373,054 jobs as of the year 2000. Before the onset of the Great Recession (2008-2009), NIRPC reported a maximum of 384,032 jobs in 2007. As per the BEA, NIRPC was able to recover the lost jobs and increase from the 2007 threshold to a total of 385,345 jobs in 2018. Between the peak (384,032 jobs) in 2007 and trough (363,434 jobs) in 2010, NIRPC had lost 20,598 jobs. Since 2011, NIRPC experienced a year-to-year positive growth in jobs, but the jobs recovery was slow and long-drawn, a trend observed in several U.S. Midwestern regions in the post-Great Recession period. Figure 1.4 shows the long-term employment growth from 1970 to 2018 indexed to jobs in 1969. Porter County experienced the maximum growth compared to the 1969 jobs. Despite being the largest county in the region, Lake County observed decreasing as well as

[9] https://nirpc.org/about-nirpc/history-of-nirpc/
[10] https://www.census.gov/geographies/reference-files/time-series/demo/metro-micro/delineation-files.html

increasing trends in the five-decade period. In the long-term employment trend, the NIRPC region performed better than Lake and LaPorte counties, but worse than Indiana and Porter County.

As observed in other U.S. regions, the recovery rate in unemployment was faster in NIRPC and by 2017, NIRPC had an unemployment rate of under 5% (refer to Figure 1.5). During the peak recession, LaPorte County suffered from an unemployment rate of 12% in 2010, whereas, Lake and Porter counties had unemployment rates of 10.8% and 9.5%, respectively. In 2018, the three counties faced unemployment rates slightly higher than Indiana's unemployment rate of 3.5%.

- *A Look at Industry Shifts*

During the 2001 recession, Manufacturing was the top industry sector providing almost 54,000 jobs in the NIRPC Region (refer to Figure 1.6). For nearly two decades, manufacturing jobs experienced continuous declines and by 2018, it was the third-largest industry providing nearly 42,000 jobs in the region (refer to Figure 1.6). At the same time, health care and social assistance increased from fourth rank (39,000 jobs) in 2001 to the top rank (51,600 jobs) in 2018. Health care and social assistance was the only industry sector not affected during the 2008-2009 Great Recession. Accommodation and food services remained the fifth largest industry sector from 2001 to 2018. It grew continuously over the two decades, except for declines during the 2008 to 2010 period. The retail and government sectors swapped their positions between 2001 and 2018 and suffered job losses during the Great Recession period. In 2001, manufacturing provided 15.1% of the total jobs which declined to 11.3% in 2018. Retail and government sector jobs followed suit declining from 12.5% to 11.7% and 13.2% to 10.9% in the 18-year period. In comparison, health care and social assistance jobs grew from 11% in 2001 to 13.8% in 2018 whereas accommodation and food services expanded from 6.6% in 2001 to 8.3% in 2018. Note that the industry sector data are obtained from Economic Modeling Specialists International (EMSI) and includes Quarterly Census of Employment and Wages (QCEW), non-QCEW, self-employed, and extended proprietor categories of job classes.

Without question, the manufacturing industry has undergone major structural shifts in the region. The BEA data show that in 1970, manufacturing provided 41% employment in the NIRPC Region, which declined to 32.5% in 1980, 20.7% in 1990, and 15.9% in 2000. The EMSI data included above show that eventually, manufacturing declined to 11.3% jobs in 2018. In more than four decades, manufacturing lost a percent share of jobs by nearly 30 percentage points. Despite these job losses, manufacturing remains a competitive sector in the NIRPC Region. As per EMSI data, the Location Quotient (LQ) of manufacturing was 1.47 in 2001 and it increased to 1.68 in 2018. This means that the share of jobs in manufacturing in NIRPC was nearly 1.7 times more than the U.S. average in 2018. Note that the LQ of a region can increase if overall the industry is declining in other parts of the U.S. In 2018, NIRPC had utilities, manufacturing, retail trade, arts entertainment and recreation, health care and social assistance sectors with higher than 1.2 LQ values, the threshold to delineate exporting or basic industries in the region.

- *Demographic Profile*

NIRPC had a population of 738,709 persons in 1970, which increased to 751,413 persons by 1980. In 1990, the population declined to 711,592. However, since 2000 NIRPC's population has continuously increased from 741,468 persons in 2000 to 771,815 persons in 2010 to eventually 784,332 persons as per the latest decennial census in 2020 (Refer to Table 1.1). From 2000 to 2010, NIRPC had a 4.1%

growth in the resident population. From 2010 to 2020, NIRPC observed a population growth of 1.6%. A growing population is a strength for any region as residents demand and consume goods and services and contribute to strengthening the regional economy.

From 2000 to 2019, NIRPC lost its share of teens (19 years or less) to the total population by four percentage points and young adults and working-age groups (20 to 59 years) by more than three percentage points. In comparison, the old age group (60 to 79 years) increased by more than six percentage points and the oldest age group (80 years and above) by one percentage point. In 2019, teens (19 years or less) made 1 in four persons or 25.1% whereas old (60 to 79 years) made nearly 1 in five persons or 19.9%. The resident population is gradually growing older in place without adequate in-migration of young age populations or new births outpacing deaths.

- *Educational Attainment Among Adults*

NIRPC has realized gains in educational attainment among its resident population 25 years of age or older. In 2000, almost 56% of the adult population had either a terminal high school education or less. By 2019, this share decreased to 47%. In comparison, NIRPC had a 17% of its population with bachelor's degrees or more in 2000 and this increased to 21.5% in 2019 (Refer to Table 1.1). An educated resident workforce can help attract, retain, or grow industries requiring advanced skills and paying higher wages. Note that due to proximity to Chicago, communities in NIRPC may have served as residential communities for professionals working in the Greater Chicago Region. Despite a decrease from 2000 to 2019, almost half (47%) of the adult population has a high school or less, indicating that a disproportionate share of the labor force in the region may be low skilled workers.

1.2.2 Southeastern Indiana Regional Planning Commission (SIRPC)

- *Employment Trends*

According to the BEA, SIRPC had 67,584 full- and part-time jobs in 1970, which grew to 80,008 jobs in 1980, and 94,030 jobs by 1990. SIRPC added more than 27,000 jobs during the economic growth period in the 1990s to have 121,274 jobs in 2000. Before the onset of the Great Recession (2008-2009), SIRPC had reported a maximum of 119,681 jobs in 2006. As per the BEA, SIRPC observed growth in jobs after 2010. It was able to recover the lost jobs and exceed the pre-recession job numbers with a total of 120,501 jobs in 2018. Between the peak (119,681 jobs) in 2006 and trough (112,608 jobs) in 2010, SIRPC suffered a net loss of 7,073 jobs. Since 2011, SIRPC has experienced a year-to-year positive growth in jobs, but the recovery has been a slower longer-drawn process, a trend observed in several Midwestern U.S. regions after the Great Recession. Figure 1.7 shows the long-term employment growth from 1970 to 2018 indexed to jobs in 1969. Decatur County observed the maximum comparative growth compared to its 1969 jobs. Despite being the smallest county in the region, Ohio County realized the highest comparative growth in 1998, and since then jobs were in decline in that county. During recent years, Switzerland and Jefferson Counties performed worse than SIRPC and Indiana. The remainder of the seven counties performed better than both the SIRPC region and the state of Indiana.

Recovery in the unemployment rate was faster in the SIRPC region. By 2016, other than Franklin and Jennings, the remainder of the seven counties had recovered from their unemployment rates of the pre-recession trough in 2007. During the peak recession, Jennings County had the maximum unemployment rate of 13.6% and Switzerland County had the minimum unemployment rate of 7.9% in 2009. In 2018,

six counties had unemployment rates slightly higher than Indiana's unemployment rate of 3.5%. Decatur and Shelby counties had unemployment rates lower than Indiana's 3.5% whereas Jefferson County had the same unemployment rate as the state in 2018.

- *The Industry Make-Up of the Region*

During 2001, Manufacturing was the top industry sector providing almost 24,500 jobs in the SIRPC Region (refer to Figure 1.9). Between 2001 and towards the end of the Great-Recession in 2010, the manufacturing sector had declined to nearly 16,800 jobs. The manufacturing industry has observed continuous growth since 2010 but it was unable to achieve the pre-recession status (21,200 jobs in 2007) even in 2018. Manufacturing remained the predominant sector with 20,860 jobs in 2018. This was followed by government (14,800 jobs), retail (11,800 jobs), health care and social assistance (9,400 jobs), and accommodation and food services (7,600 jobs). In the post-Great-Recession period, government and retail sector jobs experienced a slow decline. In contrast, health care and social assistance and accommodation and food services achieved a slow pace of growth. In 2001, manufacturing provided 20.8% of the total jobs, declining to 17.8% by 2018. Job changes in the government and retail sectors were very modest, from 12.3% to 12.6% and 10.7% to 10.1%, respectively, over the 18-year period. In comparison, health care and social assistance jobs grew from 6.4% in 2001 to 8.1% in 2018 whereas accommodation and food services expanded from 5.8% in 2001 to 6.5% in 2018. Note that the industry sector data were obtained from Economic Modeling Specialists International (EMSI) and includes Quarterly Census of Employment and Wages (QCEW), non-QCEW, self-employed, and extended proprietor categories of job classes.

Like several other regions in Indiana, SIRPC underwent structural changes in its economy. In particular, the manufacturing industry had major changes in the region. The BEA data show that in 1970, manufacturing provided 27.3% employment in the SIRPC Region, which declined to 24.7% in 1980, increased slightly to 25.5% in 1990, and declined further to 23.3% by 2000. The EMSI data included above show that eventually, manufacturing declined to 17.8% jobs in 2018. Over the course of more than four decades, manufacturing employment slipped by nearly 10 percentage points, but remains an important component of the regional economy given that nearly one in five jobs in the region remains associated with the manufacturing industry. Despite losses in jobs, manufacturing is a strong competitive sector in the SIRPC Region. As per EMSI data, the LQ of manufacturing was 2.04 in 2001 and it increased to 2.66 in 2018. This means that the share of jobs in manufacturing in SIRPC was almost three times that of the U.S. average in 2018. In 2018, SIRPC had several sectors that had LQ values of 1.2 or more. These included industries such as agriculture forestry fishing and hunting, utilities, arts entertainment and recreation, transportation and warehousing, and management of companies and enterprises. Technically, these industry sectors have the capacity to export goods and services outside the region.

As per the EMSI data, agriculture forestry fishing and hunting provided more than 7,000 (6.2% of total jobs) jobs in 2001. This declined to 5,500 jobs, or 4.7% of the total jobs in 2018. Despite a decline in agriculture jobs, the competitiveness metric of LQ is strong and changed slightly from 2.68 in 2001 to 2.60 in 2018. As explained previously, the EMSI data include covered jobs such as QCEW, other

categories of not-covered jobs, and self-employed and proprietors.[11] In the case of SIRPC, manufacturing and agriculture are the top two sectors with the highest LQ in 2018.

- *Demographic Features*

SIRPC had a population of 185,101 persons in 1970, which increased to 207,569 persons in 1980. In 1990, the population grew to 213,494 and further increased to 236,730 persons in 2000, 249,822 persons in 2010, and finally to 250,423 persons in the latest 2020 census (Refer to Table 1.1). Note that from 2000 to 2010, SIRPC increased its resident population by 5.5%. However, from 2010 to 2020, SIRPC observed a population growth of only 0.2% indicating a stagnant population.

From 2000 to 2019, the share of the SIRPC population under 20 years of age slipped by l nearly five percentage points and young adults and working-age groups (20 to 59 years) fell by four percentage points. In comparison, the age cohort 60 to 79 years increased by almost eight percentage points while the oldest age group (80 years and above) expanded by a modest one percentage point. In 2019, persons 19 years or less comprised 1 in four persons (or 24.9%) whereas older residents (60 to 79 years) represented about 1 in five persons or 21.2% (Refer to Table 1.1). While the resident population is gradually growing older, the overall population is stagnant indicating that the number of in-migrants and new births are failing to keep pace with total population losses due to out-migration and deaths.

- *Educational Attainment of Adults*

SIRPC has realized some gains in educational attainment of adult populations 25 years or older. In 2000, 65% of the adult population had either a terminal high school education or less. By 2019, the share of residents with this educational credential decreased to 54.5%. (Refer to Table 1.1). However, the fact that more than half of the adult population possessed a high school or less could pose a major challenge when it comes to growing and attracting higher-skilled jobs to the region. One positive note, however, is that the adult population with bachelor's degree or more increased from 12.7% in 2000 to 17.4% in 2019 (Refer to Table 1.1). Growing the region's educated population could help close the skills gap in the labor market.

At the onset of the project, NIRPC and SIRPC had counties that were either distressed by unemployment or distressed by income. For example, the economic distress report for NIRPC from January 2017 showed that Lake County was distressed by unemployment and LaPorte County by income. In the case of SIRPC, Decatur, Jefferson, Jennings, Ohio, Ripley, and Switzerland counties were distressed by income (Refer to Table 1.1). Note that the distress metric is based on EDA criteria where the county is determined to be distressed by unemployment if the average unemployment rate for the past 24 months exceeds the U.S. average by one percentage point. Similarly, a county is distressed by income if the annual per capita personal income is 80% or less than the U.S. average. The economic distress data retrieved in January 2020 showed no change in the status of counties in the case of NIRPC. For SIRPC, Shelby County which was not distressed in 2017 moved to the distressed category based on income in 2020.

[11] One reason that agriculture jobs are estimated higher by EMSI is due to proprietors and self-employed.

1.3 Organization of the Project and Major Steps

The economic resilience project included both qualitative and quantitative components. Both methods were pursued in parallel so that the focus groups, literature review, and data collection processes could inform and improve the methodology. Focus groups constituted a significant aspect of the qualitative analysis component. The executive directors and planning staff from NIRPC and SIRPC, along with Purdue University Extension Educators, helped identify and recruit focus group participants. Focus groups were conducted on a face-to-face basis in two counties in NIRPC during the early phase of 2020. However, with the onset of COVID-19 restrictions, all focus groups in SIRPC and the remaining one in NIRPC had to be performed online. The purpose of the focus group was to tease out the experiences and insights that residents had during the Great Recession of 2008 and 2009. The focus group was framed around the Community Capitals Framework (CCF) and working groups were established based on different community capitals. The details and findings of the focus groups are described in a separate chapter. The protocols are available in Appendix A.

The literature review evolved around major areas of regional economic resilience that included theoretical concepts, measurement of resilience, and a unique set of studies/projects that delved into the building of resilience through the examination of real wages and earnings of the labor force, innovation in the regional economies, and inter-industry relationships via the use of economic input-output (IO) tables. The review helped identify the variables and indicators employed in previous research projects, the mix of statistical methods employed, and constraints in assessing regional economic resilience. A smaller part of the review explored transportation accessibility. The review informed the collection of data, our statistical analysis, and to a modest extent, our focus group protocol. Over the course of the project, the team engaged in discussions with a handful of economic resilience researchers, such as a faculty member from the University of Idaho. See the separate chapter that showcases our literature review.

The data collection process involved a variety of public and proprietary sources, including the U.S. Census Bureau, Environmental Protection Agency, National Transportation Atlas Database, Harvard Dataverse, Bureau of Economic Analysis, and the Economic Modeling Specialists International. The majority of the data were from 2011 to 2018 and included counts, proportions, shares, distances/lengths, etc., measured in different units. This project employed a Structural Equation Model (SEM) to understand the interrelationships between community capitals and economic resilience, and further the mix of variables and indicators associated with each of the community capitals. Economic resilience and community capitals served as latent constructs or concepts, and hence could not be measured or observed directly. At the same time, the socioeconomic space was multidimensional with various events and processes affecting each other. The SEM enabled a quantitative understanding of the multidimensional and multivariable relationships. Essentially, it provided an idea of how a specific variable could influence economic resilience – either directly or indirectly. The details of SEM and data are provided in a separate chapter.

The project team engaged with the NIRPC and SIRPC planners on a regular basis, informing them of the milestones and sharing the results for their feedback. The outcomes of this project included a report, tools, and a website as mentioned previously. Drafts of these deliverables were shared with NIRPC and SIRPC representatives at various points during the project.

1.4 Organization of this Report

The report begins with the cover page, acknowledgements, table of contents, and an executive summary. The main portion of the report is organized into five chapters. Chapter 1 is the introduction and provides the background, goals and objectives, regional partners, their socioeconomic characteristics, and a schematic of the steps. Chapter 2 includes the literature review of economic resilience, methodologies for measuring economic resilience and their applications in NIRPC and SIRPC, the role of transportation and accessibility, and concludes with describing the Community Capitals Framework and the Grounded Theory. Chapter 3 provides details of the focus groups in the two regions and the results and insights gleaned from these engagements. Chapter 4 presents the statistical data analysis and the Structural Equation Model (SEM) that describes the direct and indirect relationships, along with the tool development. Chapter 5 focuses on conclusions from the study including the policy implications of the findings from qualitative and quantitative studies. References are included after each chapter. Following the main chapters, the report contains user guides on how to use the "What-If?" tool and the data dashboards, followed by a discussion of the results and conclusions. The report ends with a collection of appendices that include the focus group instruments, a roster of community meetings, project meetings with NIRPC and SIRPC, and detailed tables of statistical analysis results associated with Chapter 4.

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Table 1.1: Demographic and Economic Distress Variables for NIRPC and SIRPC

Variable	NIRPC	SIRPC
Population 2020	784,332	250,423
Population 2010	771,815	249,822
Population 2000	741,468	236,730
Population 1990	711,592	213,494
Population 1980	751,413	207,569
Population 1970	738,709	185,101
% Change 2010-2020	1.6%	0.2%
% Change 2000-2010	4.1%	5.5%
Age group 2019		
19 years or less	25.1%	24.9%
20 to 59 years	50.8%	50%
60 to 79 years	19.9%	21%
80 years and older	4.2%	4.1%
Age group 2000		
19 years or less	29.1%	29.6%
20 to 59 years	54.2%	54%
60 to 79 years	13.5%	13.3%
80 years and older	3.2%	3.1%
Educational attainment 2019		
Bachelor's degree or more	21.5%	17.4%
Associates degree	7.9%	7.7%
Some college	23.5%	20.4%
High school	36.1%	42.5%
Less than high school	11%	12%
Educational attainment 2000		
Bachelor's degree or more	17.1%	12.7%
Associates degree	5.4%	5.2%
Some college	21.6%	17.1%
High school	38%	44.1%
Less than high school	17.8%	20.9%
Economic Distress 01-2020		
Distress by income	LaPorte County	Decatur, Jefferson, Jennings, Ohio, Ripley, Shelby and Switzerland counties
Distress by unemployment	Lake County	
Not distressed	Porter County	Dearborn and Franklin counties
Economic Distress 01-2017		

Variable	NIRPC	SIRPC
Distress by income	LaPorte County	Decatur, Jefferson, Jennings, Ohio, Ripley and Switzerland counties
Distress by unemployment	Lake County	
Not distressed	Porter	Dearborn, Franklin and Shelby counties

Source: Developed by authors using U.S. Census Bureau and StatsAmerica's Measuring Distress Tool

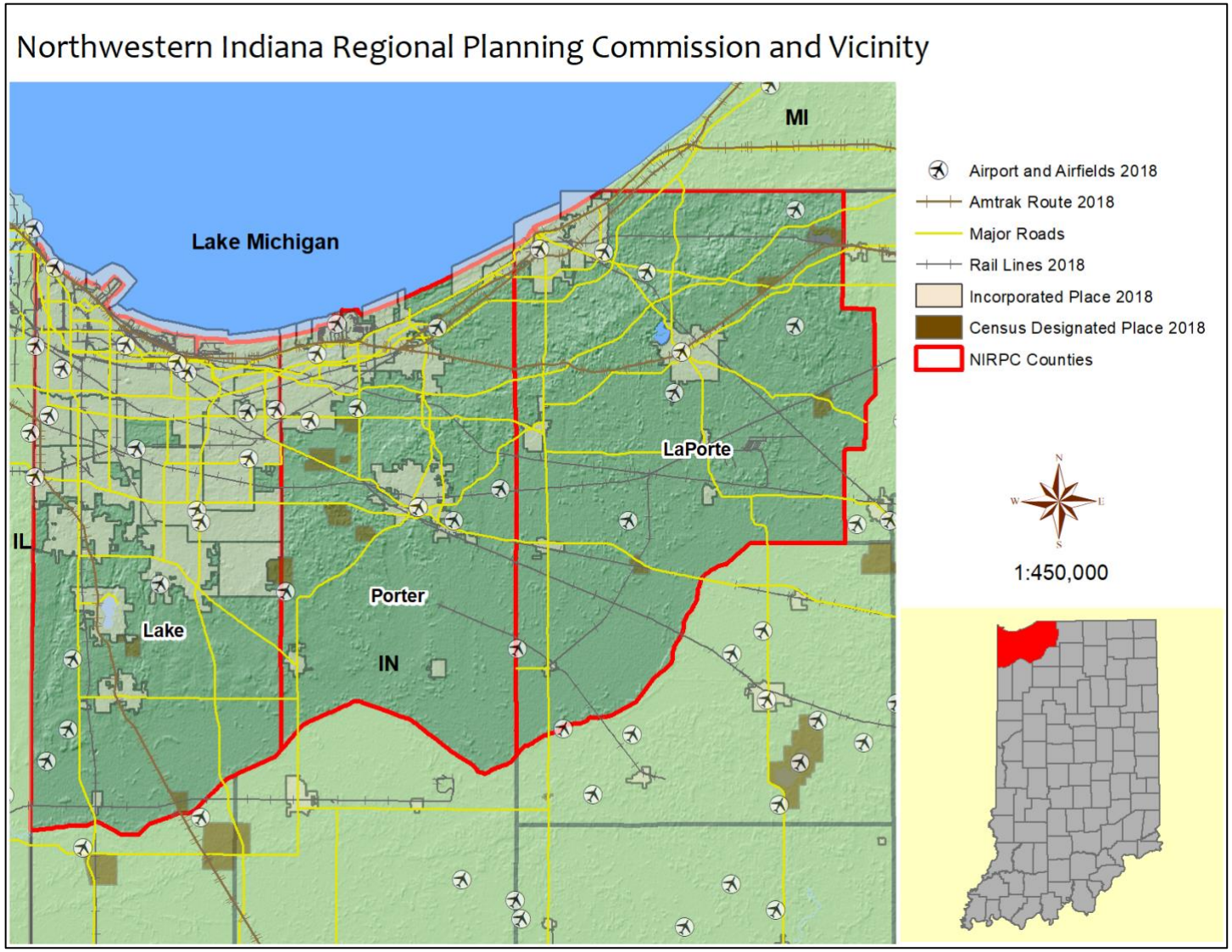

Figure 1.2: Northwestern Indiana Regional Planning Commission
Source: Mapped by PCRD using Esri and other data sources.

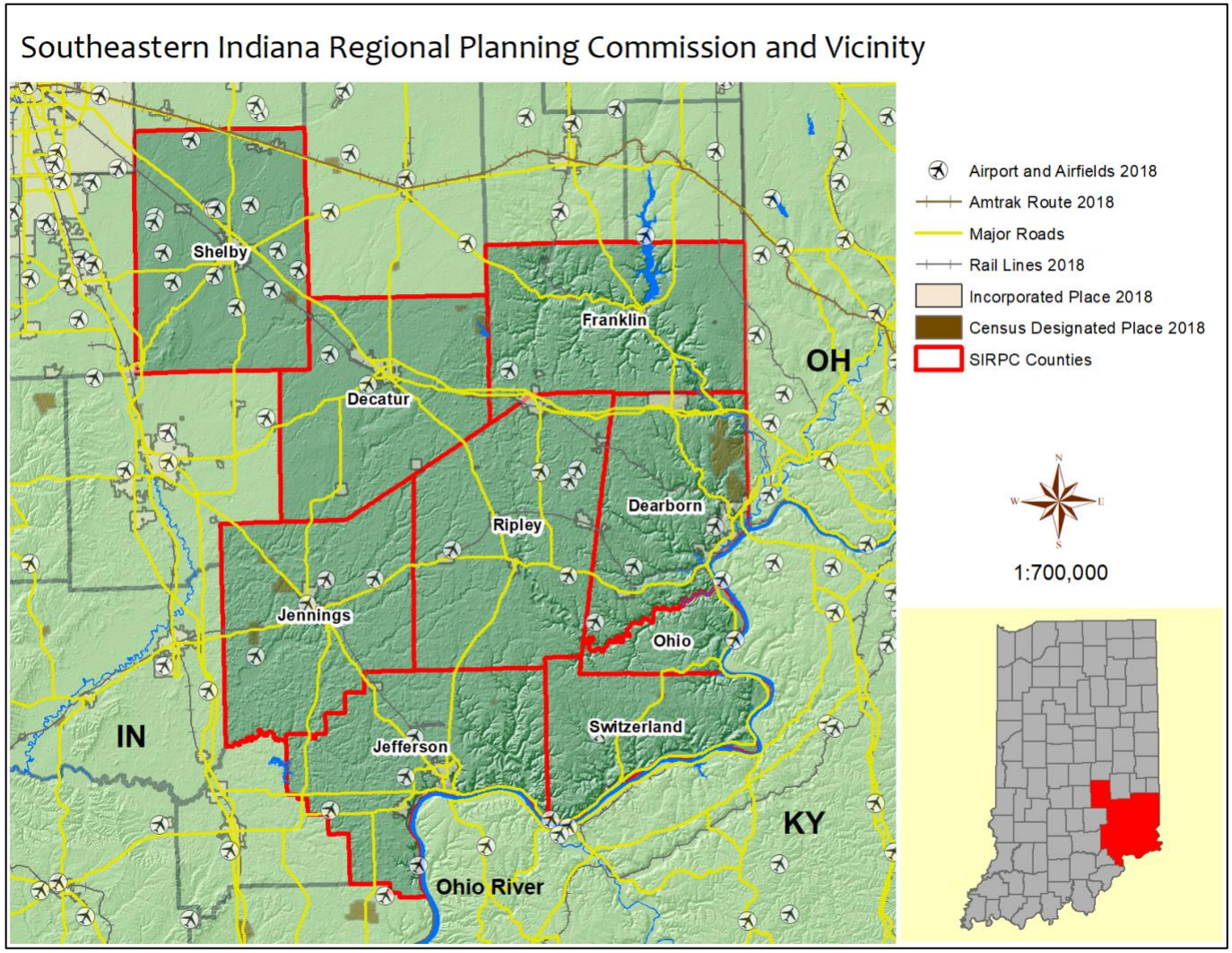

Figure 1.3: Southeastern Indiana Regional Planning Commission
Source: Mapped by PCRD using Esri and other data sources.

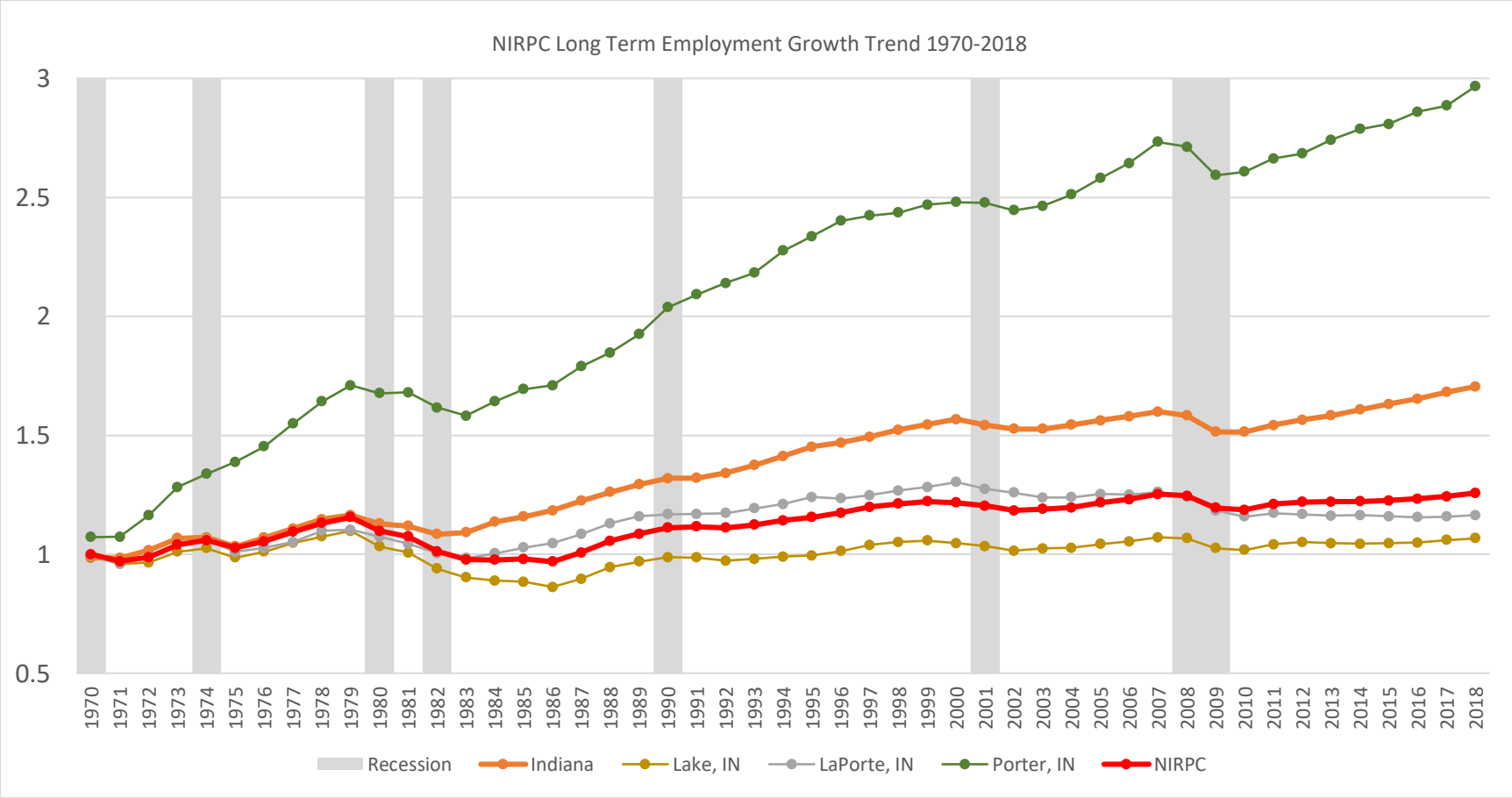

Figure 1.4: NIRPC Long-Term Employment Growth Trend 1970-2018

Source: Prepared by PCRD using the BEA data.

Note: Employment is indexed to 1969 jobs. Gray bars are recession periods.

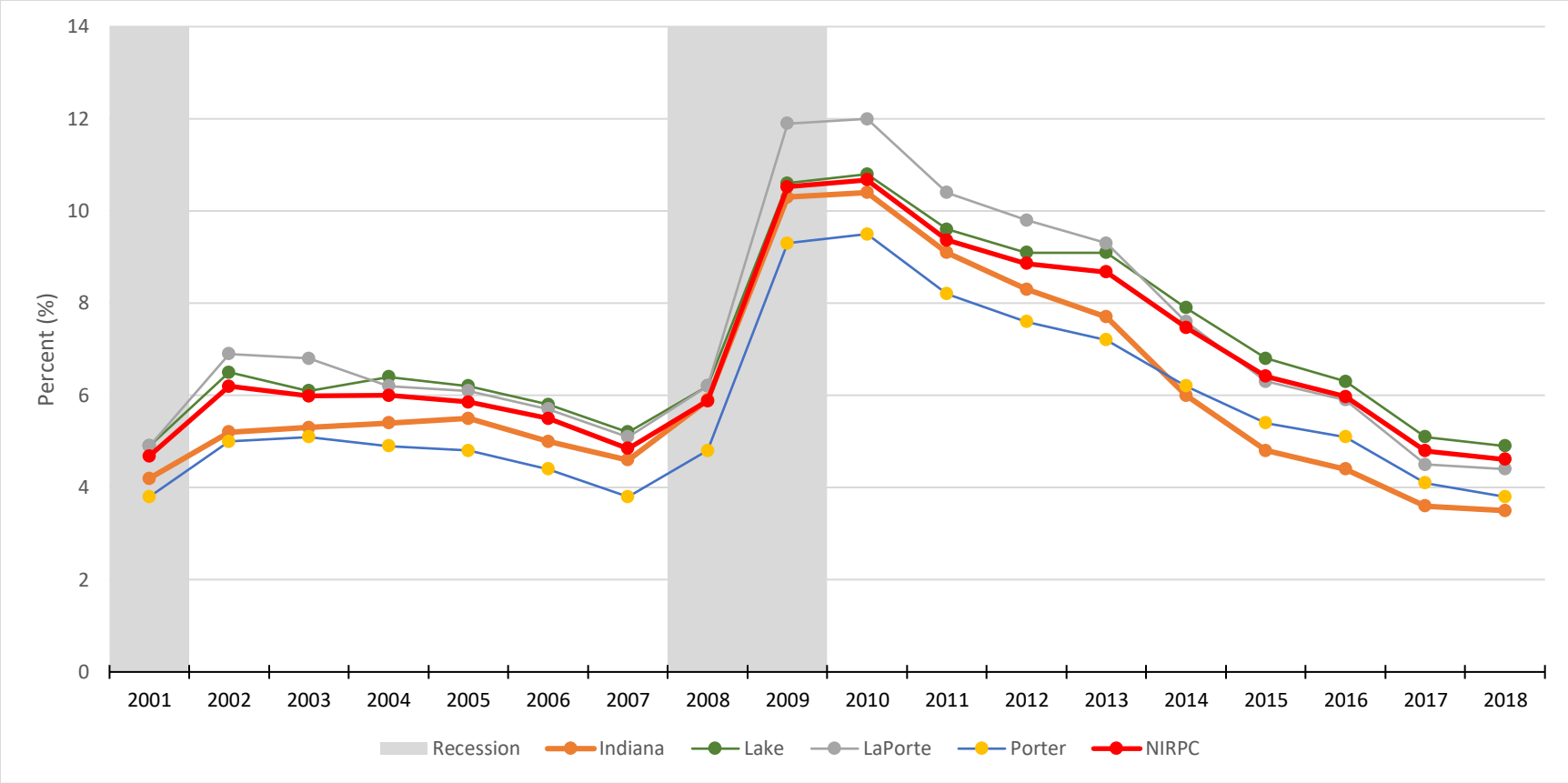

Figure 1.5: NIRPC Annual Average Unemployment Rate 2001 to 2018

Source: Prepared by PCRD using the BLS data.

Note: Gray bars are recession periods.

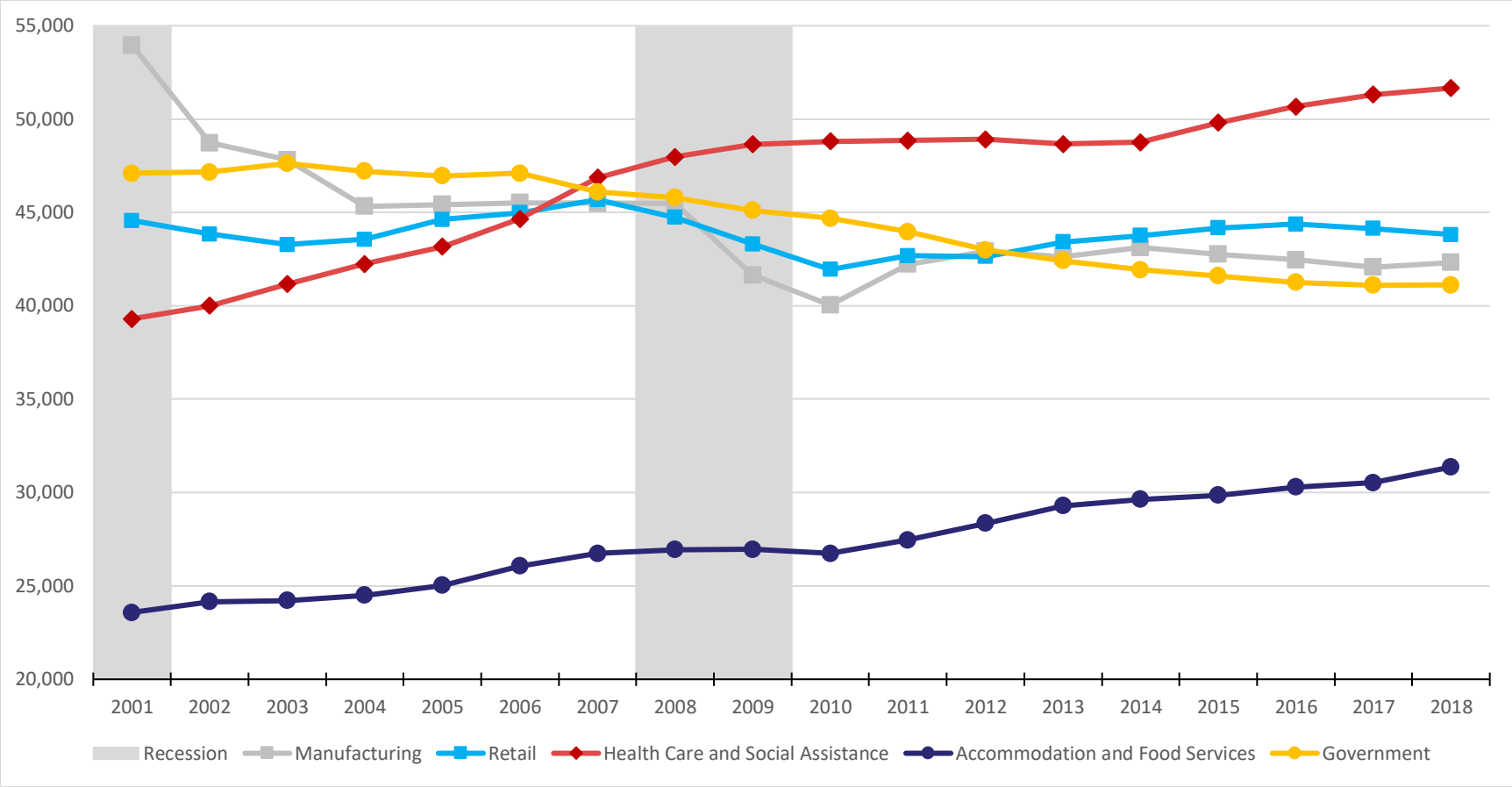

Figure 1.6: NIRPC Top Five Industry Sectors 2001 to 2018

Source: Prepared by PCRD using the EMSI 2020.1 data.

Note: Gray bars are recession periods. QCEW, non-QCEW, self-employed, and extended proprietors.

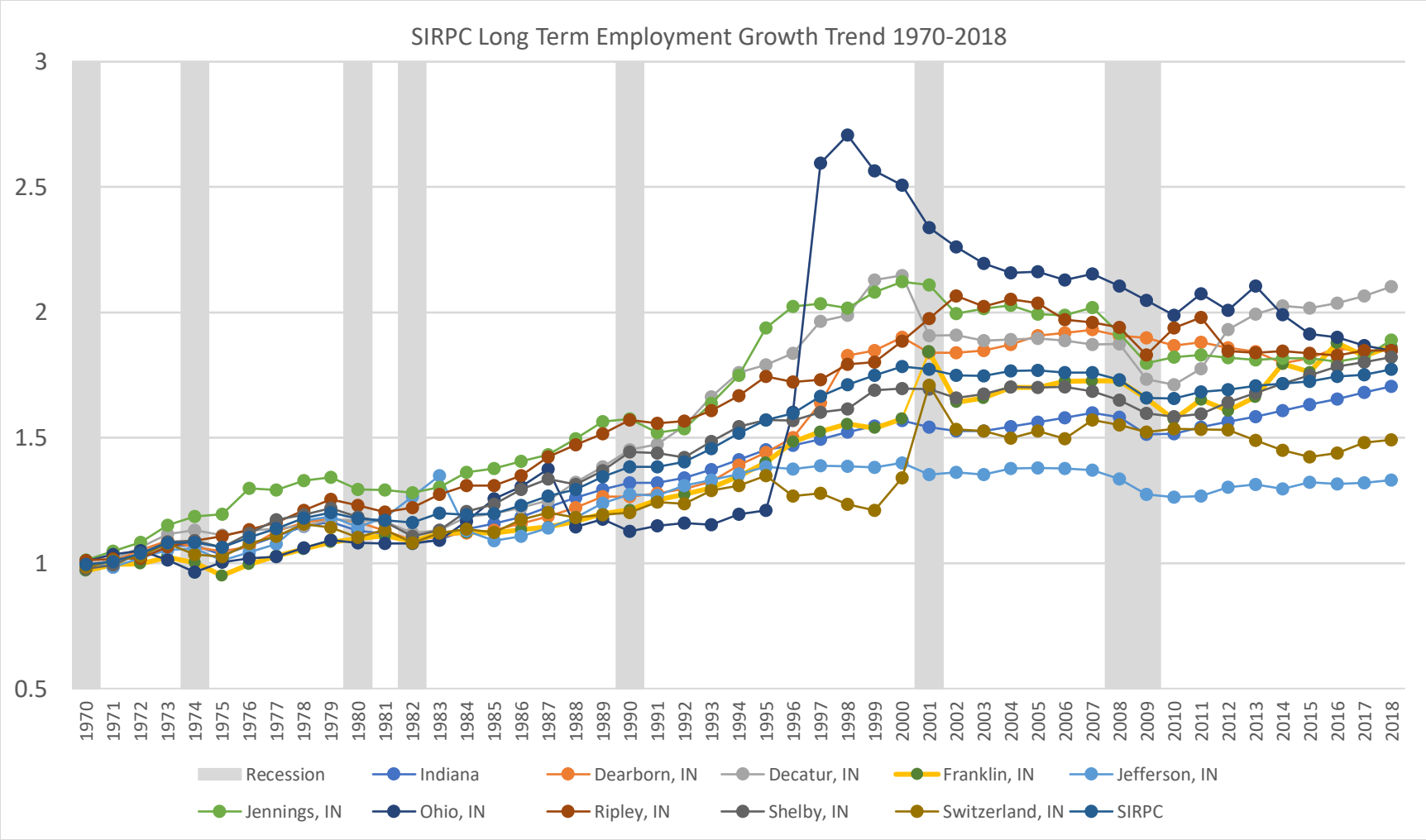

Figure 1.7: SIRPC Long-Term Employment Growth Trend 1970-2018

Source: Prepared by PCRD using the BEA data.

Note: Employment is indexed to 1969 jobs. Gray bars are recession periods.

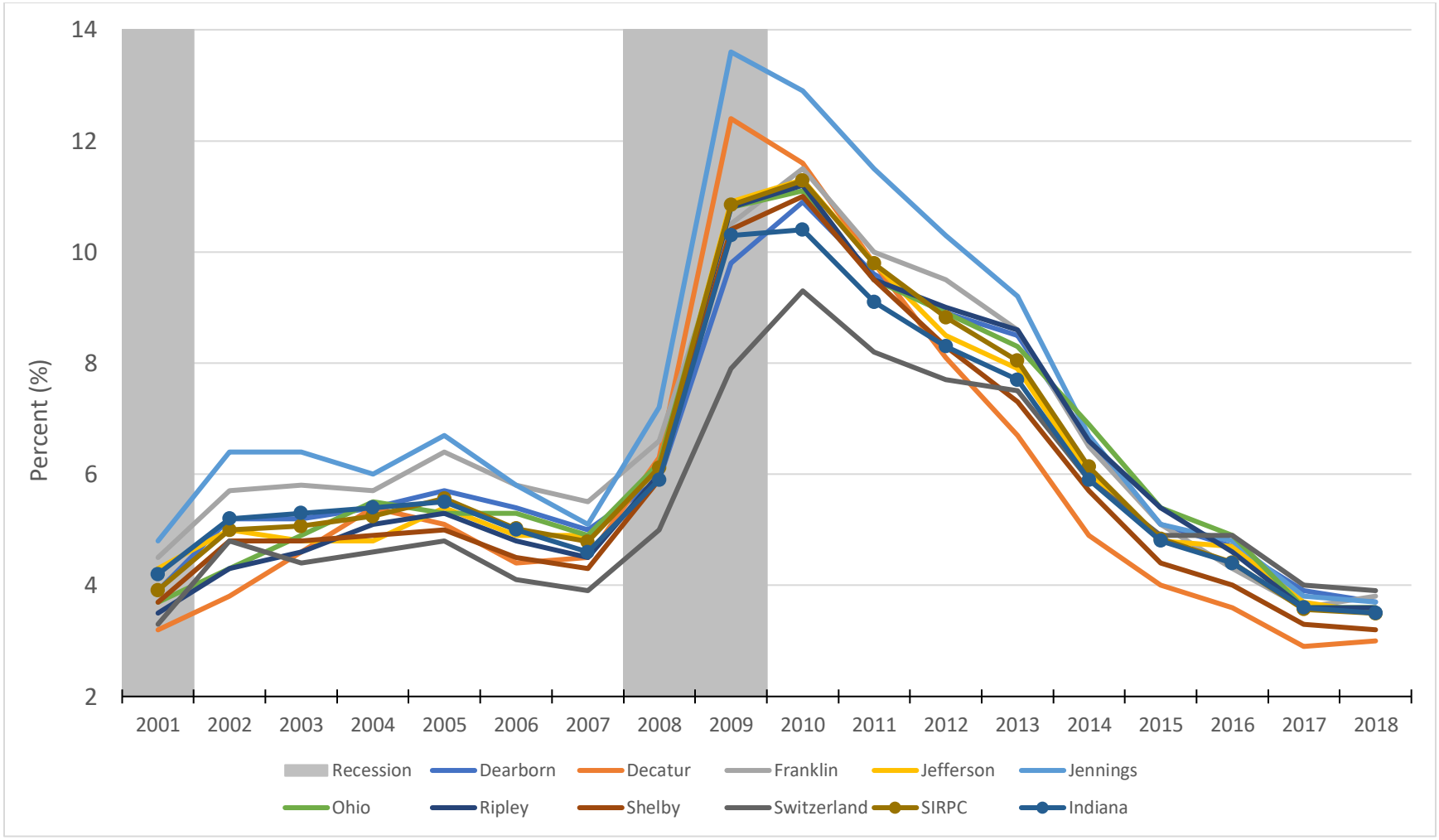

Figure 1.8: SIRPC Annual Average Unemployment Rate 2001 to 2018

Source: Prepared by PCRD using the BLS data.

Note: Gray bars are recession periods.

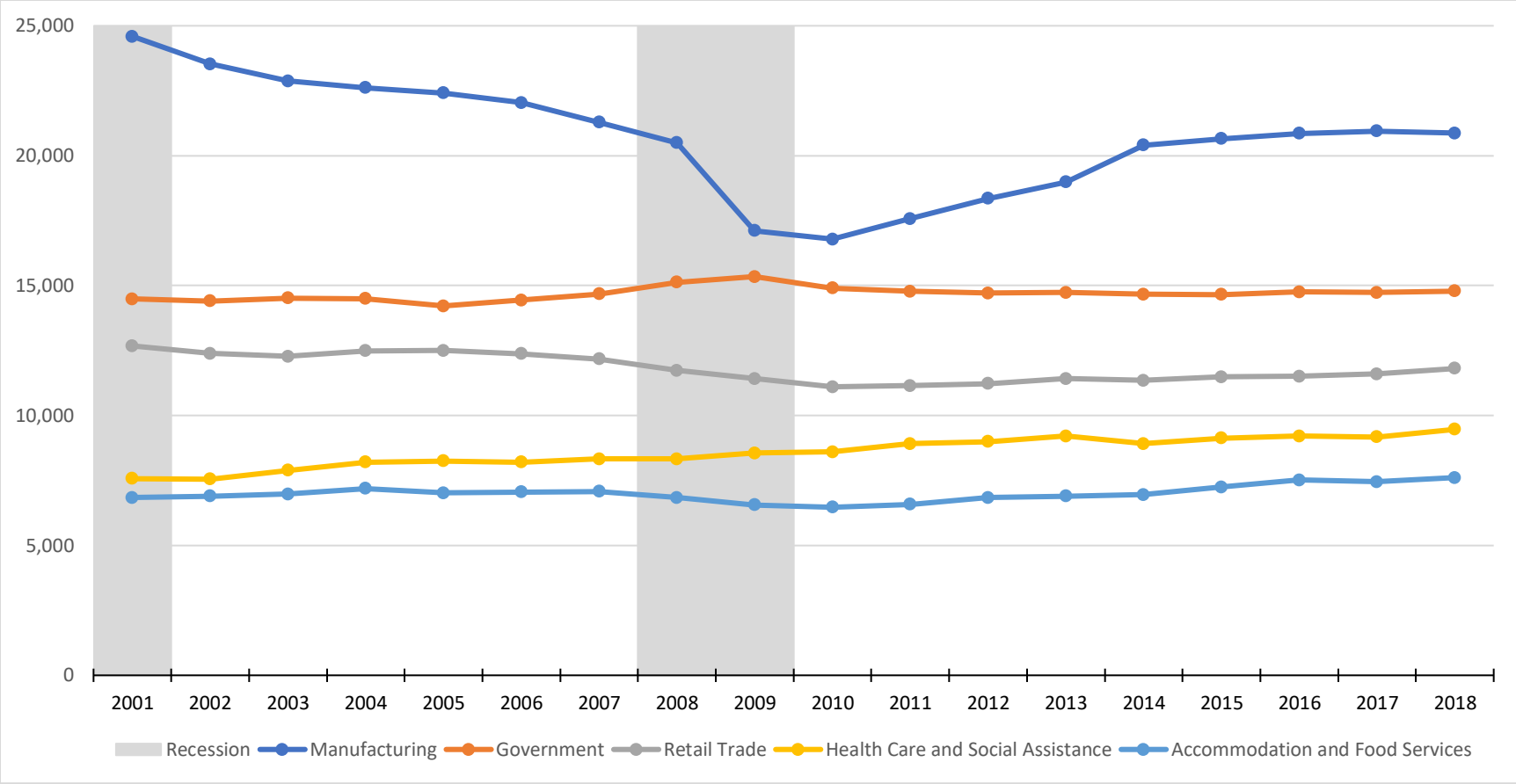

Figure 1.9: SIRPC Top Five Industry Sectors 2001 to 2018

Source: Prepared by PCRD using the EMSI 2021.2 data.

Note: Gray bars are recession periods. QCEW, non-QCEW, self-employed, and extended proprietors.

2 Overview of Economic Resilience Concept and Literature Review

2.1 What is Economic Resilience and What it isn't?

Studies on economic, business and disaster resilience have increased by leaps and bounds in the last few years as communities and regions have faced significant and frequent economic, natural, and man-made disruptions. These include economic crises such as the Great Recession (2008-2009), impacts of hurricanes such as Hurricane Maria on Puerto Rico and Hurricane Harvey on Houston, 2020 wildfires in California, and the COVID-19 pandemic. In 2012, a New York Times op-ed called for "resilience thinking" in planning and urged us to plan for developing "resilience" in our communities.[12] The authors of the book, "Resilience: Why Things Bounce Back", have suggested a need to move beyond "sustainability" by embracing "resilience" so that systems are better prepared for uncertain shocks and risks (Zolli and Healy 2012). Whereas the paradigm of resilience is broad, covering ecological, environmental, social, and national economies, our project focuses strictly on the resilience of economies. Furthermore, while scholars have explored resilience at different scales -- such as individual, family, community, and region -- our focus is on the economic resilience of a region that encompasses of several counties and communities. Martin (2012) has provided four dimensions of regional economic resilience:

- *Resistance*: Sensitivity of a regional economy and depth of a reaction to a recessionary shock[13]
- *Recovery*: Speed and magnitude or degree of recovery from a recessionary shock[14]
- *Re-orientation*: Adaptation and re-alignment of a regional economy in response to a recessionary shock[15]
- *Renewal*: Developing new growth paths and altered growth trends or resuming pre-recession growth paths as a result of a recessionary shock[16]

Recent scholarly discussions have mentioned "resistance and recovery" as processes for mitigation and "re-orientation and renewal" as part of adaptive resilience (Mayor and Ramos 2012). The authors conclude that economic resilience can enhanced by pursuing one or more of the dimensions mentioned above. Note that a region might have underpinnings in one or more of the dimensions. Conversations on economic resilience need to go beyond the discussions on sustainability and focus not only on "what" but also on "how" and "when". In this context, the following sections attempt to summarize the limited literature available in this area. First, we explore regional economic resilience and its measurement by different researchers including the application of a few of those methods on the two regional partners, NIRPC and SIRPC. Second, we present a summary of transportation accessibility and community capitals framework, two important characteristics to strengthen the economic resilience of the regions. The review focuses on the literature published in the areas of regional economics, regional science, and transport and economic geography, including emerging areas such as network science and complex adaptive systems.

[12] https://www.nytimes.com/2012/11/03/opinion/forget-sustainability-its-about-resilience.html
[13] Four dimensions of regional economic resilience, p.12, Martin (2012).
[14] Ibid. p.12.
[15] Ibid. p.12.
[16] Ibid. p.12.

2.2 Types of Economic Resilience and Measurement

Regional economic resilience refers to the capacity of the regions to counter and cope, recover and rebound, and adapt and reconfigure from external economic shocks that are unexpected and unanticipated (Fingleton et al., 2012; Boschma, 2015; Martin et al., 2016). Scholars distinguish three types of regional resilience: Engineering, Ecological, and Evolutionary resilience. The engineering-resilience focuses on the single equilibrium concept assuming that the economy will return back to the steady-state (Fingleton et al., 2012; Holling, 1996). Ecological-resilience delves into the multi-equilibrium concept where the shock has caused significant changes in the growth path and returning to the steady-state is not feasible (Fingleton et al., 2012). Hence, the region might recover either the growth rate or the level (employment or output) or both to the pre-shock period or adapt to a completely different growth rate or level in the post-shock period (Fingleton et al., 2012; Martin, 2012). Ecological-resilience is measured by the level of shock or disturbance that the system can absorb and sustain before changing its steady state (Holling, 1996). The third type of resilience is known as adaptive resilience or evolutionary resilience (Boschma, 2015; Martin 2012). This resilience refers to the adaptation and evolution of the socio-economic systems and regional economies as complex adaptive systems (Boschma, 2015; Chacon-Hurtado et al. 2020). Martin (2012) describes adaptive resilience as the capacity to anticipate, sense, and prepare to counter the shock and minimize its effects. Boschma (2015) presents evolutionary perspective as the capacity of the region to adapt its socioeconomic structure and configure new growth paths. The evolutionary resilience incorporates synergies between industry structure, networks, and institutions, and hence provides a systems perspective to the regional resilience (Boschma, 2015).

Past studies have measured economic resilience either through the engineering-resilience or the ecological resilience lens (Modica and Reggiani, 2015; Chacon-Hurtado et al., 2020). For example, researchers have measured employment-decline or difference between peak employment level before the shock and the lowest employment level or trough after the shock. The employment-recovery in the same vein is measured as a difference between the lowest employment level at the trough and the peak employment level in the post-recession recovery period. Researchers found that counties entered and exited the Great Recession of 2008-2009 during different time-periods (Han and Goetz, 2015; Ringwood et al., 2018). They also found that counties had unique trajectories or slopes (pathways) between employment-decline and employment-recovery stages. Past studies have measured economic resilience, in general, as a ratio between economic-recovery (rebound) and economic-decline (drop).

2.2.1 Measuring Economic Resilience

Research on economic resilience surged after the Great Recession of 2008-2009 with pioneering studies and projects in Europe, the United States, and Australia. The geographical scope and scale for measuring resilience varied from metropolitan areas (Hill et al. 2011) to counties (Han and Goetz 2015, Kahsai et al. 2015, Ringwood et al. 2018, Han and Goetz 2019, Chacon-Hurtado et al. 2020) to small communities (Dinh et al. 2017). One recent study looked into the susceptibility of industry sectors to economic shocks at the country level (Klimek et al. 2019). This study analyzed economic input-output (IO) tables for 43 countries from 2000 to 2014 and found that in the case of retail, real estate, and public administration sectors, shocks were amplified, and in the case of manufacturing sector, the rebound was quicker (Klimek et al. 2019). The pathways to recovery might differ based on the particular industry sector impacted by the economic shock. For example, the 2001 U.S. recession was primarily the dotcom and finance industry bubble affected by the growth in telecommunications and information technology sectors during the late 1990s. The recession lasted from March to November 2001 and impacted the

manufacturing, wholesale, and transportation sectors with the U.S., shedding more than 1.3 million jobs in 2001 (Langdon et al., 2002). In comparison, the 2008-2009 Great Recession commenced from the real estate and housing market bubble and gradually spread to almost every industry sector. The recession lasted from December 2007 to June 2009 with the U.S. shedding nearly 8.8 million jobs (Goodman and Mance 2011). In both cases, the leading events were the collapse of the financial markets, loan and mortgage, and investment institutions.

While leading indicators of recessions are usually plummeting stock market values, a large number of studies have utilized employment level, a lagging indicator, to measure economic-decline during recession and economic-recovery in the post-recession period. Some exceptions include Klimek et al. (2019) and Han and Goetz (2019) who used economic IO tables to assess economic resilience based on the interindustry relationships. Similarly, a handful of studies explored resilience through other parameters. For example, Chapple and Lester (2010) used real earnings per worker to examine the resilience of labor markets; Lewin et al. (2018) employed personal income and income inequality to study the Great Recession; and Bristow and Healey (2018) used innovation to classify economic resilience of regions. A select group of studies are described below.

- *Martin et al. (2016)*

This research team developed the concept of resistance and recoverability by assuming a counterfactual or an expected value based on the national trend. Hence, the measure for resistance is a ratio of the difference between actual contraction versus contraction per the national trend divided by the absolute value of contraction per the national trend. The recoverability has a similar formula based on the growth. The positive value indicates that the region is more resistant while a negative value shows that the region is less resistant compared to the nation. Both the metrics in Equations 1 and 2 are centered around 0, where a region has the same resilience as the nation (Martin et al. 2016). If $Resis_r$ is positive, it means that the region has countered the national rate of decline. If $Recov_r$ is positive, it means that the region has recovered with a higher growth rate than the nation. Martin et al. (2016) presented a framework to classify regions based on robust resistance and recoverability versus weak resistance and recoverability. The authors further decompose the numerators in Equations 1 and 2 into industry mix and competitive effects of the shift-share analysis. If the regional economy has industry sectors that are resilient at the national level, the region will have the resilience to the economic shocks (Martin et al. 2016).

$$Resis_r = \frac{\left(\Delta E_r^{Contraction} - \Delta E_r^{Contraction^{expected}}\right)}{\left|\Delta E_r^{Contraction^{expected}}\right|} \quad 1$$

$$Recov_r = \frac{\left(\Delta E_r^{Recovery} - \Delta E_r^{Recovery^{expected}}\right)}{\left|\Delta E_r^{Recovery^{expected}}\right|} \quad 2$$

- *Han and Goetz (2015), Han and Goetz (2019), Appalachian Regional Commission (2019), Ringwood et al. (2018)*

Han and Goetz (2015) compiled monthly employment data for counties from 2000 to 2014 from the Quarterly Census of Employment and Wages (QCEW), Bureau of Labor Statistics (BLS). They estimated the pre-shock compound annual growth rate to determine the expected growth in absence of the recession after adjusting the data for seasonal variations. The estimates for drop or economic-decline and rebound or economic-recovery were developed. Economic resilience is the standardized value (Z-

score) of a ratio, where the ratio is the natural log of rebound versus drop. Equations 3 to 6 from Han and Goetz (2015) show the drop, rebound, ratio, and resilience, respectively.

$Drop = \frac{\hat{y}_{t2} - y_{t2}}{\hat{y}_{t2}}$; Y_{t2} is the lowest employment value 3

$Rebound = \frac{y_{t3} - y_{t2}}{y_{t2}} * \frac{1}{t3 - t2}$; Y_{t3} is the highest employment during recovery phase 4

$Ratio = ln\left[\frac{Rebound - min(Rebound) + s}{Drop - min(Drop) + s}\right]$; S is a small number to ensure positive values 5

$Resilience = \frac{ratio - ave(ratio)}{stdev(ratio)}$; Z-score 6

The Appalachian Regional Commission (2019) followed a similar methodology with two major differences. First, the study period was extended from 2014 to March 2016. Second, the study introduced the concept of impulse or velocity to the peak, trough, and rebound based on Han and Goetz (2019). The research showed that in addition to the magnitude of the drop and rebound, the velocities of reaching the pre-recession peak, aftershock trough, and post-recession rebound also mattered. In other words, slow, moderate, or fast declines and slow, moderate, or fast recoveries are important parameters to assess regional economic resilience. Ringwood et al. (2018) built on previous researches and defined depth or magnitude of shock and duration after accounting for random variations. Pre-shock, post-shock, and actual employment trendlines constitute the dimensions of a county's response to the economic shock (Ringwood et al. 2018). A county's resilience is an area under the actual employment curve minus the area based on the pre-recession trendline after adjusting for random variations. A positive value means the county was resilient. Ringwood et al. (2018) presented recovery as a return to the pre-recession employment growth rate than the level.

- *Chacon-Hurtado et al. (2020)*

This research developed a metric, "Regional Economic Resilience", based on the regional shift or competitive effect of the shift-share analysis. The dynamic shift-share analysis is used and the competitive effects are plotted on a timeline. Hence, the economic resilience of the region can be interpreted as the area under the curve of competitive effects after deducting the area of the national effects trendline. Equation 7 shows the Regional Economic Resilience metric as a sum of competitive effects CE_r^t scaled by the average employment E_b from 2004 to 2007. An advantage of using a competitive effect is that it measures the region's capacity to counter the national trend. The scaling helped to reduce the effects of very large or small labor markets of counties in the Great Lakes Region.

$RER_r = \sum_{t=1}^{m} CE_r^t \Big/ E_b$ 7

- *Chapple and Lester (2010), Lewin et al. (2018)*

These studies explored regional economic resilience from the perspective of the labor markets. Chapple and Lester (2010) studied persistence or change in income inequality by using the middle-income or 50:10 ratio. The ratio measures income differences between the median and the lowest 10th percentile population. The authors also studied the change in real average earnings per worker to assess economic resilience. Chapple and Lester (2010) defined a region as transformative if the level or change was below average in the previous decade and above average in the following decade. Further, the authors defined stagnant, faltering, and thriving regions based on the start and end states of the indicators (Figure 2.1). Lewin et al. (2018) argued that limited research has happened on the effects of income inequality on

the economic recession. The authors established the causal mechanism that hollowing out of the middle class can increase the propensity for a county to enter an economic recession. The hazard modeling results revealed that a 1% increase in the GINI Index increased the chance to enter a recession by 6.6%. Lewin et al. (2018) found that growth in the population 65 years and over, of those under 18 years of age, and of individuals employed in service-providing sectors, boosted the chances of entering into an economic recession. At the same time, an increase in diversity (Blacks and Hispanics), transfer income, per capita income relative to the U.S. average, etc., decreased the chances for entering into an economic recession. Lewin et al. (2018) described the context that hollowing out of the middle class can lower the resilience of the counties since the middle class spend and consume locally and drive the local demand, and is "educated, mobile, entrepreneurial and pay taxes (p.789)".

End status / Start status	Below average	Above average
Below average	Stagnant	Transformative
Above average	Faltering	Thriving

Figure 2.1: Resilience Typology
Source: Based on Chapple and Lester (2010)

- *Bristow and Healy (2018), Shutters et al. (2015)*

Bristow and Healy (2018) found that innovative regions in Europe were able to counter the recessionary shocks of 2007 to 2008 effectively and recovered from the recession within three years. In so doing, the authors made a compelling case for building and investing in the regional innovation capacity (RIC) of the regions. Innovation builds capacity and adaptability for regions, enabling them to change their growth paths after sustaining economic shocks and hence, add to the evolutionary economic resilience capacity of the regions (Bristow and Healy 2018). The study used a unique European Regional Innovation Scoreboard as the data source. The data included outputs from the well-known Community Innovation Survey (CIS) in Europe which captured the firm-level innovation activities. A higher proportion of innovation-leader regions were able to either resist the economic recession or recovered from the shock at a faster pace compared to regions that were either innovation-follower, moderate-innovator, or modest-innovator.

Shutters et al. (2015) explored economic resilience through the lens of the complex systems measured via interrelatedness in labor markets. In particular, the authors dealt with two competing points of view. First, a highly interconnected system can sustain a shock if one node fails because of the existing complementary linkages in the network. The other view is that a highly interconnected system will fail due to an economic shock because of the cascading effects spreading out through the network. The authors' research on occupational labor markets in the U.S. metropolitan areas led to the conclusion that matured, specialized, and interconnected labor markets were vulnerable and less resilient (Shutters et al. 2015). The authors defined a conditional probability that two randomly selected occupations will be specialized (LQ>1)[17] in Equation 8, where $m, m', and\ m''$ are randomly selected metropolitan areas.

[17] LQ stands as Location Quotient which is a ratio of proportion of occupational employment to total employment in the region versus proportion of occupational employment to total employment in the nation. LQ>1 for an occupation indicates specialization in that particular occupation.

The authors further estimated link values by weighting the conditional probability between two occupations with average normalized employment followed by the tightness index for a metropolitan area as the sum of all link values. The metropolitan areas with many specialized pairs of occupations and higher tightness values did not fare well during the recession period. The average tightness value of the U.S. metropolitan areas decreased in 2009 and increased gradually in the post-recession period (Shutters et al., 2015). This shows that having pairs of specialized occupations might not help to counter the recession. Industrial diversification has been suggested as a strategy to counter the economic shocks, Shutters et al. (2015) show that occupational or skill diversification is equally important.

$$\xi_{ij} = \left\{ \left[LQ_i^{(m)} > 1, LQ_j^{(m)} > 1 \right] \Big/ P\left[LQ_i^{(m')} > 1 \right] P\left[LQ_i^{(m'')} > 1 \right] \right\} - 1 \qquad 8$$

- *Kahsai et al. (2015), Dinh et al. (2017)*

Kahsai et al. (2015) developed a county-level economic resilience index comprised of six dimensions which included human capital, industrial diversity, income diversity, entrepreneurial activity, business dynamics, scale and proximity, and physical capital, respectively. Each dimension was comprised of more than one indicator. The authors standardized the data and created sub-indices by adding the standardized indicators. The county economic resilience index is the sum of weighted averages of the sub-indices assuming equal weightage for each of the six sub-indices. The authors classified counties in West Virginia into quartiles for 2000 and 2005.

Dinh et al. (2017) developed a community economic resilience index for statistical area level 1 (SA1) geographies in Australia for 2006 and 2011. The SA1 is the smallest geography with populations varying between 200 and 800 with an average of 400 individuals. The authors developed the index based on five community capital measures which included human, social, natural, physical, and financial capital. In addition, the authors added the community's economic diversity and the level of accessibility by using the Accessibility and Remoteness Index developed for Australia. The authors first developed specific index by using the principal component analysis followed by the composite index, which is the mean of standardized values (0 to 100) of seven different indexes. Next, they developed fixed effects models for individual and composite resilience index by including time-invariant effects such as urban, rural, state, etc., and dummy variables for the years. In general, rural areas in Australia increased their resilience index between 2006 and 2011. The model between the composite resilience index in 2006 and median household income in 2011 revealed a positive relationship. Hence, enhanced resiliency in the past increased household incomes in the future. In contrast, economic shocks and recessions could plummet significant financial resources at different hierarchical levels. For example, Shutters et al. (2015) quoted that U.S. households lost nearly $16 trillion of wealth during the recession of 2008-2009 and highlighted the Panarchy Framework where shocks cascaded from nation to the households which belonged to the lowest order in the hierarchy.

- *Hill et al. (2011), Foster (2012)*

The authors researched economic resilience as part of the *Building Resilient Regions Initiative* funded by the MacArthur Foundation from 2006 to 2013. The article by Edward Hill and co-authors is part of the studies in Urban and Regional Policy and Its Effects: Building Resilient Regions, published by the Brookings Institution in 2012. Hill et al. (2011) defined a region as "shock-resistant" if no adverse impacts on employment and economic output resulted from the economic shock. Conversely, a region

is determined to be “resilient” if it recovers at least the prior growth-path if not the level within a certain period of the shock (Hill et al., 2011). In contrast, a region can be “non-resilient”, the most undesirable condition for a region. The authors defined economic shocks either as a national economic downturn, a national or local industry shock, or a combination of both, and studied the recovery of the metropolitan regions since 1970. They found that regions generally had recovered their pre-shock unemployment rates but not the employment levels. Note that a declining labor participation rate can explain declining unemployment rates, but it fails to capture the underemployed and discouraged workers in the labor market. The modeling results revealed that a region dependent on durable manufacturing, a smaller number of export industries, lower levels of formal schooling in residents, experiencing a national industry shock, without right-to-work laws or with unions, and higher income inequality is more susceptible to a downturn in employment, gross regional product, or both. The modeling results, based on select regions that experienced shocks, revealed that a higher share of employment in durable manufacturing and lower levels of educational attainment made the regions less resilient. They also found that diversity in export industries was more important than overall industrial diversity in explaining the shock-resistance of the regions.

The third type of model focused on the resiliency or capacity of the regions to rebound after economic shocks. The regions with right-to-work laws or flexible non-unionized labor markets had more resilience in both employment and gross regional product (Hill et al., 2011). A counterfactual finding was that higher-income inequality decreased employment resilience but increased gross regional product resilience, (Hill et al., 2011). A higher share of employment in health care and social assistance might help during recession making regions less susceptible, but also hinder faster recovery in the post-recession period (Hill et al., 2011). The authors also found unique characteristics by geography such as metropolitan areas in the West were more susceptible to employment downturns but more resilient in recovering after the downturn. The authors’ final model explored the duration of recovery or the length of time to recover after a downturn and found that regions with the higher number of research universities recovered faster in employment than in the gross regional product. Overall, the research revealed the importance of multi-pronged policies targeting state workforce laws, structural economic factors, and household plus individual-level characteristics.

As part of the Building Resilient Regions Initiative, Foster (2012) presented resilience as an “outcome” measured as the degree of recovery in the post-stress period or a “capacity” comprised of the socioeconomic conditions and attributes that enabled resiliency in the regions. The author developed a framework for regional performance as a function of resilience capacity, attributes of the stress, and non-capacity factors. This particular research proposed an index for metropolitan regions based on relative-resilience. Compared to absolute-resilience, which is based on identifying the threshold values for various indicators, relative-resilience incorporates simple ranking of regions, and hence more tractable in sparse data situations (Foster 2012). The author identified three main categories of resilience capacity index which included regional economic capacity, sociodemographic capacity, and community connection capacity. The regional economic capacity included variables for economic diversity, income, and income distribution; sociodemographic capacity was comprised of education, working age, ability, and poverty; and community connection capacity encompassed variables on familiarity, linguistic connection, and housing. The index values were developed by summing average z-scores of various capacity variables. Laredo, TX was identified as a metropolitan region with the lowest resilience capacity while Rochester, MN emerged as the region with the highest resilience capacity. Additional metropolitan areas with higher scores in resilience capacity were Ames, IA; Madison, WI; Minneapolis-St. Paul-Bloomington, MN-WI; and Burlington-South Burlington, VT which performed well in sociodemographic capacity. Foster (2012) found that college-towns fared well in sociodemographic capacity enhancing their resilience capacity scores. On the other spectrum include metropolitan areas

with dominant industries but non-diversified economies such as Dalton, GA; Las Cruces, NM; Visalia-Porterville, CA; and Laredo, TX. These areas had negative scores in all the three main categories of economic capacity, sociodemographic capacity, and community connection.

2.2.2 Application of Existing Frameworks on NIRPC and SIRPC Regions

The previous sections covered definitions of economic resilience, measurement framework, and summaries of select research studies on economic resilience. This section presents the application of a few previously published methods on the NIRPC and SIRPC regions, particularly at the county level.

- *Framework by Han and Goetz (2015)*

The researchers developed an index for economic resilience. Figure 2.2 shows the chart for resilience index for NIRPC and SIRPC counties based on the framework developed by Han and Goetz (2015). The resilience index is the standardized value of the log of the ratio of rebound to drop. If a county has experienced a smaller drop from an economic shock, and a greater rebound after the economic shock, it is more resilient. As per this framework, Decatur, Ohio, Ripley, and Dearborn counties in the SIRPC region are more resilient with positive values for the Resilience Index. Within NIRPC, only Lake County exhibited a positive resilience index. Note that Switzerland County in SIRPC peaked and then declined continuously after the economic shock of the Great Recession. Hence, Switzerland County is not included in the chart. This framework is applicable when a county has observed both, a drop and a rebound. Henceforth, this framework is not applicable for some of the counties in Indiana. For example, Hendricks County has grown continuously during the study period despite the Great Recession of 2008-2009. Martin, Posey, Union, and Switzerland counties in Indiana declined continuously from their peak values of jobs after the Great Recession. Han and Goetz (2015) based their research, data, and charts on the QCEW, BLS up to 2014.

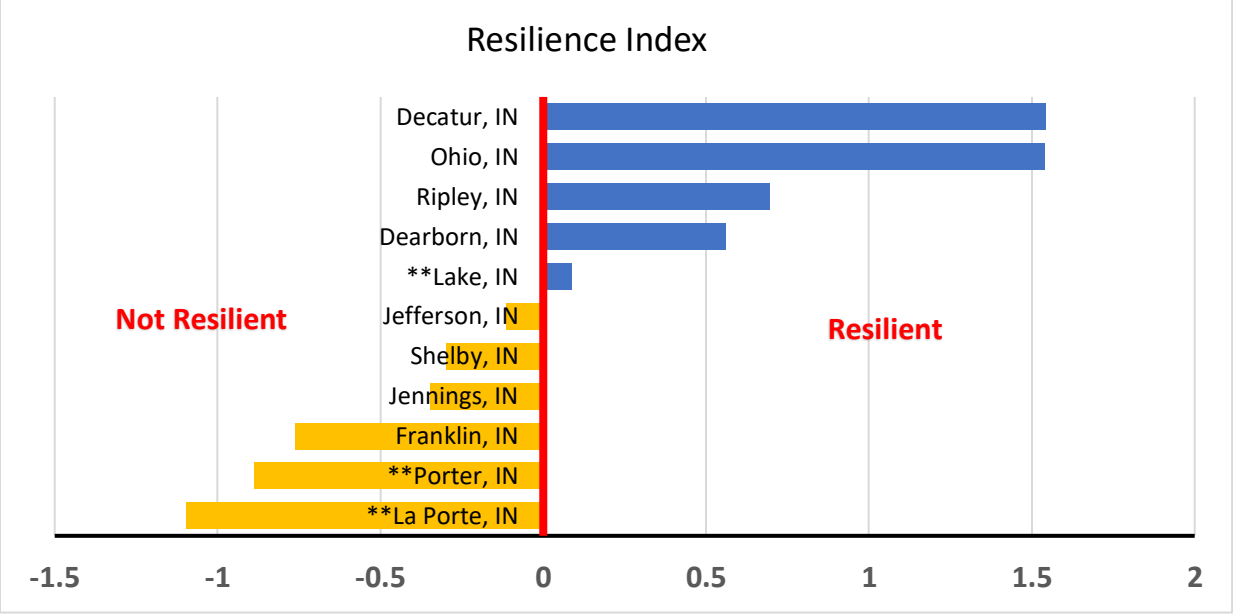

Figure 2.2: Resilience Index for NIRPC and SIRPC Counties
Source: Chart developed by the authors based on data from Han and Goetz (2015)
Note: Data were updated on May, 2021 by Han and Goetz (2015)

The framework by Han and Goetz (2015) has two parts, drop and rebound. Hence, a county can occupy a position in the cartesian plane bounded by the two axes of drop and rebound. If axes are drawn based on U.S. average values for drop and rebound, a county can have a combination of drop (high or low) and rebound (high or low) values. Figure 2.3 shows a county's position based on the drop and rebound planes, where axes are based on the U.S. averages of 0.19 for drop and 0.03 for the rebound. Decatur, Ripley, and Dearborn counties in SIRPC occupy low drop and high rebound quadrant, which provides higher resilience index values for the three counties (see Figure 2.3). Ohio County has the drop value close to the U.S. average, and the highest rebound value amongst all SIRPC and NIRPC counties. Hence, Ohio County has a higher value for the resilience index (see Figure 2.2 and 2.3). SIRPC counties are spread in all four quadrants, which means that counties in the region adjusted to the economic shocks from the Great Recession differently. In contrast, NIRPC counties of Lake, Porter, and La Porte are in the same quadrant of low drop and low rebound. Whereas the low drop is a positive trait showing that county economies have countered the Great Recession shocks, low rebound values indicate a lower rate of recovery capacity in the post-recession period. Hence, NIRPC counties exhibit a lower value of resilience index in Figure 2.2 except Lake County. The rebound value for Lake County is close to the U.S. average, hence, giving a slightly positive resilience index for the county. Note that the formulas for the drop, rebound, and resilience index account for the velocity of job changes and are standardized to adjust for differences in the absolute number of jobs.

It is evident from Figure 2.3 that despite differences in populations and size, NIRPC counties exhibit similar capacity and challenges for economic resilience. In comparison, SIRPC counties occupy all four quadrants. SIRPC has three counties in low drop and high rebound quadrant, which is the strongest quadrant for economic resilience. SIRPC has two counties in high drop and low rebound quadrant, which is the weakest quadrant for economic resilience. In addition, SIRPC has two counties in low drop and low rebound quadrant and one county in high drop and high rebound quadrant.

At the national level, Han and Goetz (2015) could not estimate the resilience index for 302 counties because either they declined continuously, peaked and then declined continuously, or grew continuously. There were 12 counties in the U.S. that grew continuously during the study period. The counties included Hendricks County in Indiana; Dunn, Mountrail, Stark, and Williams counties in North Dakota; Bell, Grimes, and McMullen counties in Texas; Prince George County in Virginia; Lincoln County in South Dakota; Kings County in New York; and La Salle Parish in Louisiana. Houston County in Texas exhibited the maximum resilience index value of 9.57, which was in part due to the minimum drop value of -0.33 in the U.S. Clinton County in Iowa exhibited the minimum resilience value of -5.84. Similarly, Mercer County in Missouri exhibited the maximum rebound value of 2.2.

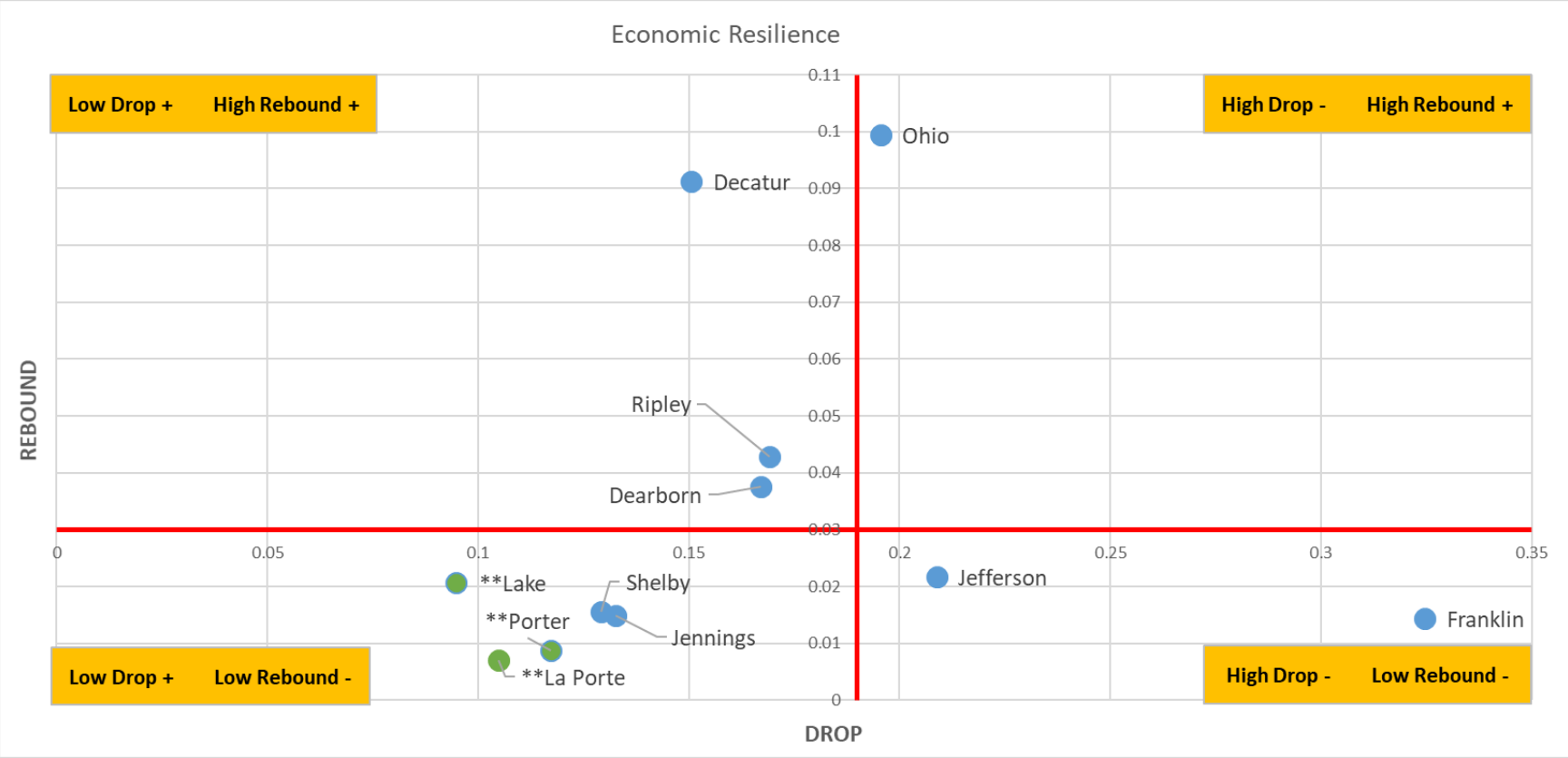

Figure 2.3: Drop and Rebound Values for NIRPC and SIRPC Counties

Source: Chart developed by the authors based on data from Han and Goetz (2015)

Note: Data were updated on May, 2021 by Han and Goetz (2015). Axes values are based on the U.S. averages for drop and rebound.

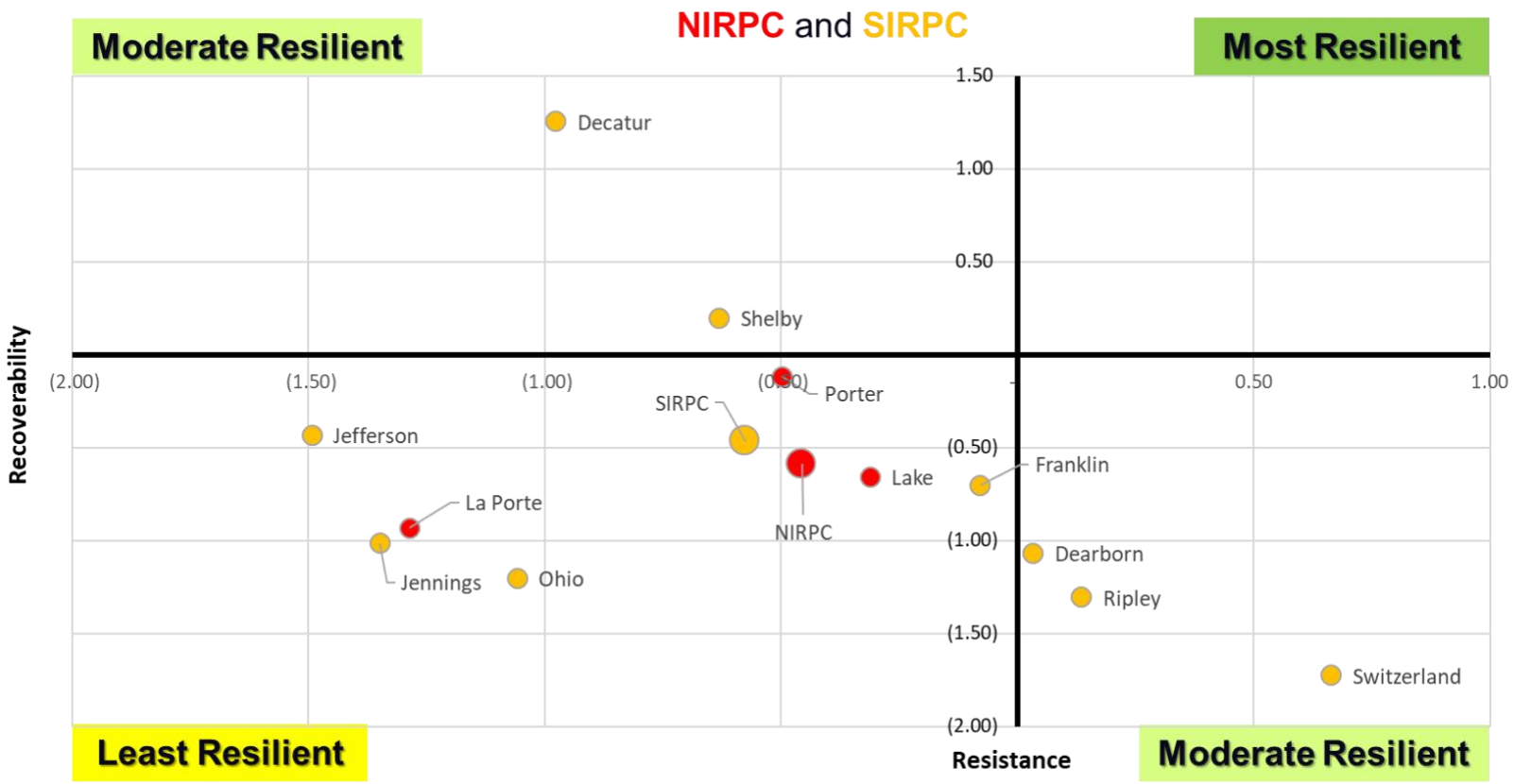

Figure 2.4: Resistance and Recoverability for NIRPC and SIRPC Counties
Source: Chart developed by the authors based on Martin et al. (2016)
Note: Resistance and recoverability estimates are based on the U.S. average values.

- *Framework by Martin et al. (2016)*

The researchers developed the framework of resilience based on the characteristics of resistance, recoverability, and the national trend counterfactuals. If the region has countered the national declining trend and declined less than expected, it has demonstrated a higher resistance. Similarly, if the region has exceeded the national growth rate during the post-recession period, it has demonstrated a higher recoverability. Figure 2.4 lays out the NIRPC and SIRPC counties based on the research framework developed by Martin et al. (2016), U.S. trends, and data from the Economic Modeling Specialists, International (EMSI). Note that the EMSI jobs data are comprised of four classes of workers which include QCEW, non-QCEW, self-employed, and extended proprietors estimate. The method by Martin et al. (2016) has enabled us to locate counties in NIRPC and SIRPC either into moderate resilient, most resilient, or the least resilient quadrants. The overall SIRPC and NIRPC regions are also allocated a quadrant.

Switzerland, Ripley, Dearborn, Shelby, and Decatur counties in SIRPC fall into the moderate resilient quadrant. Franklin, Ohio, Jennings, and Jefferson counties in SIRPC fall into the least resilient quadrant. Overall, the SIRPC region places in the least resilient quadrant. In NIRPC, all three of its counties of-- Lake, La Porte, and Porter – as well as the region as a whole fall into the least resilient quadrant. As regions, NIRPC and SIRPC are close in economic resilience capacity and fall within the least resilient quadrant. This analysis uses EMSI data from 2007 to 2014.

- *Framework by Chapple and Lester (2010)*

The researchers developed the economic resilience framework based on average earnings and income inequality, and introduced methodologies to determine the new equilibrium and path dependency for regions. If a region has below average earnings in the starting period and remains below average in the ending period, it is a stagnant region. Refer to Figure 2.1 in Chapter 2, which shows faltering, thriving, and transformative regions based on Chapple and Lester (2010). Figure 2.5 shows NIRPC and SIRPC counties in the transformative, stagnant, faltering, and thriving quadrants based on the real total earnings per worker for the recession year of 2009 and the post-recession year of 2018. The data are obtained from EMSI using the four classes of workers and version 2020.1. Lake County in NIRPC falls into the thriving quadrant because it maintains its real average earnings above the state average values during 2009 and 2018. Porter County in NIRPC falls into the transformative quadrant because it increased its real average earnings from below the state average in 2009 to above the state average value in 2018. Similarly, Decatur County in SIRPC falls into the transformative quadrant. A transformative equilibrium state happens when a county moves its real earnings from below the state average to above the state average during the study period. The remaining SIRPC and NIRPC counties are in a stagnant state in terms of their real earnings per worker. Note that the new equilibrium is based on the point estimates for real earnings per worker. The analysis highlights the importance of higher-wage jobs in enhancing the economic resilience of the regions.

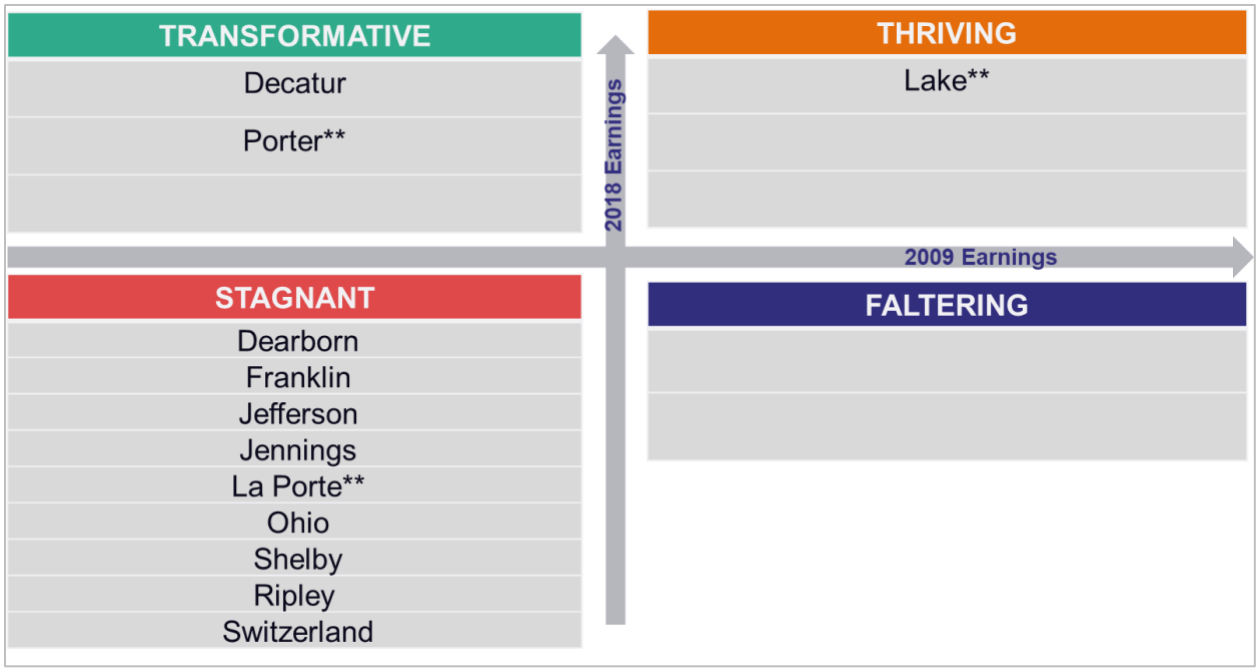

Figure 2.5: Real Total Earnings Per Worker ($ 2018)- New Equilibrium 2009 and 2018.
Source: Chart developed by the authors based on Chapple and Lester (2010)
Note: The quadrants are based on Indiana average total earnings values

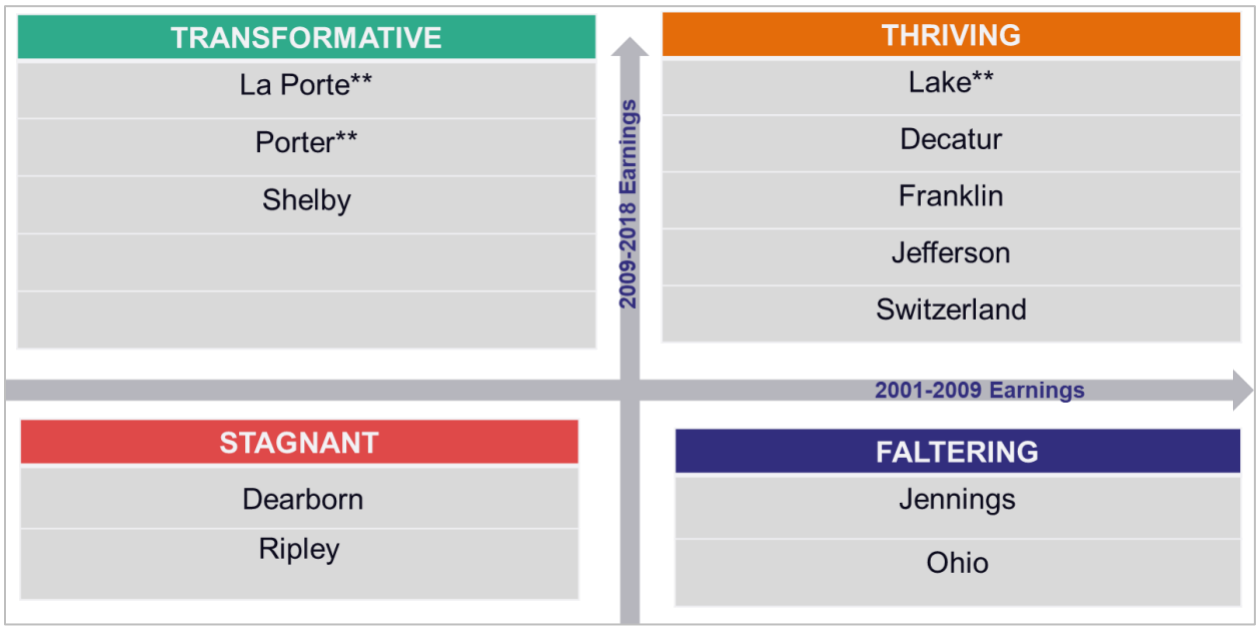

Figure 2.6:
Growth Rate of Real Total Earnings Per Worker ($2018)- Path Dependency 2001-2018
Source: Chart developed by the authors based on Chapple and Lester (2010)
Note: The quadrants are based on Indiana average growth rate of total earnings

The researchers defined path dependency based on the growth rates in real earnings over a longer period. If a region had an above-average growth rate in the pre-recession period and retained the above-average growth rate during the post-recession period, it was assigned into the thriving quadrant. Similarly, a transformative region had a growth rate below the average in the pre-recession, and above the average in the post-recession period. Stagnant regions remained below-average growth rates during the pre-recession and the post-recession periods. Similarly, faltering regions had a higher than average growth rate in the pre-recession but lower than an average growth rate in the post-recession period.

Figure 2.6 shows the path dependency for NIRPC and SIRPC counties based on real earnings growth rates from 2001 to 2009 and 2009 to 2018 periods. NIRPC counties fall into thriving and transformative quadrants if growth rates of real earnings over a longer period are considered. Similar to previous analyses, SIRPC counties are distributed across all four quadrants.

Chapple and Lester (2010) also explored relationships between economic resilience and income inequality. Are regions distressed with income inequality also less resilient? The researchers presented changes in income inequality as a "path dependency" framework for economic resilience. A region could decrease or increase its income inequality and become a transformative or a faltering region in terms of the regional labor market.

Figures 2.7 and 2.8 show the 50:10 ratio of NIRPC and SIRPC counties from 2000, 2008-2012, to 2014-2018 periods. The 50:10 is a ratio between middle versus the lowest 10^{th} of the income distribution (The Equality Trust 2021). The ratios for counties in Figures 2.7 and 2.8 are estimated by using the decennial census 2000 and 5-year American Community Survey for 2008-2012 and 2014-2018 periods. The data include the number of households by different income ranges, such as less than $10,000; $10,000 to $14,999; etc. The estimation required developing cumulative percentages of households to identify relevant income ranges for 10% and 50% of the households. Within NIRPC, the income inequality increased in Lake County, increased and then decreased in Porter County, and increased and remained stagnant in LaPorte County. Within SIRPC, income inequality increased in Dearborn, Decatur, Ohio, and Ripley counties and decreased continuously for Jefferson County. For Franklin, Jennings, Shelby, and Switzerland counties, the income inequality increased and then decreased. Refer to Figure 2.7 for individual values of income inequality for NIRPC and SIRPC counties. In comparison, Figure 2.8 shows the changes in the 50:10 ratio between 2000 and 2014-2018 for NIRPC and SIRPC counties. A negative value shows an increase in income inequality, whereas a positive value shows a decrease in income inequality over a longer period. SIRPC counties of Franklin, Jefferson, Shelby, and Switzerland observed a decrease in their income inequality over a longer period of time.

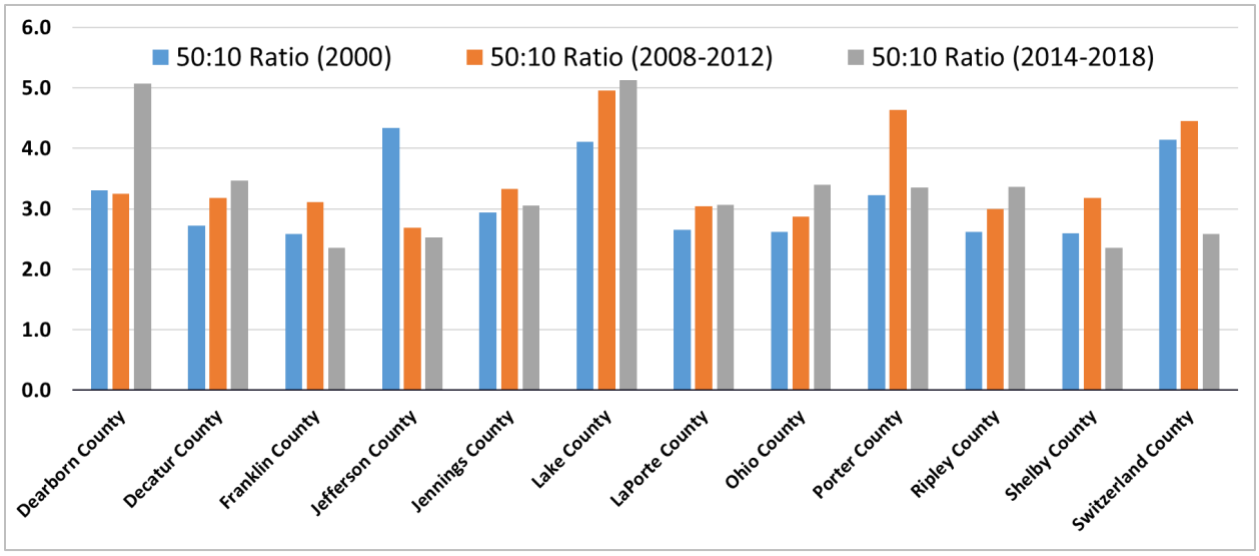

Figure 2.7: 50:10 Ratio for 2000, 2008-2012, and 2014-2018 Periods
Source: Chart developed by the authors based on Chapple and Lester (2010) and U.S. Census Bureau Data.

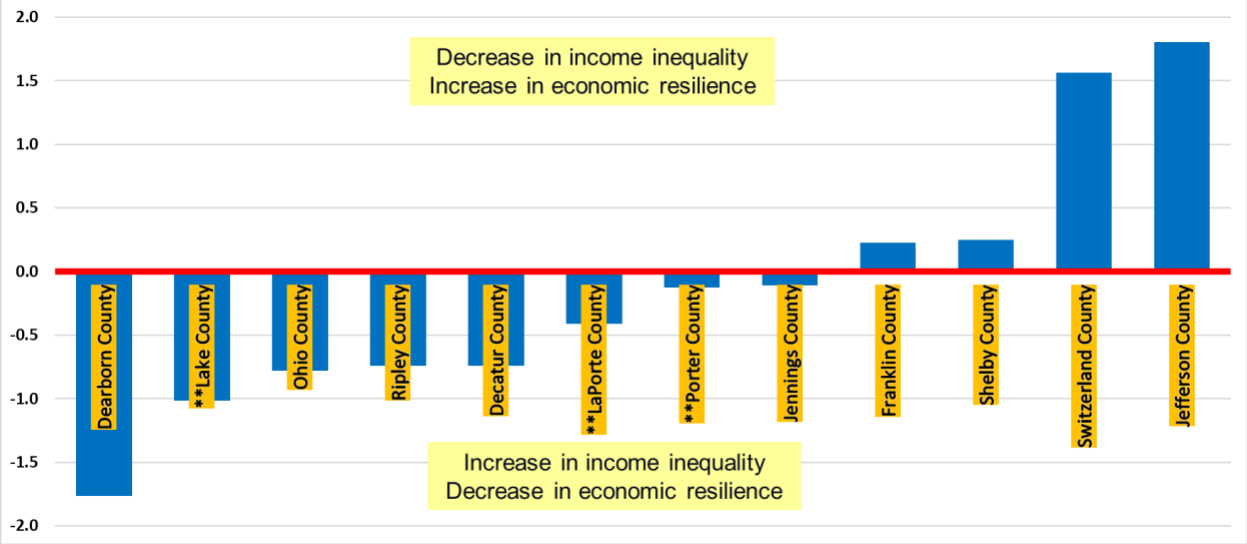

Figure 2.8: Change in 50:10 Ratio from 2000 to 2014-2018
Source: Chart developed by the authors based on Chapple and Lester (2010) and U.S. Census Bureau Data.

- *Discussion*

It is evident that based on different frameworks developed in the previous research studies, the economic resilience of constituent counties within a region could be different. The variables such as jobs, real earnings per worker, changes in real earnings, income inequality, and changes in income inequality provide useful perspectives on new equilibrium and path dependency -- two important paradigms of regional economic resilience. Regions might have a stronger position in one socioeconomic

variable and might be weaker in another. Such heterogeneity reveals that the planning for regional economic resilience needs to have a holistic approach in assessing equilibrium and path dependency conditions from different perspectives. The counties within NIRPC and SIRPC regions have similarities as well as diversity, strengths as well as weaknesses, and interventions and strategies need to consider the diverse constituent counties in both the regions. The analysis also reveals that economic resilience is a dynamic concept, and hence should be analyzed using different frameworks, socioeconomic variables, and both point- as well as period-estimates. Note that depending on the data sources for different variables, some changes in county positions within the quadrants might be plausible. In the recent past, only a few studies have explored the role of transportation accessibility in assessing the resilience capacity of the regions (Östh et al., 2015; Chacon-Hurtado et al., 2020). In the next section, we review the concepts of transportation accessibility and mobility and briefly present the findings from the recent research. We commence by describing the differences between accessibility and mobility followed by discussions on the relationship between transportation accessibility and economic resilience.

2.3 Transportation Accessibility and Mobility

Transportation accessibility represents the ability of individuals to access opportunities with ease. It links two key concepts: the ability to travel (mobility) and the presence and distribution of desirable activities such as employment, education, health care, retail, and recreation (opportunity). Accessibility is an important metric of transportation system performance from a conceptual standpoint as it represents the true purpose of transportation – participation in activities outside the home. Compared to mobility-based metrics such as intersection delay and highway level of service, accessibility is much more difficult to measure due to its complexity (Litman, 2011). However, there is currently an 'accessibility shift' underway in which accessibility is desired over mobility during the planning process (Jonathan C. Levine, 2019; J. Levine, 2020).

2.3.1 Benefits of Transportation Accessibility

Better accessibility can improve overall community quality of life, also known as livability. Ensuring that community members have a wide range of transportation options, including transit and active modes, is crucial to enhance accessibility (Rue et al., n.d.; Pfeiffer et al., 2020). This improvement in accessibility and livability can in turn attract higher quality employees looking for a nice place to live. Access to transit has also proven to be a valuable asset for a location, which is often reflected in increased values in nearby properties (Appleyard et al., 2017; Robert Cervero & Day, 2008; Yang et al., 2020).

Transportation accessibility (or lack thereof) can often contribute to a community's social equity issues, especially when it comes to access to employment. An increasingly important concept in this area is known as spatial mismatch. Spatial mismatch refers to the access gaps in locations that can exist between jobs and residential areas – a 'mismatch' of land uses that can leave suitable employment opportunities geographically far away from where potential employees live. Spatial mismatch creates an accessibility problem that most heavily impacts lower income individuals who cannot afford to own a car and may not be able to reach the areas where suitable employment is located. Spatial mismatch can contribute to excess commute burden – individuals being forced to spend excessive amounts of time, money, energy, or other resources in order to commute to work. Excess commute burden is also known to most heavily impact lower income individuals, often due to spatial mismatch. These equity issues are

both caused by lack of accessibility stemming from land-use patterns and transportation network density.

Accessibility also has the fundamental role of influencing travel behavior. When, where, why, and how people travel is tied to their mobility and destination options. Ewing & Cervero (2010) discusses the impact accessibility has on travel behavior. They note that quantity of private vehicle travel (measured in vehicle miles traveled, VMT) is closely tied to indicators of accessibility to destinations. Walking behavior is closely tied to several accessibility concepts including land use diversity and the number of destinations within walking distance (a function of density). Transit use is closely related with nearness to the stops and street network design with a lesser relationship with land use diversity. Most surprisingly, the study finds that once other variables have been controlled for, population and job density have minimal impact on travel behavior. It is clear that accessibility is a fundamental determinant of travel behavior and that changes in travel behavior are likely only possible through changes in accessibility.

2.3.2 Measures of Transportation Accessibility and Economic Resilience

(Páez et al., 2012) notes that measures of accessibility often consist of two basic components: cost of travel (in time, money, energy, etc.) and the availability of a sufficient number of desirable opportunities. These components can be combined to produce both location-based and person-based indicators. Location-based indicators typically measure accessibility from (origin-based) or to (destination-based) a specific land use from some other location. An example of a location-based indicator is the number of supermarkets within a given distance from the town center. Person-based indicators measure accessibility for an individual matching a specific profile (such as a fully employed single parent) from (origin-based) or to (destination-based) a specific land use from some other location. An example of a person-based indicator is the number of pharmacies within a typical trip distance of an individual with profile (such distance varies for different individual profiles). The choice of location-based or person-based indicator is often a question of data availability and required level of analytic detail. Location-based indicators can be converted into a person-based indicator through consideration of different profiles, modes available to different profiles, and any temporal constraints different groups may have.

Páez et al. (2012) also raises the important issue of whether an accessibility indicator is positive or normative. Positive indicators measure strict facts regarding travel behavior and accessibility (how far people actually travel). Normative indicators apply a judgement or assumption about what travel behavior ought to look like (what the 'norm' should be). For example, a normative analysis of transit accessibility might be that those living within a five-minute walk of a stop have accessibility to the system – relying on the assumptions that five minutes is a maximum walk time and that the only way people access the stop is by walking. A positive analysis would try to determine the number of people actually utilizing the stop and remove the assumptions regarding travel time and mode. Normative indicators are not inherently limited and can be quite useful, but it is important to check that the assumptions underlying them are reasonable.

Accessibility is an important component of community success from practically any viewpoint. Previous works have shown accessibility to be an important component of regional economic resilience where regions with better access to markets and labor tend to weather recession shocks better (Chacon-

Hurtado et al., 2020; Östh et al., 2015). Businesses need a workforce to create their produce and as per Chacon-Hurtado et al. (2020) transportation systems can affect accessibility of both commuters as well as the labor force. Chacon-Hurtado et al. (2020) found a positive relationship between transportation accessibility and regional economic resilience. In addition to affecting movement of personnel, enhanced accessibility can make it easy to obtain raw materials for industries and to bring their final products to markets. Historically, business activity has centered on areas with the best accessibility – first by water, then by rail, and later by freeways -- and hence, accessibility is still a fundamental element of community economic success (R. Cervero, 2001).

Good accessibility has a more indirect impact on economic resilience as well. Higher levels of accessibility have been shown to promote higher levels of industrial diversity. More diverse economies are generally more resilient ones (Kreston & Wójcik, 2013). Good accessibility additionally facilitates the development of healthier and more highly educated communities as people are better able to reach quality health care and educational opportunities. Researchers have determined that active transportation (walking and cycling) have positive impacts on community health outcomes (Mueller et al., 2015; Frank et al., 2006).

The preceding discussion shows that accessibility is a result of interactions between various elements of the community including transportation, land use, income group of the households, and preferences. It has both, quantitative or measurable and qualitative or perceptional dimensions, and can affect resilience of the regional economies by improving the access to the labor markets and transportation of goods and supplies. Within the general equilibrium framework of regions, reducing transportation costs for movement of labor and goods increases the production efficiencies of the industries and businesses. The accrued positive effects can be observed through the lower cost of doing business, increased wages, etc., which are positive traits to enhance the regional economic resilience.

The penultimate section of the literature review deals with the Community Capitals, a framework to evaluate and facilitate community development. Every community has some form of community capitals, and some communities are resilient enough to recover from an economic shock whereas others delve into perpetual decline. Communities could recharge their socioeconomic conditions by applying this framework. The final section of the literature review presents the Grounded Theory, which is the qualitative method employed in this project.

2.4 Community Capitals Framework

2.4.1 What are Community Capitals?

The Community Capitals Framework (CCF) (Emery & Flora, 2006) provides a way to analyze both community and economic development efforts from a systems perspective. The framework capitalizes on the identification of assets within each capital, the investments related to each capital, interactions between capitals and how these impact communities. Seven community capitals constitute the CCF which include: natural, cultural, human, social, political, financial, and built capitals. These community capitals, as defined by Emery and Flora (2006), present in the following paragraphs.

Natural capital refers to the environmental assets for a location such as the weather, geography, natural resources, recreational amenities and attractiveness. According to Flora and Flora (2008), natural capital shapes how cultural capital connects to place. Cultural capital remains rooted in the ways that people

experience the world and how they act within it. This capital influences who we listen to and what we hear and how creativity, innovation and influence may emerge and are nurtured therein. Frequently, cultural capital forms a privileged component of dominant groups.

Human capital encapsulates the talents, skills and knowledge of people to enhance or access resources. Some of the prized assets include leadership that proactively shapes the future for a community or group and acts in an inclusive manner. While leadership is a desirable characteristic, other key assets at the community level include the workforce and local employers. Social capital, another crucial element, precludes a community's ability to leverage assets found in other categories and is often considered to be the "glue" which allows actions to happen. Bonding social capital consists of close redundant ties that build community cohesion such as within families or among colleagues. While bridging social capital involves loose ties that span across organizations and communities (Granovetter, 1973 and 1985). Flora and Flora (2008) found that entrepreneurial social capital is often related to community economic development and includes networks, mobilization of resources and connections to power brokers.

Political capital often springs from social capital and is critical to the ability to find their voice and engage in actions that ostensibly further their community (Flora, 1998; see Aigner et al., 2002) in the public realm. Increased financial capital directly results from the funding resources available to invest in capacity-building, the development of businesses, and support civic organizations which accumulate wealth for future endeavors. Lastly, built capital, finally, includes the physical infrastructure supporting all of the capital activities (Emery & Flora, 2006).

Previous research has explored the role of community capitals in regional economic resilience (Ringwood, 2017). This project will make use of the CCF through quantitative and qualitative analysis to explore regional economic resilience.

2.4.2 What is Grounded Theory?

Grounded Theory is a qualitative method of enquiry. it is one of the four popular research methods used in social sciences along with ethnographies, case studies, and phenomenological studies (Kolb 2012). Ethnographic studies are based on participant observations over a long-term and primarily used in Anthropology[18]; Case studies are used in both, social sciences and engineering disciplines, and require an in-depth focus on a single event or a phenomenon, organization, program, project, or a location to gain a multi-faceted understanding of the subject (Crowe et al., 2011); and Phenomenology, which is used mostly in psychology, learns from experiences of the people who have observed, participated or were affected by the event[19]. What sets the Grounded Theory apart from the other three methods is the emphasis on discovering a theory from the beginning of the research (Kolb 2012). It is comprised of a collection of steps to formulate and verify theories of participant's behavior (responses) from the collected data. It was developed by sociologists Barney Glaser and Anslem Strauss and includes aspects of both "rigorous" but "down-to-earth qualitative research" (Glaser and Strauss, 1967). Charmaz, Thornberg and Keane (2018) explained Grounded Theory as a combination of inductive and abductive

[18] Ethnography, https://www.emeraldgrouppublishing.com/how-to/observation/use-ethnographic-methods-participant-observation.
[19] Phenomenology, https://guides.library.duq.edu/c.php?g=836228&p=5972144#:~:text=A%20phenomenological%20study%20explores%20what,before%20embarking%20on%20your%20research.

reasonings where "specific and/or incomplete observations can be used to provide general conclusions and/or possibly best predictions"[20]. Margolis and Zunjarwad (2018) quoting Charmaz and Mitchell (2001) explained the Grounded Theory as follows:

- Simultaneous data collection and analysis,
- Identifying emergent themes while doing data analysis,
- Identify social processes,
- Develop abstract theory inductively based on social processes, and
- Refine the abstract theoretical framework by causes, conditions, and consequences.

Grounded Theory uses the Constant Comparative Method where the researcher is continuously coding and analyzing the data (interview responses, focus groups, etc.) to identify emergent themes with the purpose to uncover the underlying theory (Kolb 2012). For example, emerging themes and findings could be that urban versus rural residents experienced the Great Recession differently despite having similar macro-economic shocks. Or the individual, household, and community level responses differ for urban and rural areas for similar types of impacts or shocks. The Grounded Theory provides flexibility in data collection and analysis (Zamani and Babaei 2021). It is being used in various disciplines such as care giving and gerontology, social work, women and gender studies, cultural studies, education, business, family studies, etc., and even in urban planning and design (Zamani and Babaei 2021). In this project, the Grounded Theory will be used to analyze the data collected from the focus groups of residents in NIRPC and SIRPC regions.

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3 The nature of "disruption" on regional economies: focus group discussions

The Economic Resiliency and Transportation project focused on two main data components: quantitative and qualitative. The team set the project so that the qualitative focus group results informed the search for the quantitative variables that were ultimately selected for the dashboard model. Additionally, the focus groups were divided into two primary groups their narratives differed based on primary home or work geographic locations. Each section outlined in the focus group is divided by both urban and rural as well as each of the community capital subgroups.

The protocol questions during the focus groups were developed to solicit responses based on the perceptions and experiences of decision makers during the Great Recession of 2007-2009. The community capitals were used as a central theme to probe experiences. The group discussions concentrated on the ways that participants perceived the negative impacts of the recession in relation to each of the community capitals. The participants' responses to the community capitals during Great Recession, as well as the perception (despite prompting) of what constitutes a capital, were recorded during the sessions. The following chapter outlines the focus group methodology (protocol in Appendix A), focus group data interpretation and the main themes which emerged.

3.1 Focus group delivery

The three urban focus groups spanned over two time periods and employed two delivery methods in northwest Indiana. Two focus groups were conducted in person on February 21, 2020, one at the Purdue Northwest (PNW) campus and the second at the LaPorte County Purdue Extension office. Twelve participants took part in the PNW event, while the LaPorte County focus group had seven individuals taking part in the session. All participants were regional decision-makers and represented local nonprofits, banking, educational, religious and governmental institutions.

February 21, 2020 Lake county: 8-11 am - PNW

February 21, 2020 LaPorte County – 1:30 – 4:30 Porter County Extension and NIRPC Conference room

November 20, 2020 Porter County – 9am-11am – virtual focus group session

Both the NIRPC and SIRPC focus groups spanned over two time periods in 2020. The first group of focus groups were conducted in person and used a protocol and flip charts. The second group, later in 2020 (for SIRPC and one for NIRPC), was implemented via an online focus group session using Google Jamboard. The Jamboard method was used in place of flip charts to generate discussion for all of the counties based in southeast Indiana and Porter County in northwest Indiana. Thirty-two decision makers across three focus groups participated in SIRPC's focus groups.

Dearborn, Ohio and Franklin Counties: November 18, 2020 from 8:30 – 11:00 am

Ripley, Decatur and Shelby Counties: November 24, 2020 from 8:30 – 11:00 am

Jennings, Switzerland and Jefferson Counties: December 2, 2020 from 1:30 – 4:00 pm

3.2 Focus Group Data Interpretation

The focus group notes, recordings and flip charts were utilized to create a narrative of what was said and communicated during the sessions. The researcher used the grounded theory (GT) method of decoding and uncovering the central themes found in focus groups. This is an extremely useful approach it allowed the team to focus on how economic shocks impacted a region both individually and community-wide. Anecdotes about individual perspectives were discussed in the context of the overarching economic recessionary situation. The perceived and observed economic changes were documented which reflect what occurred in two Indiana regions. GT methodologies is one of the best approaches for gaining insight into the complexities and intricacies of a situation. GT is a methodological approach best suited for the inductive study of phenomena with little theoretical understanding. In this case, there are few theoretical underpinnings about how institutions could support economic resiliency.

Focus group participation remains a strong qualitative, participatory research component to gain an in-depth understanding of social issues. For this project, data was collected from decision makers from two regional locations (northwestern and southeastern Indiana), rather than a statistically representative sample of the population. This geographic focus provided qualitative data on perceptions of economic resiliency from a multitude of geographic classifications: urban, small town and rural built environments and populations.

Achieving myriad perspectives from a range of regional decision-makers living and working within a variety of geographic areas in Indiana became an important project goal. This approach was adopted in order to expand the scope, definition and usability of economic resiliency tools developed out of the focus groups.

The link between people's perceptions and their socio-cultural situation, in this case economic resiliency, is critical to decision-making. Most regional decision-makers derive at least part of their notions and interpretations from their immediate experiences (Berkes, 2004).

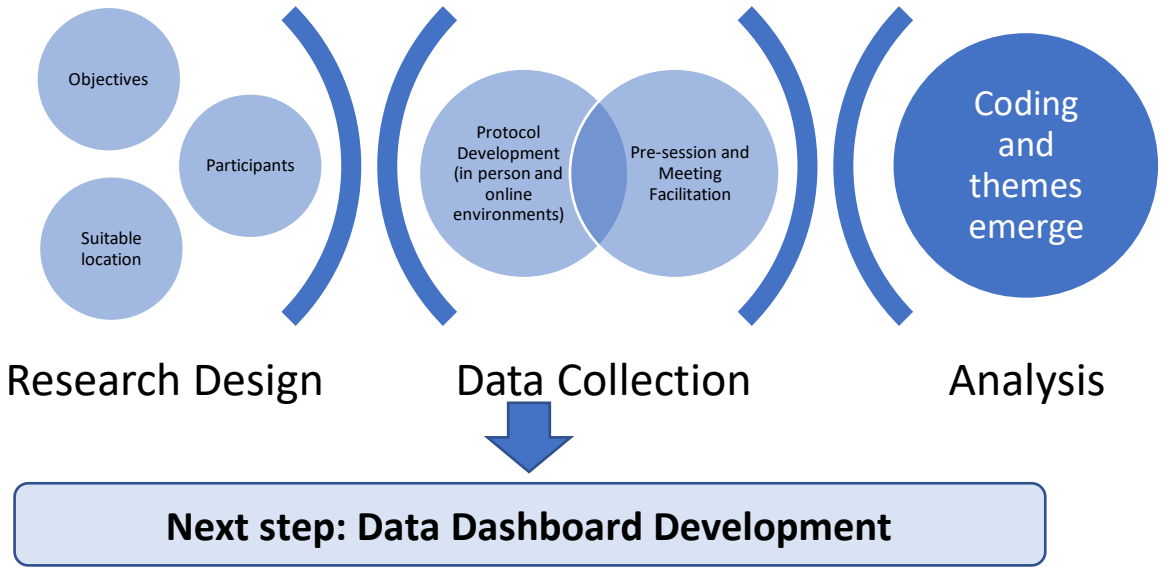

Figure 3.1: Flow Chart of Focus Group Methodology

The flow chart above provides an illustration of the methodological process utilized in the qualitative research piece and how they came together to develop the data dashboard tool. The research team, illustrated by the Research Design images, began by working by identifying the study's objectives. The team then collaborated to identify potential regions in which to focus the study.

The next step, as visualized by the interlinking circles in the middle of the Figure 3.1, found the team working with both NIRPC and SIRPC, meeting with the regions regularly to establish the best locations and timings for the focus groups. A protocol was also developed at this stage for in-person focus groups. But with the onset of the Covid-19 pandemic, the focus groups in the SIRPC region had to be delayed. A new, virtual protocol was crafted and launched in November/December 2020 for the continuation of the focus groups. The last step, involved transcribing the focus groups, using GT and outlining the primary themes. All of these steps led to the formation of the resiliency dashboard tool.

3.3 Coding and Themes

Four main themes emerged as focus group participants discussed the Great Recession. On an individual basis, people were concerned for their work prospects for the future and feared that they would not be able to meet their financial obligations. At the nonprofit level, organizations were concerned by the growing needs within their communities and whether they would be able to continue to serve the community adequately. This included being able to provide food and shelter for people who come to them for help. As the crises endured, the number of individuals seeking help from nonprofits only continued to rise while supporting resources dwindled. At the local government level, civil servants and elected officials sought ways to cut services to the community as tax revenues. State and federal air cuts were necessitated by declining revenues to sales, property and income taxes. Public infrastructure financing for projects such as bridge and highway repairs fell across the US. Lastly, the business community suffered because there was concern over who could afford to purchase products and services that they offered.

Financial uncertainty permeated across all levels of society. Some words and phrases that participants used to signify the situation include: constant uncertainty; dread and change; constant cycle; crises, inflexibility; contingency; cycle; out of control; and bad to worse.

3.4 Community Capitals

The focus groups generated discussions around 5 community capitals: Built Environment, Transportation & Infrastructure, Social & Political, Educational & Human, and Financial. It is important to note that the CCF framework has been used as an analytical tool in the past such as to determine the effectiveness of investments in addressing social conditions (Emery and Flora: 2008). Additionally, the CCF, in conjunction with its spiraling up theory posits that by strategically increasing the capacity within each category, a community may build a stronger, more vibrant regional economy.

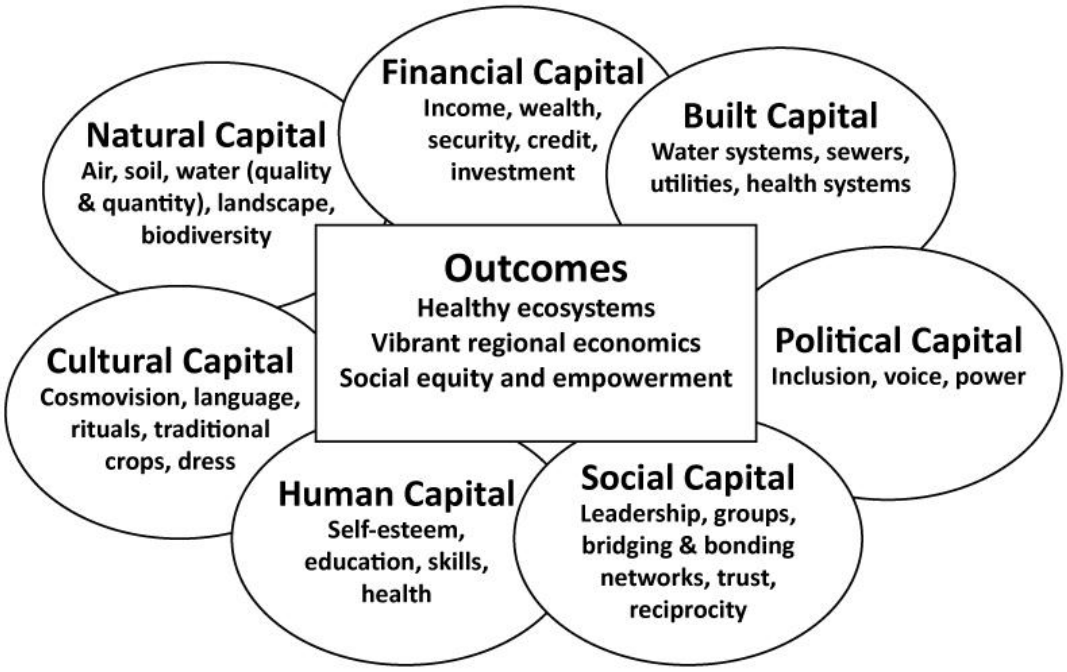

Figure 3.2 depicts all seven CCF's and how the outcomes related to each bolster a regional economy.

Olsen, David P. 2006. *Factors Contributing to the Growth of a Small Town.* Ph.D. dissertation, Department of Rural Sociology, South Dakota University, Brookings, SD. Adapted from Cornelia Flora's presentation slides (2005)

3.5 Built Environment Capital

3.5.1 Urban

The loss of homes (both rental and owner occupied, foreclosures and loss of property value were the main themes discussed and voted on during the focus groups in the Northern Indiana region. Participants mentioned the visibility of the foreclosures on their psyche and the impact that had – the fear which it instilled. The property values entered a deflationary period which both followed and caused a period of jobs losses: both in terms of losing jobs across multiple industrial sectors which then caused the housing industry to fold. This perception deviates from the reality in that it the housing market crash was fueled by the subprime lending market. Levitin and Wachter (2012) posited that there was an excess of mispriced mortgage finance, thus increasing risk as over-supply occurred (which began in 2004). The crash has also been attributed to government policies encouraging affordability, irrational consumer expectations, and an inelastic supply of housing. Whatever the cause, participants noticed an endless cycle of job losses followed by more and more "for sale" signs and a glut over available homes on the market. One participant lost all of their rental homes as a result of the housing market crash. His tenants lost their income and this forced him to declare bankruptcy.

Home foreclosures in the region increased threefold from nearly 4,000/year to 12,000/year. Newbie and inexperienced homeowners and house flippers were blamed for some of the housing market crash. The market crash clearly had repercussions beyond housing – participants suggested that it also brought about a downturn in the retail sector as several participants voted that empty storefronts blighted the

retail landscape. At the time of the focus groups in 2020, as well, the availability of affordable housing remained a continuing problem for the region.

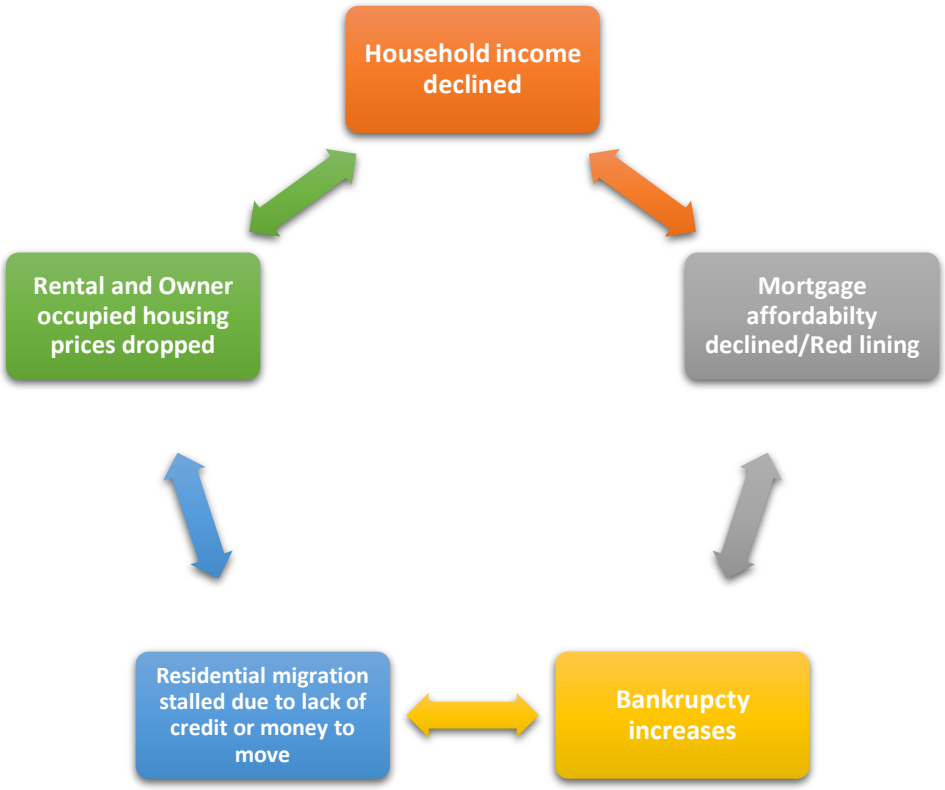

Figure 3.3: Ripple effects of urban recessionary cycle

3.5.2 Rural

The rural impacts within this category differed significantly from the urban themes. While economic stability is sought by regional decision makers, recommended measures are balanced with emerging vulnerabilities and a marked desire for the rural character and lifestyle to remain as a hallmark of these communities. Some of the policy recommendations may be supported (by amplifying the need for support at the community level) and organized by regional governmental organized. Other recommendations may be supported by simply elevating the pressures faced by women/families in the workforce with local Chambers of Commerce and private banking institutions such as highlighting the need for day care (and maybe lending resources) to would be local entrepreneurs interested in developing child care facilities. The overall goal of the proposed economic resiliency pathway is to: 1) generate needed core service stability during a time of turmoil; 2) ensure that the workforce is able to perform their jobs without having to manage their family's acute needs simultaneously.

Rural communities noticed a marked decline in their downtown stores and small businesses. A shortage of supermarkets and grocery stores was also noted during the focus groups. The Great Recession had an overall negative impact on the retail environment in rural Indiana – downtown stores along with supermarkets both closed leaving residents having to shop further away for essentials and creating downtown blight. At the same time, large retail investments also shuttered in some of the larger towns such as Greensburg. During the Great Recession period, retail investment by possible stores was lost.

Participants also cited the rise of online shopping as being challenging on local retailers – a loss of connection was cited. Some areas continue to be underserved by supermarket and grocery locations in rural southeast Indiana. This was the main theme that emerged from the rural focus groups.

A second, and critical point in terms of housing also effected the region. Independent contractors in the trade professions: electricians, carpenters and plumbers were not able to sustain themselves. Many retrained into other occupations in order to earn a living. The impacts of this are keenly observed today by the lack of new homes being built throughout the region. The deflationary property values caused people to invest less in their homes – fueling the existing workforce shortage in this area. As opposed to the urban focus groups, this perception matches the reality in that it the housing market crash was fueled by the subprime lending market. Levitin and Wachter (2012) posited that there was an excess of mispriced mortgage finance, thus increasing risk as over-supply occurred (which began in 2004). The market crash clearly had repercussions beyond housing – participants suggested that bank lending locally caused tighter lending practices which in turn influenced a higher unemployment rate along with small business closures. As a result, loss of skilled workforce, the area continues to be negatively impacted by the lack of construction workers in order to generate its own housing developments. The cycle of continuous impacts in rural areas is illustrated in Figure 3.3 above.

3.6 Infrastructure

This category naturally forms as part of the built environment capital. However, given the special attention this project is giving to infrastructure resiliency, it was discussed separately in order to tease out a deeper set of issues.

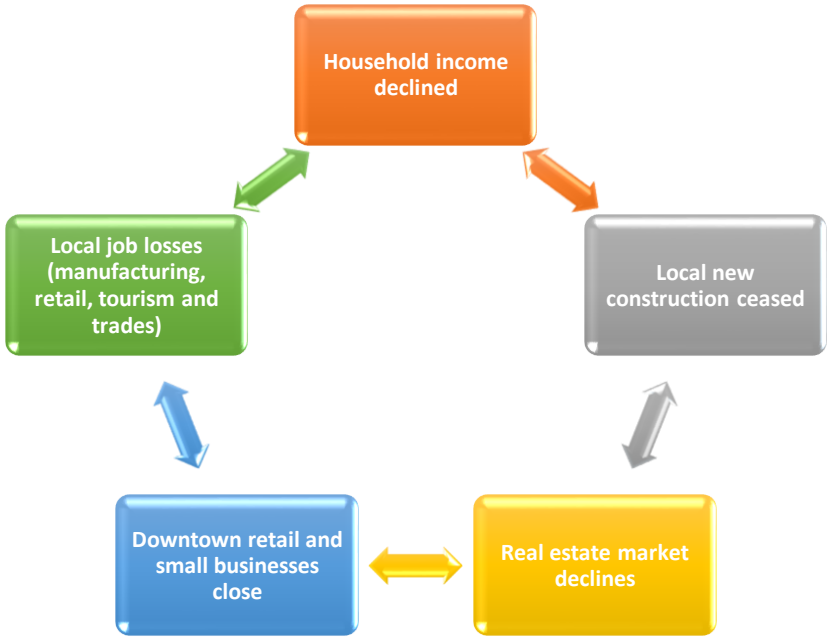

Figure 3.4: Ripple effects of rural recessionary cycle

3.6.1 Urban

The most voted area of discussion for participants was a lack of broadband or dial up services at the time of the Great Recession. In fact, the participants felt that internet speeds were poor despite a highly urbanized population along with a growing agricultural industry in parts of the region.

There was much discussion on the INDOT Major Moves investment in transportation infrastructure which occurred through 2012. The participants felt that the timeliness of this project helped set up the NIRPC region for success by investing in transportation projects while the economy was contracting. The perception of participants was that this helped aid regional recovery during a critical period.

During the same time period, however, many participants commented on how the rerouting of Cline Avenue through the region contributed to a disconnection between northwest Indiana and the great Chicagoland region. As a result, many stated that the job market was inaccessible to them due to increased commuting times to potential jobs.

3.6.2 Rural

The most voted on area of discussion for participants was poor port accessibility to the wider roadway network, a lack of broadband or dial up services at the time of the Great Recession, and the widespread need for public water, sanitary sewer and infrastructure investments.

The participants cited a general lack of funding to keep up crucial infrastructure improvements prior to the Community Crossing grants – and while this has helped, it still does not meet the need in regard to public local water and sewer services. Two other funds were noted as being lost: the “motor vehicle highway fund” and “local roads and streets”. These two funding sources are likely not coming back and are forcing county-level and small-town governments to rethink how they continue to fund critical maintenance costs.

Decatur County noted substantial losses in missed development opportunities that would have strengthened the tax base, thereby leading to increase infrastructure resiliency. The Great Recession impacted investments in telecommunications and broadband upgrades. It was cited that the region is at least 4-5 years behind similar locations in their broadband installation.

3.7 Financial Capital

When discussing financial risks, a variety of viewpoints were expressed by participants. Not only did a housing market crash occur, but the stock market also collapsed. This negatively affected the workforce, particularly those who hoped to retire within a couple of years.

3.7.1 Urban

Local tax revenues were deeply impacted by a fall in housing values at the local level which impacted the quality of life for residents. Participants also noticed that schools lacked resources for routine maintenance and upgrades because of a dip in tax revenue at the local level. LaPorte County participants mentioned that several of their schools consolidated as local finances sought to balance budgets. Some participants felt that the quality of education for local school children suffered as a result and that the resulting job losses would be difficult for the community to absorb.

3.7.2 Rural

The process of working with local lending institutions was lengthy as towns had to set up as surrogate homeowners to keep up the appearance of foreclosed and abandoned homes with general property maintenance (Rising Sun and Dillboro). This caused a drain on the local financial resources for the small towns that also lost significant tax revenues. Building conditions declined across the region and local governments had to step in to help.

The ability to secure financing for small businesses became difficult during the Great Recession. Several mechanisms were ultimately established, but not in time to stem local job losses. A revolving loan fund was established leveraging the state's Office of Community and Rural Affairs (OCRA) funds, local banks and USDA rural enterprise grants in order to build a sizable enough fund.

Lastly, the consolidation of local lending institutions from small town banks to larger conglomerates was noted as occurring during the Great Recession. This changed local lending patterns and the access to financial capital and ultimately levels of local reinvestment.

3.8 Human and Educational Capital

3.8.1 Urban

The Great Recession played a significant role in what the regional decision-making participants called "economic diversification" and how this was key to resiliency. They stated that the lack of diversity at the regional level contributed to an inability to absorb job losses or the ability to find compatible occupations. This means that the workforce could not easily convert their skills to another industry within the region.

The issue of maintenance not only impacted local schools, but also contributed to the "deterioration of neighborhoods." In general, participants noted that sidewalks and road potholes remained unfixed for months and years which contributed to a less pleasing community aesthetic.

These lack of resources at the community level also laid bare a disturbing trend: an increase in substance abuse among the working age population. Several participants noticed a general decline in mental health among those living in the region and saw an increase in substance abuse problems among both the unemployed and underemployed.

3.8.2 Rural

One major impetus to stemming out-migration was a concerted effort to step up re-education and workforce training offerings in the region. The East Area Health Education center was established to serve 14 counties in southeast Indiana to find, train and keep healthcare professionals in rural areas. Despite this effort, however, few doctors exist in some of the counties and a key hospital closure occurred in Dearborn County (it tried to re-establish but was ultimately sold to the St Elizabeth network). Both of these facts compounded a legacy issue of substance abuse and lack of mental health assistance which is not an uncommon occurrence during an economic downturn.

Despite this, substance abuse continues even with the increase in mental health facilities that could help tackle this problem. Similar to their urban counterpart, the participants in this region cited a lack of resources for therapy at the community level. They also noticed a disturbing trend starting to take hold at this time: an increase in substance abuse among the working age population. Additionally, several

participants noticed a general decline in mental health in the population which coincided with an increase in substance abuse problems among both the unemployed and underemployed.

3.9 Social and Cultural Capital

Social capital became an interesting topic for discussion as many of the participants represented local and regional nonprofits directly serving the communities.

3.9.1 Urban

As the Great Recession took hold of the economy, funding for Federal, state and local grant programs dried up leaving nonprofits to compete for a less. Nonprofits had to become more targeted in their outreach programs at the same time as they had their budgets slashed. In response, they had to focus on critical and immediate areas of need while putting off serving crises areas in their infancy. As a result, many local nonprofits had to consolidate with larger entities such as The United Way in order to keep some of their programming alive. At the same time, the "at need" and "at risk" populations grew given the presence of fewer nonprofit entities or resources to serve their needs. For example, participants cited the growth in working age adults who abused drugs during this period. There were few to no local or regional resources available to help people be resilient during a climate of job, housing, and educational opportunity losses. At the same time, participants noted that race relations appeared more strained across the region.

3.9.2 Rural

Nonprofits in rural southeastern Indiana faced cuts and with little money in its reserves. Endowments, who also fund county-wide, needs were also severely cut. At a time when human need increased dramatically for increased social services, funding and programs were cut across all areas. Increase drug use, for example, was cited as not only negatively impacting the local workforce but also as a drain on local police. In addition, the drug use generated a huge swathe of mental health issues across the family spectrum. Once the economy began to grow again, and recover, it was also difficult for local employees who could pass drug tests and safely operate machinery. The workforce situation was compounded by an overall lack of training and experience for people to secure jobs or interviews. Participants felt that schools emerged stronger after the recession primarily because they were forced to consolidate and pool institutional and civic resources.

3.10 Conclusions

The focus groups provided a narrative of the Great Recession's regional impacts – how the negative changes rippled and were varied based on whether the community was urban or rural in typology. The disruption experienced to the regional economies could be characterized as jarring as the economy corrected itself over a number of years. The economic corrections were unforeseen at the regional level. This left community businesses, nonprofits, institutions scrambling over a several year period to stabilize and find a workable normalcy.

The results of these focus groups paved the way for the team to test a number of variables for fit against the resiliency dashboard. In some instances, the data was not available and proxies were sought such as the case with the number of religious jobs in a county or a region versus nonprofit positions. The stories

which emerged from the focus groups allowed the team to make determinations on the data variables which ultimately drove the formation of the economic resiliency dashboard.

4 Latent Variables, Structural Equation Model, and Tool

4.1 What is Structural Equation Model (SEM)?

Structural equation model (SEM) integrates several multivariate techniques into one modeling framework: Measurement theory, factor analysis, path analysis, regression, and simultaneous regressions. Multivariate techniques attempt to model a real problem where the outcome is affected by more than a single factor. For example, the decision to increase resilience in a region may consider employment opportunities, financial status, and infrastructure levels, among others. Multivariate techniques allow researchers to understand relationships between variables in an overarching way and quantify the relationship between variables. SEM is useful for research questions involving complex and multi-faceted constructs measured within some error margins (Kline, 2005). As a multivariate technique, it can help specify a 'system' of relationships in addition to uncovering indirect as well as direct effects of a variable on other variables, and vice versa. Most socioeconomic concepts are neither directly observable nor measurable; hence we use SEM to define hypothetical or 'latent' constructs (Iacobucci, 2009). The latent construct can be understood as index variables or concepts that are based on the variables that can be measured.

SEM usually comprises three main steps: model specification, numerical estimation of the measurement model, and structural model estimation. Model specification refers to identifying variables and stating a model by determining which parameters are related. This process is carried out by establishing hypotheses from previous findings in the literature and drawing the hypothesized diagram model. A measurement model is carried out for each individual latent through confirmatory factor analysis (CFA). This enables us to determine whether the observed variables are good indicators of their respective latent construct or concept. Finally, the structural model represents the relationships between latent variables only, and it must be inferred from the measured variables (Carvalho & Chima, 2014). The advantages of SEM compared to other multivariate methods lie in its capability of simultaneously estimating relationships among a set of observed variables as mediated by other variables and the ability to account for measurement errors in the modeling process. Additionally, SEM can disentangle the direct, indirect, and total effects of a variable on another variable, even in complex models, to streamline the results.

SEM was used in this project to investigate the complex relationships among the different community capital(s) identified in Sections 2 and 3 of this report. The Community Capitals Framework (CCF; Flora and Flora 1998) capitalizes on identifying assets within each capital, the investments related to each capital, interactions between capitals, and how these impact communities. Seven community capitals constitute the CCF: natural, cultural, human, social, political, financial, and built capitals. The relationships between community capitals have been identified as non-linear, and different interrelations have been uncovered in previous research (Ringwood, 2017). For example, social capital can influence political capital, but it could also be affected by financial capital. Specifically, the community capitals offer an approach for analyzing the effect of economic development on various socioeconomic outcomes and vice versa (Hunter et al., 2020).

4.2 SEM Set Up for this Project

Various observed variables were analyzed and tested for each latent variable constructed to create an SEM representing economic resilience for the NIRPC and SIRPC regions. After the focus groups and literature review processes, five community capitals or themes were identified as important in this project: Human Capital (HC), Financial Capital (FC), Social and Political Capital (S&PC), Labor Characteristics (LC), and Built Environment and Infrastructure (BE&I). The Capitals were reduced to five as a product of the discussion of the focus group and the results of the confirmatory analysis done to choose the adequate variables to represent each of them. For instance, Social and Political Capital were group together, as well as the Infrastructure and the Built Environment capital. For each capital, at least eight variables were tested initially as part of the measurement model. These capitals aimed to represent the dependent variable, the Employment population ratio (Out_EPR). The availability of the data and residents' inputs during the focus groups helped identify these variables. We used data from multiple years to examine the latent variables and found high correlations across years; thus, it was decided that using latent variables comprised of the average of these variables was more robust to secular trends than single-year indicators (Poulsen et al., 2019). Hence, variables considered in this project were the averages of multiple years of data when possible. The study area was defined as the employment (or population) that could be reached within a 180-min drive from the county population centroid. This threshold considers a round trip for same-day deliveries and measures access to markets for domestic supply chains (Alstadt et al., 2012; Chacon-Hurtado et al., 2020). The final study area is comprised of 258 counties from Indiana, Illinois, Kentucky, Michigan, Ohio, and Wisconsin, as presented in Figure 4.1.

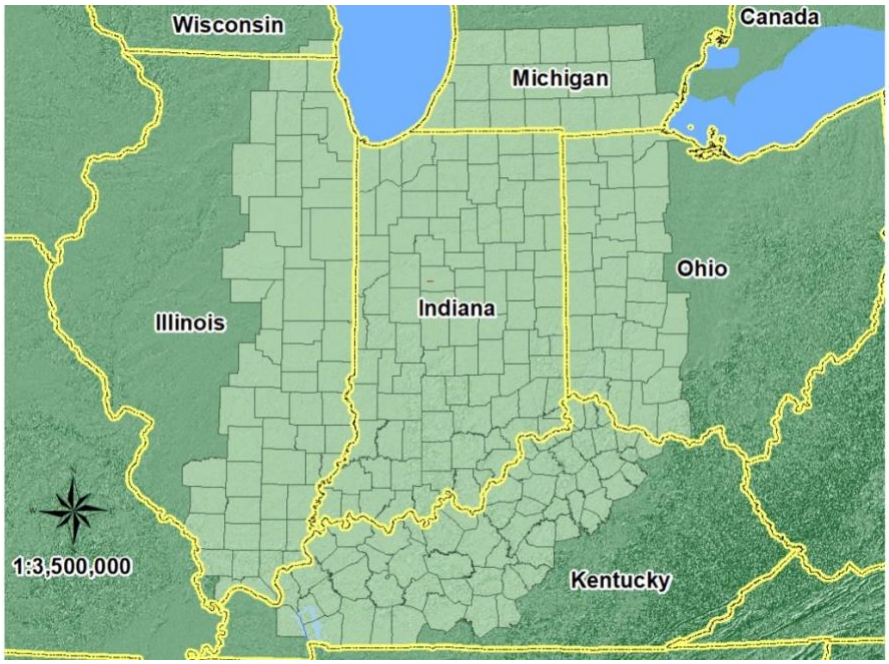

Figure 4.1: Counties Considered in the SEM model

Many observed variables did not fulfill the normality (normal distribution) assumptions. Hence, those variables were transformed using logarithmic transformation to meet assumptions. Additionally, multicollinearity was checked between the variables and was a factor of consideration in variable inclusion within the measurement model. Higher multicollinearity, where variables can be highly correlated with each other, can be problematic and make the estimation biased. All variables initially included in the analysis can be found in Appendix B. Once the assumptions of normality and multicollinearity were met, exploratory factor analysis was conducted to identify which observed variables could better represent each latent variable (community capital). Table 4.1 presents the final variables considered in this analysis and how they fit into the community capitals.

Table 4.1: Description of Major Variables

Latent	Observed Variables	Description	Expected Direction
Dependent Variable	Out_EPR	Average employment-population ratio 2011-2018	
Human Capital (HC)	STEM	Percentage of population with STEM occupations - average between 2011 and 2018	Positive
	DISA	Percentage of population with disabilities average between 2012 and 2018	Negative
	EDHS	Percentage of population with high school education and more - average between 2011 and 2018	Positive
	EDBH	Percentage of population with bachelor education and more - average between 2011 and 2018	Positive
Financial Capital (FC)	HHMOR	Average housing units without a mortgage between 2011 and 2018	Positive
	TRpctPI	Transfer receipts as a percent of total personal income	Positive
	ENT	Employment diversification measured as entropy	Positive
Labor Characteristics (LC)	FEMP	The average percentage of female labor participation rate 2011 to 2018	Positive
	MOVE	Percent population that moved within the same county and moved from a different county	Positive

Latent	Observed Variables	Description	Expected Direction
		but the same state in the last year.	
	LRELJ	Logarithm of religious jobs per 10K population	Positive
Social and Political Capital (S&PC)	ETH	Ethnicity index	Positive
	POLC	Political competition in 2016	Positive
	PVOTEC	Change of vote between 2012 and 2016	Positive
	FAMHH	Family households as a percent of total households	Negative
Built Environment and Infrastructure (BE&I)	WALK	Population weighted national walkability index	Positive
	LROADSQR	Logarithm of roads in the county (miles)	Positive
	LEST	Logarithm of average total utility establishments between 2011 and 2018	Positive
	LBRIDGESQR	Logarithm of bridge density	Positive
	PNIA	Percent no internet access	Negative
	LDIR1	Logarithm of distance to rail class I from county centroid	Negative

The exploratory factor analysis was also evaluated using different measures of goodness of fit (GoF). A Cronbach alpha higher than 0.5 indicates adequate internal consistency across the measurement variables considered for each latent. Sample size over significant chi-square (the smaller than 5, the better) aims to overcome the test's high sensitivity due to sample size and have an accurate measure of GoF. Reliability is defined as "the degree to which the scores are free from random measurement error" and free from random sampling error (Kline, 2005). Reliability is calculated as the average proportion of variance in the items that go into the latent variable (Kline, 2005). Root Mean Square Error of Approximation (RMSEA) (the smaller than 0.08, the better) assesses how far a hypothesized model is from a perfect model. Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) are incremental fit indices that compare the fit of a hypothesized model with that of a baseline model (Xia & Yang, 2019). For CFI and TLI, the closer to one, the better. The cutoff values considered were recommended by Hu & Bentler (1999). Additionally, the sign of the effect of each observed variable on the latent variable was considered. Table B4.2 in the Appendix B presents the most common GoF statistics for this analysis.

Once the exploratory factor analysis was completed, the structural equation model was estimated. Figure 4.2 discloses the different associations and the relationships between latent and measurement variables in the model.

In Table 4.1 and Figure 4.2, the average Employment-population ratio from 2011 to 2018 is used as the dependent variable. This macroeconomic statistic measures the civilian labor force currently employed against the county's total population. Researchers have explored the economic resilience of the regions using labor market variables (Chapple & Lester, 2010; Lewin et al., 2018). Whereas jobs, unemployment rate, and the regional gross domestic values have been used to study the recovery of regions from recessions and usually reported in the media, the employment-population ratio variable is more robust in capturing the growth in jobs in comparison to the changes in the population base. Note that a recessionary shock can not only impact jobs but also the population because of outmigration of the resident labor force. For example, Hill et al. (2012) and Foster (2012) stated that many areas had recovered their unemployment rates after the Great Recession much earlier despite poor labor market performances. Hence, we selected a ratio-based labor market-related outcome variable for this project.

Individual community capital, measurement variables (Figure B4.2), and data sources are presented below:

Human Capital (HC): Human Capital (HC) is represented by four measured variables presented in Table 4.1. The STEM (science, technology engineering, and mathematics) variable captures the average percentage of the jobs within the 91 STEM occupations between 2011 and 2018. STEM occupations are based on six-digit standard occupational classification categories, the most detailed occupation classification provided by the Bureau of Labor Statistics. This variable is expected to influence HC positively. A higher value of STEM variable indicates proportionately more jobs that require a bachelor's education or higher and specialized training. The STEM occupations include higher paid jobs and are part of the creative class identified by Richard Florida (Florida, 2002). Florida has proposed that human capital and the creative class are essential for urban and regional development (Florida, 2003). On the other hand, the population with disabilities averaged between 2012 and 2018 is expected to impact HC negatively as the disabled population may require special care and accommodations. Both the percentage of the population with high school education and higher- averaged between 2011 and 2018 and the average rate of the population with bachelor education and higher between 2011 and 2018 are significant and expected to influence the HC positively. The four variables that affect the HC were collected from the American Community Survey (ACS) (US Census Bureau, 2019) and Economic Modeling Specialists, International (EMSI).

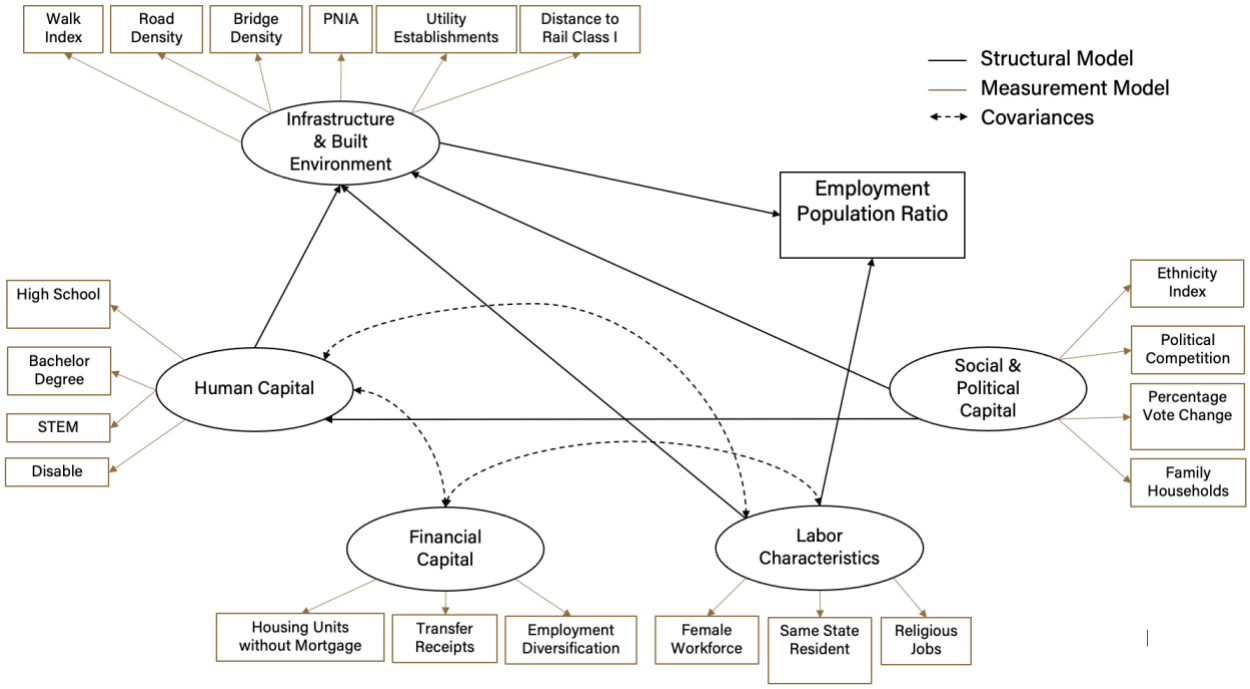

Figure 4.2: SEM associations for Economic Resilience

Financial Capital (FC): Financial Capital (FC) is represented by the three measurement variables: average percentage of housing units, transfer receipts, and employment diversification. The average percentage of housing units without a mortgage was measured between 2011 and 2018 and indicates the proportion of owner-occupied housing units that have the mortgages paid and are mortgage-free. This variable was collected from the ACS, U.S. Census Bureau. The percentage transfer receipts variable was also significant to represent FC, as well as the employment diversification measured as entropy. The former variable was collected from the Bureau of Economic Analysis (BEA), and the latter was collected from the EMSI. These three variables were expected to influence FC positively. BEA defines transfer receipts as the income received from government social benefits and net transfer receipts from businesses, including net insurance settlements, donations, fines, fees, certain penalty taxes, and excise taxes paid by non-profit institutions serving households (BEA, 2018). Here, the variable measures average percent transfer receipts of total personal income from 2011 to 2018. The employment diversification or entropy index is based on Equation 1, where S_i represents the share of employment in the i^{th} industry in the economy. N is the number of industry sectors. A log value is estimated for the reciprocal of the share of the individual industry sector and multiplied by the same share. The entropy value is the sum of values for all industry sectors. A value closer to 0 indicates that jobs are concentrated in fewer industries, and more negative values indicate more diverse economies.

$$Entropy = \sum_i^N S_i ln\left(\frac{1}{s_i}\right) \quad 1$$

Labor Characteristics (LC): Labor Characteristics (LC) is represented by three measurement variables. During the focus group discussions, gender-based challenges in retaining employment or obtaining new employment, out-migration of talent out of the region, and the critical role of religious and non-profit institutions as support organizations were shared by the participants. The average percentage of female labor participation rate from 2011 to 2018 collected from the ACS met the criteria to explain LC and is

expected to influence this latent variable positively. The percentage of population that moved within the same county or moved from a different county but within the same state in the previous year is collected from the Census, and it is expected to influence LC positively. The geographic mobility within the same state averaged from 2011 to 2018 shows in-migration happening within the same state. In addition, the logarithm of average religious jobs per 10,000 population from 2011 to 2018 is expected to impact the LC positively. The data for this variable is obtained from the EMSI.

Social and Political Capital (S&PC): Social and Political Capital (S&PC) is comprised of the following four measurement variables. The ethnic diversity index is based on Alesina et al. (1999) and measures population distribution in eight different races based on ACS data. Higher values of the ethnicity diversity index are reflective of more racial and ethnic diversity in the community and is expected to influence S&PC positively. The average index value from 2011 to 2018 is used. The political competition variable represents the ratio of votes between two major political parties in the 2016 presidential election in the US. The closer the value is to 1, the more equal the representation of both major political parties in the region. The data for 2016 is obtained from the Harvard University Dataverse and it is expected to impact the S&PC positively. The change of vote measures the difference between percentage of voter participation in the 2016 presidential elections and the percentage of voter participation in 2012 presidential elections. A higher value represents more engagement in the democratic process and enfranchisement; this variable is expected to impact S&PC positively. These data were also collected from the Harvard University Dataverse. The ACS-based family household variable indicates the proportion of families against total households and is expected to influence the S&PC positively.

Built Environment and Infrastructure (BE&I)): Built Environment and Infrastructure (BE&I) is represented by six measurement variables. The population-weighted national walkability index from the Environmental Protection Agency's Smart Location Database is expected to influence the BE&I latent positively. The walkability data are developed for 2015 at the census block group level. The walkability index values are aggregated for the county level by using the population as weights. The higher values indicate more walkable communities. The walkability index is based on three urban form characteristics: design, distance, and diversity (Watson et al., 2020). The logarithms of roads (road miles) and bridge (number of bridges) per unit area are two variables that are expected to influence BE&I positively. Both the variables were collected from the National Transportation Atlas Database (NTAD) (Bureau of Transportation Statistics, 2015). Distance to Class I railroad is estimated using the data from NTAD (Bureau of Transportation Statistics, 2015). The lower value for this variable indicates closer distance to the Class I railroad, which is considered a positive trait for the county. Class I railroads are major freight carriers in Northern America. Hence, this variable has a negative direction with respect to the BE&I latent construct as smaller distances to Class I railroad are preferable for economic development. The remaining two variables include the percent of households without access to the internet in 2017 and average number of utility establishments between 2011 and 2018. The former data is obtained from the ACS, U.S. Census Bureau, and the latter from EMSI. The percentage of homes without internet access is expected to influence BE&I negatively as lower values are better for socioeconomic development. The utility establishments include business establishments engaged in electric power generation, transmission, and distribution; natural gas distribution; and water, sewerage, and other systems. This indicator is expected to affect the BE&I positively as large values indicate variety of utilities present in the region.

4.3 Key Findings

From the 258 counties that encompass this project's sample, we found that resilience (measured as the employment-population ratio) is directly affected by Labor Characteristics and Built Environment and Infrastructure (BE&I) capitals. Resilience is indirectly influenced by Human Capital, Social Capital, and Labor Characteristics through BE&I Capital. Social Capital also affects Human Capital directly. Further, Labor Characteristics Index indirectly affects Resilience. Built Environment and Infrastructure measurement variables have a higher impact on the employment-population ratio than any other variables. For example, walkability and road density measurement variables have direct effects on this latent variable (Table B4.3). In addition, Human Capital and Labor Characteristics variables do not affect the employment-population ratio directly but affect BE&I variables, which is translated as an indirect effect to the Resilience outcome variable.

From the observed linkages between measured and outcome variables, we present a few key findings and their implications. If road density (road miles per square mile area) increases by 1 square mile, the Infrastructure & Built Environment latent increases by 0.802. If the walkability index increases by one unit, the Built Environment and Infrastructure index increases by 0.919. Note that the BE&I is positively impacted by both roads and highway as well as walkability infrastructure. Since BE&I affects the resilience measure directly, the results indicate that multimodal transportation systems can enhance the economic resilience of the region. Educational attainment affects the Human Capital positively which in turn influences the resilience indirectly, but positively. For example, if a bachelor's degree increases by 1%, Human Capital latent increases by 0.987. If disability rates in the county increase by 1%, the Human Capital decreases by -0.407. These results are intuitive in that more educated, healthy, and less disabled population are better for Human Capital. In Financial Capital, the rise of transfer receipt by 1%, increases the latent by 0.798. If the entropy of employment diversification increases by 1, Financial Capital latent increases by 0.438. The findings in Labor Characteristics highlights important linkages between gender-based labor participation rate and economic resilience of the region. For example, if female workforce rises by 1%, Labor Characteristics latent increases by 0.778. It is mentioned previously that Labor Characteristics influences resilience in a positive manner via the BE&I Capital. The challenges of female workforce participation came to light during the Great Recession (2008-2009). Similarly, another effect of the Great Recession was population outmigration. This study finds that if percent population that moved within the same county, or moved from a different county but remained in the same state in the last year, rises by 1%, the Labor Characteristics latent increases by 0.346. In other words, in-migration affects the resilience of a region positively. Additional numerical coefficients and findings are included in Table B4.3 in Appendix B.

4.4 Tool Development

The results and associations presented in Table B4.3 were used as weights to describe the influence that one observed variable or a latent concept has on economic resilience. Given those associations, we can create "what-if" scenarios. For example, we could assess the ripple effects on the regional economy if NIRPC improved the female labor participation rate by one percentage point. In this case, Labor Characteristics Index improves by 0.791, and the Economic Resilience index improves by (0.791*0.36) or 0.28 units. In addition, there are impacts on the BE&I Capital.

To visually show how changes in an area's economic resilience can result from shifts in various attributes, we used Tableau to create a dynamic and easy-to-use online tool. The tool is conceived to permit analysis and scenario development at the regional level, specifically for NIRPC and SIRPC. It is

necessary to highlight that the final value of the Employment-Population ratio is an index (unitless), and it serves as a reference to compare NIRCP or SIRPC regions with the 258 counties included in the analysis. As presented in Figure 4.3, we have provided a reference point for each index. For instance, the Built Environment and Infrastructure index's indicators are set in the average value of each of the variables for the region. For example, the average value of the percentage of no internet access is 17%, which is listed close to the variable name in parenthesis. Given this average value and all the other average values of the variables included to form this index, the index value in average is 9.30. If we kept all other variables at the average value, the Resilience Index would be 3.98. If we were to decrease the percentage of internet access to 10%, this index value would increase to 9.37, and in turn, the Resilience Index would become 4.00 (ceteris paribus). Changing only this variable could mean an increase of 0.5% in the overall Resilience Index.

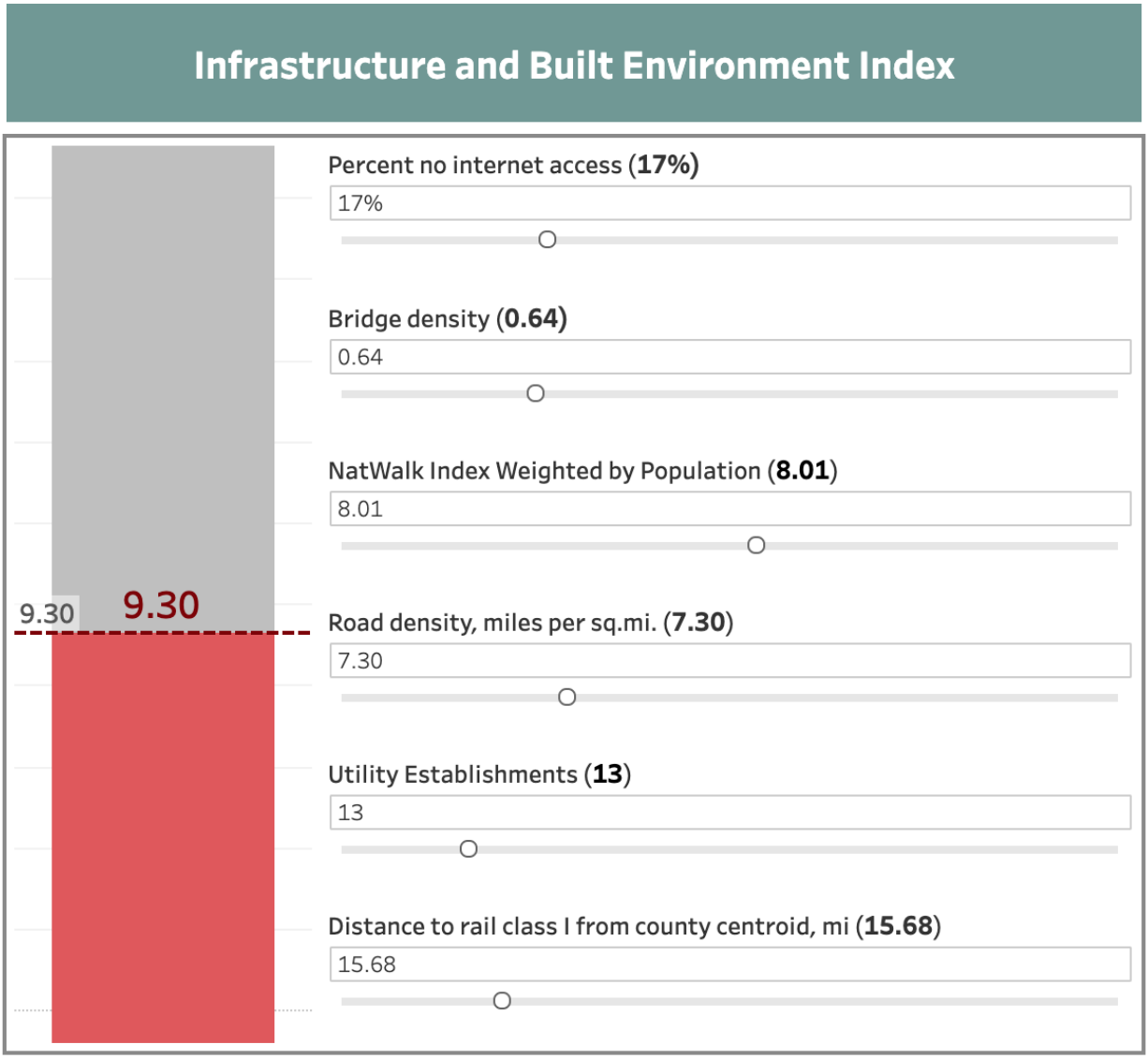

Figure 4.3: Infrastructure and Built Environment Index - Tool Example

Using the tool, we can also quantify the impact of adopting a policy that will change two variables in the model, even if they are related to a different index. For instance, if we consider increasing by 4% the

percentage of STEM-educated population and by 10% the female labor participation rate, the Economic Resilience Index increases from 3.98 to 4.01, which is again an increase of 0.75%. Hence, the tool developed allows to change multiple variables and assess the impact of those on the Economic Resilience of a region.

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5 Conclusions, Policy Implications, and Guidelines

5.1 Conclusions

The research findings presented in the previous chapters were guided and informed by the community capitals framework (CCF). Both the qualitative component as represented by the series of focus group sessions, as well as the quantitative component reflected in the Structural Equation Model (SEM), were interpreted with a lens on the CCF. The CCF includes an array of capitals, such as political and social capital, where improvements are much desired but would require resources beyond the capacity of SIRPC and NIRPC, the two regions serving as the pilot sites for this project. This chapter will focus on the mix of community capitals that SIRPC and NIRPC could influence by focusing on a set of programs and projects that could enhance the economic resiliency of these regions.

5.1.1 Inferences from Qualitative and Quantitative Analyses

The focus groups revealed that sustained, incremental change from the onset of economic turbulence is the only way to buffer communities. This begins with a recognition of the social vulnerabilities that become visible as the result of an economic downturn. In order to survive the initial short term and have resiliency during both the response and recovery stages of an economic crisis, well-coordinated partnerships and collective action among myriad organizations -- including: educational institutions (such as adult education, colleges, early childhood providers), nonprofits, community foundations, the business community and government institutions -- are required in order to forge a resilient future.

Turning into the quantitative analysis, the SEM results showed that the variables used to assess the impacts of CCF factors on regional economic resilience have different influences. As shown in Table 5.1 and Figure 5.1, the Built Environment and Infrastructure Capital is the one that has the highest impact on the economic resilience index compared to other capitals. From the variables that constitute this factor, the population-weighted national walkability index is the one that prompts the most significant improvement in the economic resilience index. Changes in either the built environment and infrastructure variables and especially in the walkability index have the most significant impact on the measure of economic resilience among all variables considered in this research study.

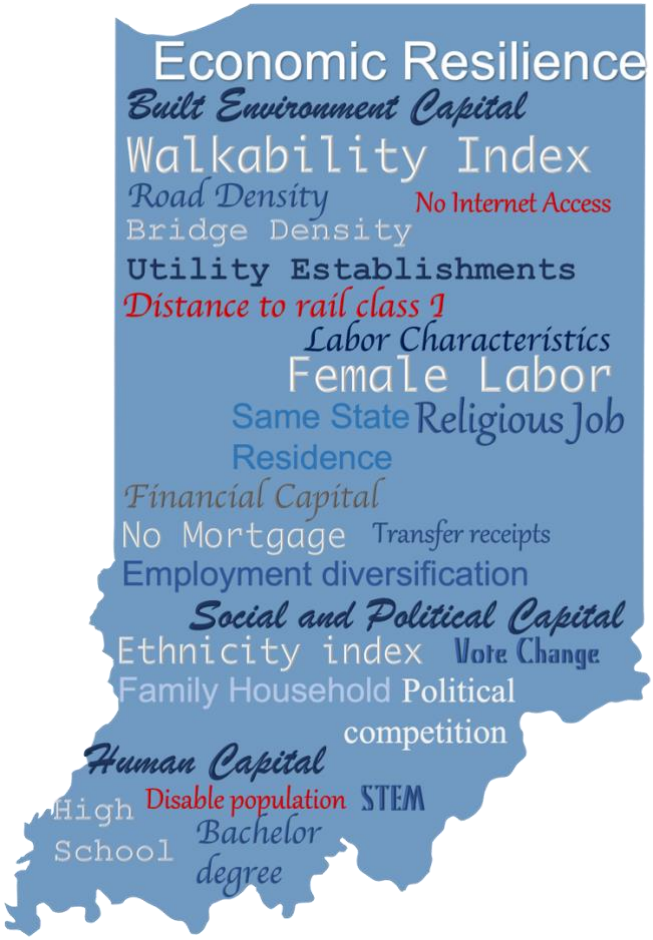

Figure 5.1: Variable Influence in Economic Resilience

Social and Political Capital also have significant impacts on the economic resilience index. S&PC is the second most important factor in the economic resilience measure we found in our research for this project. From previous research, Lewin et al. (2018) argued that increasing racial and ethnic diversity decreased the chances of entering an economic recession. This finding is also supported in this project given the importance of ethnicity and political competition on the general resilience index. However, it would be challenging for NIRPC or SIRPC to influence most of the factors part of this capital.

The labor characteristic latent variable also included two variables that moderately and positively influenced economic resilience, namely, female labor participation and the presence of religious jobs. The latter aimed to capture non-profit organizations' role in building the resilience capacity of an area. The focus groups affirmed the need for tactical coordination between community development and human service sectors in order to develop economic resilience immediately following a shock event and the resulting period of uncertainty.

Table 5.1: Impact of CCF factor and other variables on Economic Resilience

Description	Impact on Resilience
Human Capital (HC)	**+**
Percentage of population with STEM occupations - average between 2011 and 2018	+
Percentage of population with disabilities average between 2012 and 2018	-
Percentage of population with high school education and more - average between 2011 and 2018	+
Percentage of population with bachelor education and more - average between 2011 and 2018	+
Financial Capital (FC)	IA
Average housing units without a mortgage between 2011 and 2018	+
Transfer receipts as a percent of total personal income	+
Employment diversification measured as entropy	+
Labor Characteristics (LC)	**+**
The average percentage of female labor participation rate 2011 to 2018	++
Percent population that moved within the same county and moved from a different county but the same state in the last year.	+
Logarithm of religious jobs per 10K population	++
Social and Political Capital (S&PC)	**++**
Ethnicity index	+
Political competition in 2016	++
Change of vote between 2012 and 2016	+
Family households as a percent of total households	-
Built Environment and Infrastructure (BE&I)	**+++**
Population weighted national walkability index	+++
Logarithm of roads in the county (miles)	+
Logarithm of average total utility establishments between 2011 and 2018	+
Logarithm of bridge density	+

Description	Impact on Resilience
Percent no internet access	-
Logarithm of distance to rail class I from county centroid	-

How to interpret the table:

+/- means the item improves/reduces test score by up to 0.9 points; + + / - - means the item improves/reduces score 1-2.5 points; + + + / - - - means the item improves/reduces score by 2.5 or more points. IA means the item has no significant direct impact on the score but through other latent variables such as S&PC and HC.

Most other community capitals highlighted in Table 5.1 had positive, but less substantial impact on the economic resilience index. Three variables were found to influence the index negatively: the percentage of population disabilities from Human Capital, family households from Social and Political Capital, and percent no internet access and distance to rail class I, both from Built Environment and Infrastructure Capital. Financial Capital was found to influence the economic resilience index indirectly. As explained in Chapter 4, the influence is embedded in the Human Capital and Labor Characteristics factors' in the case of Financial Capital. Labor Characteristics seem to play a critical role in the general index from those two. Factors such as female labor participation and religious jobs per 10 K population should improve the Labor Characteristics.

Additionally, we compared the index results with the level of rurality of the different counties in the study area to determine whether urban areas are more likely to have higher resilience levels. The index of relative rurality (IRR) was chosen due to its continuous, threshold-free, and unit-free features, making it a good alternative against the traditional discrete classifications (Waldorf & Kim, 2018). As shown in Figure 5.2, the more rural the place (higher IRR), the lower its resiliency index. This is in line with previous research. This pattern was also confirmed from NIRPC (in grey) and SIPRC counties (in orange). Note that the research has focused on the recovery period of 2010 to 2018 after the Great Recession of 2008-2009. Figure 5.2 reveals that rural areas were comparatively disadvantaged during the post-recession recovery. It is known that the recovery after the Great Recession was slower and longer drawn with marginal increases in indicators such as labor participation rate and employment population ratio. This suggest that rural areas will need more support and assistance to advance their economic resiliency.

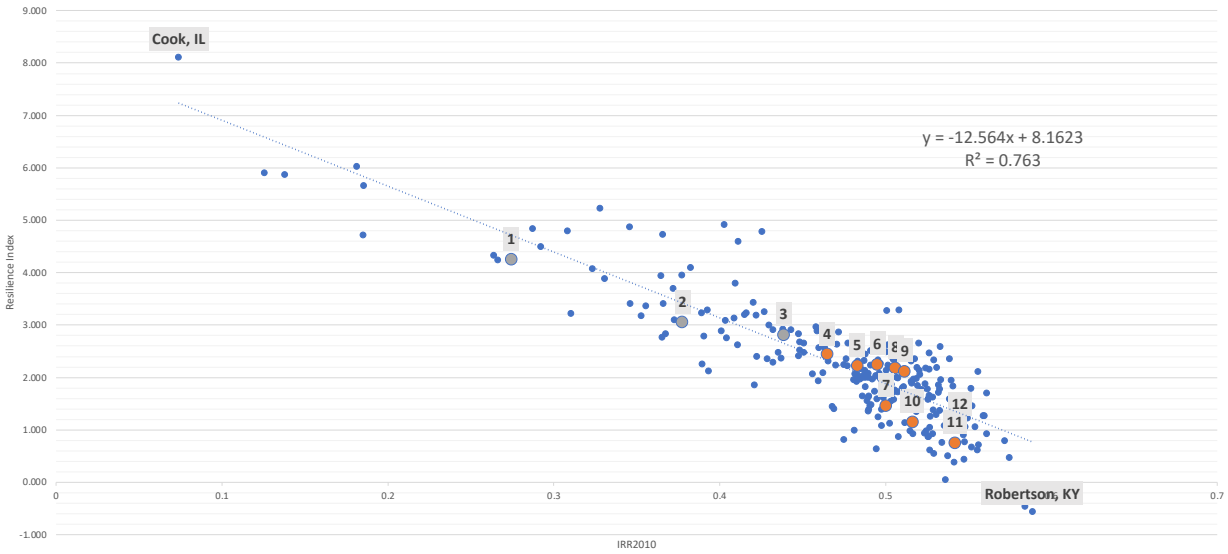

Figure 5.2: Resilience Index compared to IRR. NIRPC Counties (1. Lake, 2. Porter, and 3. LaPorte) and SIRPC Counties (4. Dearborn, 5. Shelby, 6. Jefferson, 7. Jennings, 8. Decatur, 9. Ripley, 10. Franklin, 11. Switzerland and, 12. Ohio)

5.2 Policy Implications

There are a host of strategies that could help NIRPC and SIRPC strengthen the factors that were found to impact the economic resilience index. As discussed in the previous section, built environment and infrastructure variables, specifically the walkability index, were important from the focus group results and the quantitative analysis. Policies that enhance the walkable environment around the study area could increase accessibility, reflected in the region's likelihood of being resilient. Investments in infrastructure that allow non-motorized modes (i.e., walking, biking) to be present in the communities remain particularly important to resiliency. NIRPC and SIRPC could use the "What-If?" Tool (created as part of this project) to evaluate how changes in the built environment and infrastructure features of their regions could guide their transportation planning and implementation activities.

On a similar note, female labor participation highly influenced the resilience index. For that reason, programs that expand the opportunity for females to be an active part of the labor force, such as better access to childcare serving children 0-13-year olds, should be promoted. In addition, employers could be encouraged to offer more family friendly policies dedicated to childcare and eldercare. Some programs could also help increase the resilience index by focusing on the less impactful variables found from the quantitative analysis, which in combination with other variables, could help improve the index. For instance, educational programs that encourage the importance of science and technology among different groups could increase the percentage of STEM jobs in the area, increasing the resilience index. The comparison with the rurality index inferred that rural counties might need a higher commitment to improving their resilience levels compared to urban areas.

5.2.1 Urban policy evolution and the creation of new pathways for resiliency

The research pointed to the need to have a wide-range of shorter and longer-term strategies for communities and regions in the face of an economic shock. Most participants felt that the most critical

issues needed to be addressed within the first month to three-year timeframe. In order to survive on a short-term basis, the focus groups pointed to the need to increase partnerships across education, nonprofits, community foundations, the business community and government institutions working together to address more immediate needs. The steps toward a more resilient region in the short term, as they presented in the focus groups, are presented in the following text and illustrated in Figure 5.3.

Prior to implementing any of the aforementioned steps, it is strongly suggested that the region identify any vulnerable populations and/or groups that exist and who would immediately feel the negative impacts of an event, effects that could cause ripples in the local economy. This may include people with disabilities, non-English speakers, the elderly, minorities, migrant workers, and people who live in poverty. The region should also determine where pockets of vulnerabilities are spatially located. This will enable the policy recommendations and resource provisions to be more targeted during a response and recovery phase.

Another recommendation is for the region to convene with local governments in their jurisdiction to undertake an honest appraisal of how well the local government can operate following a major shock. This could include whether the local governmental institutions can continue to function given any anticipated financial constraints that are predicted to occur as a result of a shock. Several questions regions should could pose is whether these jurisdictions have the resources and support necessary to continue with normal operations, and, if not, how can the two organizations work together to bring more resources to address the issue?

Depending on the nature of the economic shock, access to utilities such as clean water, sanitation sewer, electricity and broadband may be severely impacted following an event. If these services are impacted at all, the region should help lead localized efforts to address these locations, particularly if outages occur in multiple places. Furthermore, as a longer-term approach, resiliency strategy would seek to evaluate the vulnerabilities associated with the utility infrastructure and plan to bring resources to address these weaknesses. Ideally this tactic would consider infrastructure interdependencies, capability/capacity gaps and the consequences of their disruption to the health of the regional economy.

Mental health issues surface during an economic shock and continue beyond its duration and even after an economic recovery. Stakeholders reported how mental health issues cropped up because of job layoffs, lack of employment, underemployment, drug addiction (which may or may not be connected with job situation), homelessness and a general lack of resources which contribute to self-care. In this instance, regional entities should convene local nonprofits to determine resource needs, at-risk populations, service gaps and potential solutions to address the situation before it becomes chronic.

Other steps that can be taken to limit the economic damage following a shock could consist of the following stages: (1) Ensure that prior to a shock, the regional economy has a diverse industrial and occupational base to drive growth; and (2) The nonprofit sector, which serves the region, should be assessed for strengths and gaps in offerings. For example, during the Great Recession, many nonprofits folded or became part of larger organizations because of few funding opportunities. This ultimately led to few services and resources to help vulnerable populations to be unable to ultimately meet the population needs. Organizational and community-wide helplessness set in as a result.

The Figures found on the following pages provide a pathway for both urban and rural local governments in which to focus their stabilizing efforts during economic periods of uncertainty. The Figures also provide a timeline for short and medium-term resiliency strategies. While they remain steps toward resiliency, it is of utmost importance that each phase is strengthened and maintained during the entire economic recovery process. For example, this means that once a region is able to move onto step 4 that each previous step remains in place and is sustained. In other words, each phase builds on the previous step or steps as way to actively recover and build resilience.

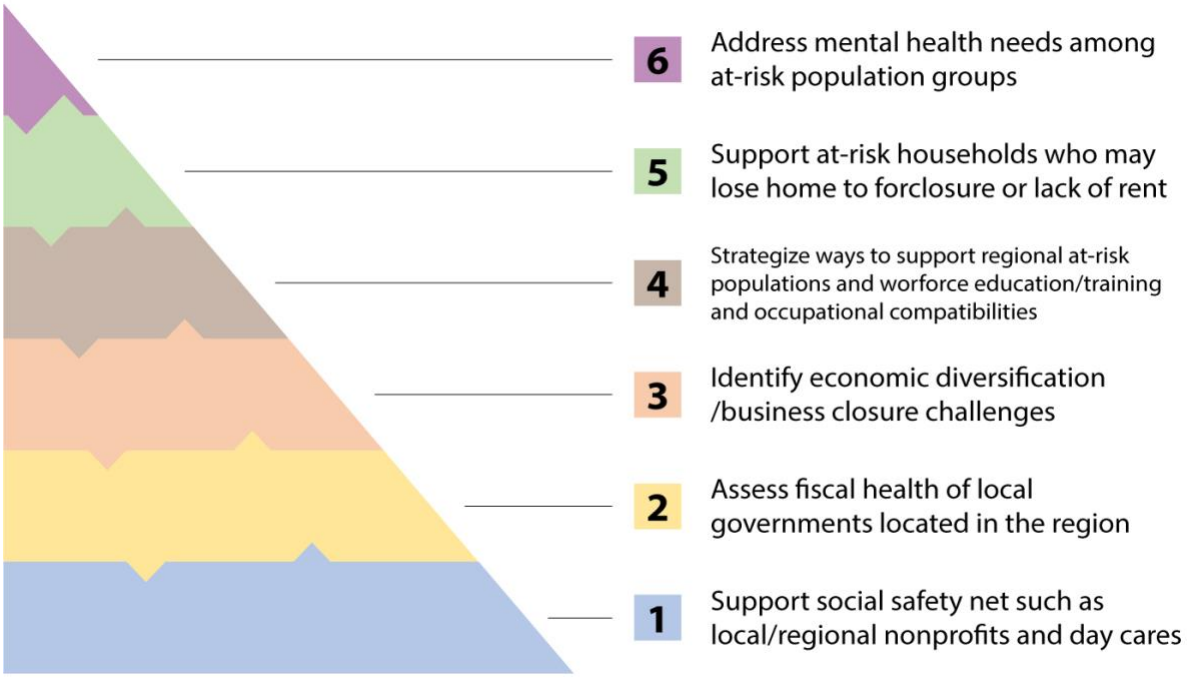

Figure 5.3: Urban active recovery strategies 0 to 4 years after economic shock

The timeline shown in Figure 5.3 indicates the order of support an urban region needs following an economic shock for an urban area. For instance, urban decision makers expressed the need for communities to bolster the social safety net immediately. Although the Figure indicates that this is a first step, it is crucial as it sets the foundation for recovery and must be maintained for the entirety of the recovery period. The main challenge outlined during the focus groups was the absolute need for organizations to collaborate and strategize on a tremendous number of projects to stem economic falls in a short period of time. The window in which to actually support economic activity after a shock appears to be a very tight timeframe and requires a committed heavy lift with some prioritization of workload.

The fiscal health of local government institutions needs to remain sound in order to survive the protracted economic turbulence a shock brings. Sometimes institutions face funding issues when its tax base declines (with falling property values and business closures) – these should be outlined and the region be prepared to offer collaborative support during those potentially difficult times.

The next two steps addressing regional resiliency, are closely intertwined: economic diversity and workforce compatibilities. Manufacturing industries, along with transportation and trade professionals faced significant declines in demand during the Great Recession. This triggered a protracted period of instability and uncertainty in urban regions for manufacturing industries, transportation and trade professionals all of whom are in extremely short supply over a decade later. This shortage prevented economic gains during the recovery period.

Lastly, urban residents, as a result of workforce instability face homelessness and mental health challenges. Urban/metro regions should coordinate efforts to address household instability because the consequences reverberate over generations once poverty occurs to a household – or a slip from middle to lower middle class occurs. Once this is widespread, it is difficult to escape the cycle of deprivation and poverty and rebound as an intact household.

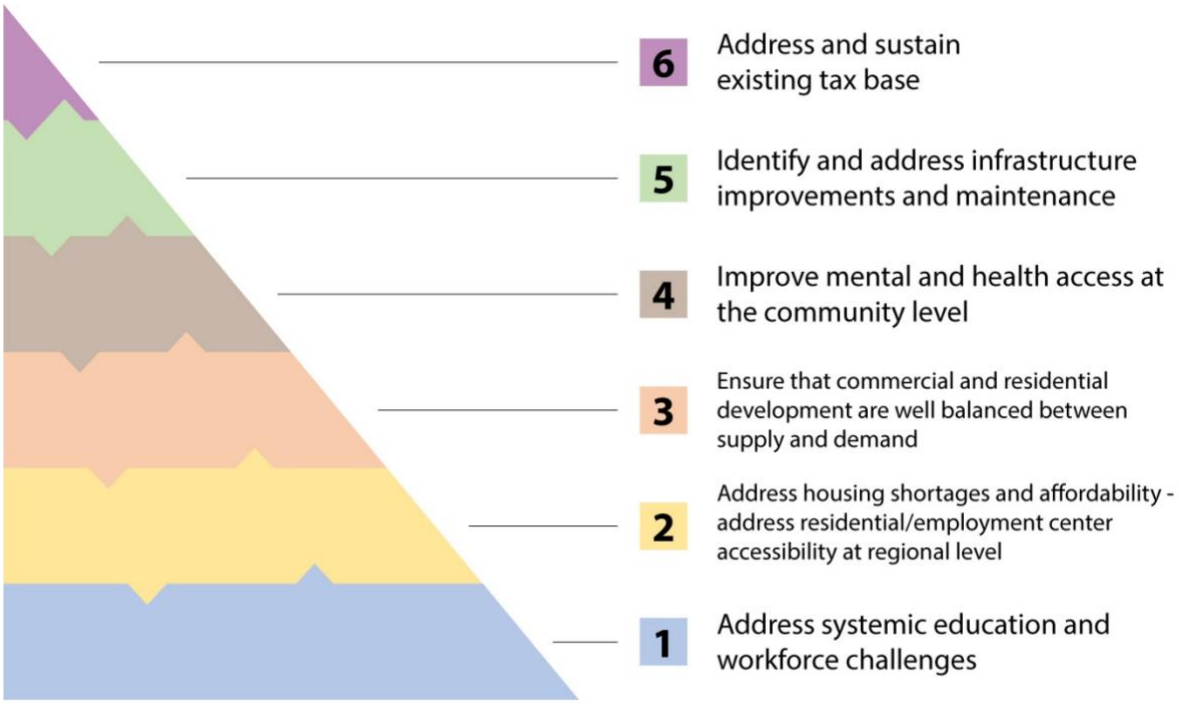

Figure 5.4: Urban medium to long- term resiliency strategies Years 5 to 15+ years after economic shock

All of the medium- and long-term steps outlined in Figure 5.4 mirror the short-term resiliency steps for the most part. However, it focuses on taking a balanced approach to address gaps in the social and built environmental capitals. One way that regions may build up resiliency is to partner, collaborate and support nonprofit efforts very closely over the long term. This theme was particularly acute in the urban focus groups. There appeared an overall lack of awareness on behalf of regional and urban decision makers on how to work closely with nonprofits – bridging and leveraging governmental and nonprofit institutions. Rural regions appear to be more socially supportive and aware of the challenges which exist, although, again, a lack of true collaborations remain. Further research should be conducted on what form and funding exists for government & nonprofit regional partnerships for the future.

5.2.2 Rural policy evolution and the creation of new pathways for resiliency

The research pointed out the need to have a wide-ranging and immediate path in the face of an economic shock. Most of the participants felt that the most critical issues needed to be handled within the first month to three-year timeframe. In order to survive the short term, the focus groups pointed to the need to increase partnerships across education, nonprofits, community foundations, the business community and government institutions to work together (Figure 5.5).

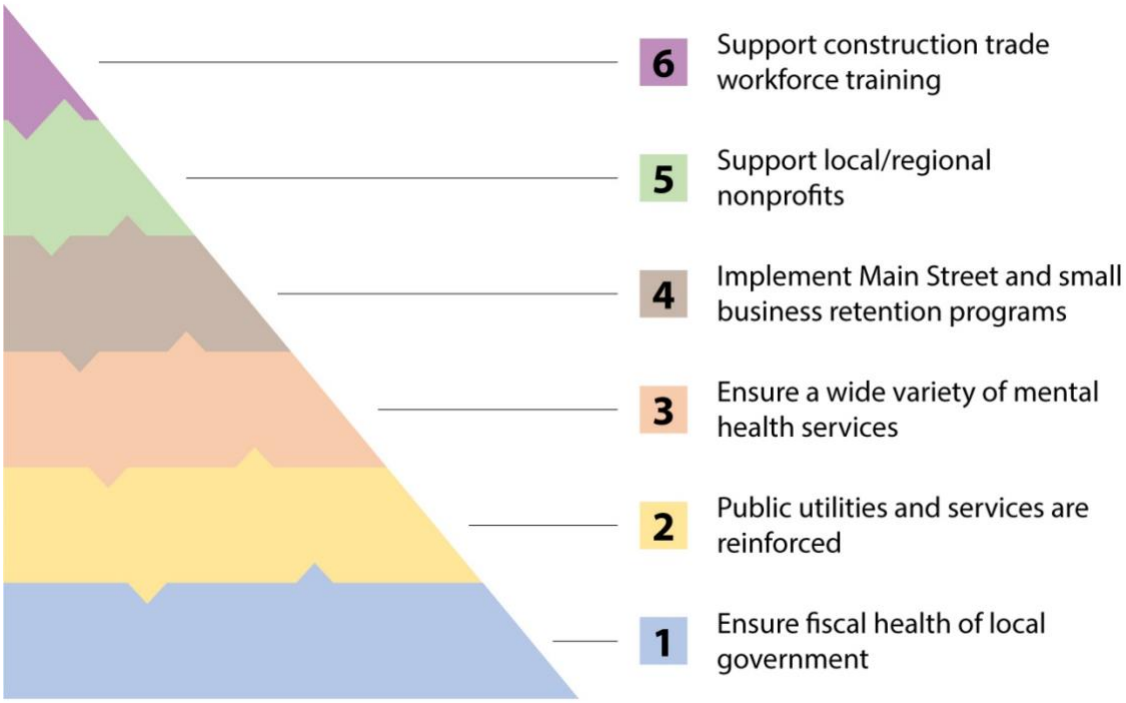

Figure 5.5: Rural recovery strategies Years 1 to 3 after economic shock

The first three years after an economic shock is the most crucial period in which to implement changes in order to avoid institutional collapse. It is also recognized as the most stressful to people because the ravages of the economic issues become visible and plentiful to witness. The policy guidance outlined above provides broad steps that regional and local governmental organizations can implement which will allow to endure the short and long-term consequences of an economic downturn.

The proposed strategies seek to mitigate the impacts of an economic downturn which threaten the fiscal health of institutions and stymie their ability to help vulnerable populations. While not outlined in Figure 5.5, economic resiliency begins with industrial and occupational diversification and planning for that at the regional level is feasible through its Comprehensive Economic Development Strategy (CEDS). In addition, the health of public utilities such as water, sewer, and electrical providers should be assessed along with privately operated broadband services.

Mental health issues begin to crop up shortly after an economic shock – the population feels helpless and constantly buffeted by change. This takes a toll on mental health particularly among people who may face homelessness or joblessness. Mental health, nonprofits and their services should be prepared to expand immediately after a downturn or a shock event.

Lastly, in order poise the rural region to remain steadfast in light of changing events and a shifting economic landscape, it was found that Main Street and small business retention programs should be implemented, bolstered and supported. Their needs could be easily determined with a quick survey assessing skills, equipment, workforce and other measures for short term relief of stresses. Younger populations may not have experienced economic downturns in their adult lives prior to this time, and those who work in the trade professions are particularly vulnerable to seeking employment opportunities outside of a region during this time. If the region wants to retain this workforce which is vital to rebuilding and sustained growth following an economic shock, additional workforce training or upskilling and/or short-term retention programs should be implemented. Measures which stem outside talent migration for skilled professionals may serve to ensure the region is poised for recovery and growth post economic recession.

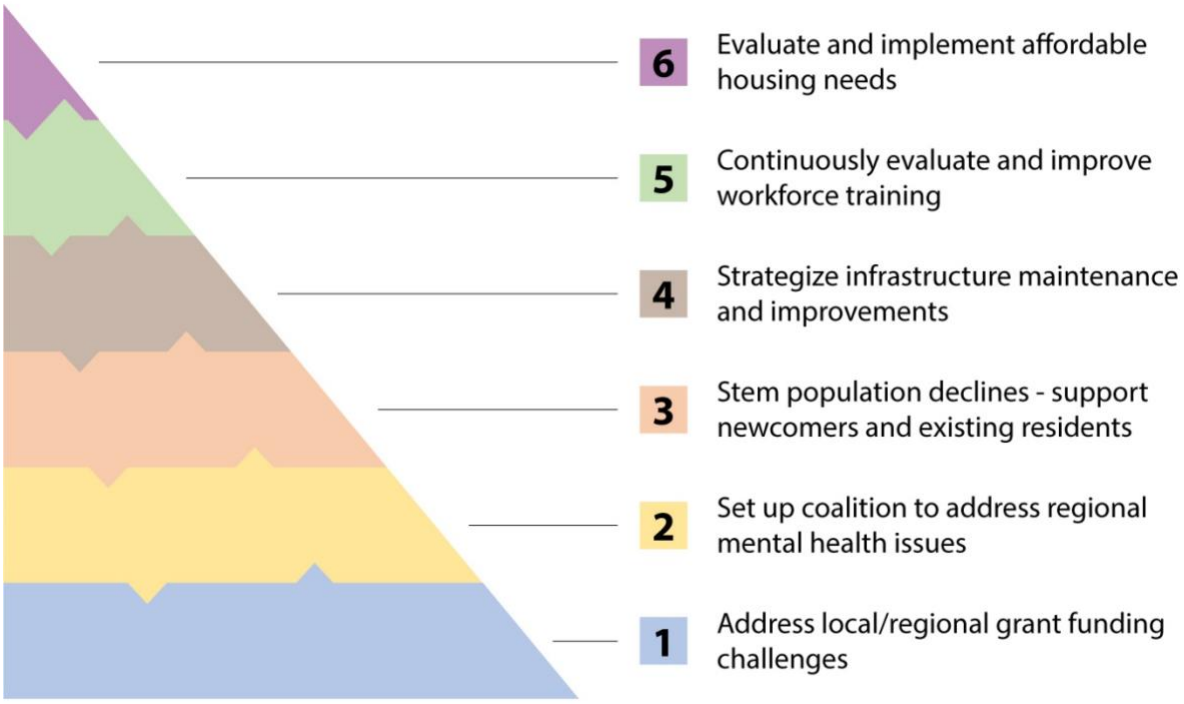

Figure 5.6: Rural medium to long- term resiliency strategies Years 5 to 15+ years after economic shock

Following the first three years, the second period identified through the focus groups concerned the 4 to 20-year timeline (Figure 5.6). This represents a critical period in which recovery and growth should be planned for and prioritized. However, this period should be recognized as a time when households which have endured the economic challenges remain vulnerable to lingering burn out. This concern extends to community business owners. It is also the time to plan for future economic shocks and positioning regional economies to withstand the changes that may be encountered at that time. Thus, this guidance provides general steps which will help regional and local governmental organizations supplement their CEDS policy development over the long term. It is recommended that the CEDS document make note of how the regional economy may position itself as resilient in the future, beyond the typical five-year time horizon.

The proposed strategies seek to mitigate the medium and long-term impacts of an economic downturn. First of all, regional communities should coordinate efforts and pool resources to seek funding at the state and federal level in order to overcome any institutional or population challenges. Secondly, while many regional entities have established workforce development networks to address rural healthcare occupation gaps, it is suggested that their scope is broadened to address some of the mental and physical health impacts facing community populations. For example, substance abuse and mental health treatment centers could be identified and a judgement made concerning whether it meets the needs of the region.

Infrastructure improvements such as street and highway, sanitation sewer services and other utility maintenance should be prioritized. Funding opportunities should address population growth and decline in terms of suitability and sustainability to ensure future fiscal health. Population decline remains a serious issue for many rural populations. In these cases, civic engagement programs should address talent pool retention and welcoming of newcomers to the area. Rural focus group participants emphasized that a social safety net is best supported by nonprofit institutions. These are the groups who should also lead the way in bringing a community-wide recognition to newcomer populations such as (and, for instance) migrant workers and remote workers.

5.3 Guidelines

The policy directions discussed previously are specific suggestions and recommendations for urban and rural communities because they have unique assets, strengths, and challenges. Both NIRPC and SIRPC have urban and rural components although in different proportions. Some regional planning organizations might have more urban areas and some will be more rural. It is evident from the research that urban and rural areas experience impacts from a recessionary shock in different sequences. The recovery period and the trajectory are also different. Hence, when regions work on their Comprehensive Economic Development Strategies (CEDS), it will be important that the unique characteristics and challenges of urban and rural areas be recognized and addressed in their resiliency plans. Some areas where NIRPC and SIRPC can work to strengthen the economic resilience of their regions include Built Environment and Infrastructure Capital. For other areas, such as Social and Political Capital and Labor Characteristics, partnerships with non-profits, community support organizations, grass-root workers, etc., are vital. Similarly, partnerships with private institutions such as community banks are suggested for Financial Capital, while educational institutions and workforce development organizations are suggested for Human Capital. The research uncovered multifaceted linkages of economic resilience to community capitals. Hence, planning and program development will require a multi-pronged approach. Considering that temporal scale (immediate, short-term, medium, and long-term) of impacts can vary for households, communities, and regions, planning for economic resilience may consider developing a bundle of programs and initiatives for different constituents and for different time periods.

5.4 References

Lewin, P., Watson, P., & Brown, A. (2018). Surviving the Great Recession: The influence of income inequality in US urban counties. *Regional Studies*, 52(6), 781-792.

Waldorf, B., Kim, A. (2018). The Index of Relative Rurality (IRR) : US County Data for 2000 and 2010. Purdue University Research Repository. doi:10.4231/R7959FS8.

6 Appendix

Appendix A. Focus Group Question Protocol

Focus Group Question Protocol

Projected Audience: Regional decision makers

Required tools: large sheet of paper at least 8 feet in length for focus group notes. Have 1 packet of surveys and for each participant (no names or identifying features will be used when collecting this information). Include 20 pens with supplies to complete surveys. Room will be set up prior to participants' arrivals.

Introduction: Explain who we are, what the project is, why and where we are conducting focus groups. Hand out IRB consent forms for signatures and project information.

The first 2 questions will be put into handouts for the participants to complete before the breakout session found at Questions #4, the Community Capitals Exercise. The pre-focus group survey is found attached.

1. Hand out quick survey questions to each participant as they arrive. Ask participants to write their home location in 2008, their work location in 2008, and any employment or home locations since 2008. (10 minutes)

2. What were the occupations of the focus group participants before, during and after Great Recession? Did they change? What was the type of company or business that they worked in? Example: wait staff, retail, car sales etc.

3. In which industries did they see as most impacted by the Great Recession in their area?
    i. Each participant will circle to indicate their perception of the top 5 industries which suffered in the region. (15 min)
    i. Investigate key, regional industries ahead of time and provide a list of employers and sectors to participants from which to choose. Replicate this short activity for top occupation groups as well. Each participant will circle to indicate their perception of the top 5 industries which suffered in the region. (15 min)

4. Adopt and breakdown an abbreviated version of the **Community Capitals** (Emery & Flora, 2006) framework and have people discuss how aspects of the Great Recession negatively impacted the regions **(Use rotating flip charts to record and place people into groups of 3 randomly selected individuals and place recording devices at each station. Do not call this "community capitals" to participants as it is just a conceptual framework).** Each flipchart will explain the topic category at the top of each sheet (in case multiple sheets are used per focus group). Ask participants to first list the places that were negatively impacted during the recession in their

county and/or community under each topic. Ask participants to be specific – which roads were affected? Which parks went downhill? Which banks did not offer support to small businesses in trouble during the recession? (30 min)

a. **Built environment** – public spaces such as parks & libraries, housing, factories/tech parks, schools, offices, stores and malls
a. **Infrastructure**- roads, bridges, airports, sidewalks and broadband
a. **Financial** – community development banks, reliable financial capital institutions, banks, credit unions, loan funds, venture capital funds and microenterprise loan funds.
a. **Social & Cultural** – local nonprofit organizations, local churches, regional nonprofits, other civically-engaged groups, senior centers, services for disabled residents, organizations that support homeless, immigrants, or specific demographics such as children, Latinx, African Americans, etc. museums, libraries, parks, playhouses, theatres, art studios, colleges/universities, community or adult sports teams, community arts institutions, cultural districts
a. **Human** – Investments in education, on-the-job training, skills and health status which increase their productivity and earning levels

Each flip chart will contain a definition of the category. Participants will be given a short list of questions with each chart which will help them to discuss the category.

5. **Part 2 of Community Capitals:** Review the lists generated in Part 1 and use stickers to vote on the top 3 from each category which **is** of crucial importance to the ***recovery*** of a **stressed** economy. Each participant casts 3 votes on each chart to indicate community capitals they consider to be most important to the resistance and/or recovery of a regional downturn. Each topic will be placed on a notecard. The top 3 from each category will be on a notecard to set up for the next exercise. (10 min + 5 min voting)

Hand out a sheet with the region's top 10 industries and occupational groups. Each participant will vote to indicate their choices. These will be collected by the convener prior to the Community Capitals Timeline brainstorm.

6. In which industries did they see as most impacted by the Great Recession in their area?
    ii. Each participant will circle to indicate their perception of the top 5 industries which suffered in the region. (15 min)
    ii. Investigate key, regional industries ahead of time and provide a list of employers and sectors to participants from which to choose. Replicate this short activity for top occupation groups as well. Each participant will circle to indicate their perception of the top 5 industries which suffered in the region. (15 min)

While #6 is in progress, #7 is set up by conveners.

7. **Community Capitals Timeline for Recovery** long sheet with a 1 – 20 year time horizon represented (short 1-5), medium (6-12) and long term (12+) time spans will be delineated. The participants will come together to rank the temporal features of the capitals cited crucial to a

recovering economy. If one government agencies should prioritize, what timeline and sequence of activities should be dealt with in the short, medium and long term? (15 min)

8. Several cities have developed, or are in the process of developing, resiliency plans with an emphasis on equity and inclusion. Who are the most vulnerable groups of people in your area? And, how should **REGIONAL planning** address social vulnerabilities? What capacity should it serve in during planning and recovery efforts? (15 min)

General Discussion Questions located with their corresponding each community capital stations:

1. Built environment - is located at the Built Environment flipchart only

a. What did you see in your town or neighborhood that was negatively impacted during the recession in this category? Did malls and retail shops begin to close down? What about local supermarkets and chain stores? Was there a problem with empty buildings and/or foreclosures such as with housing? If so, where in your town/neighborhood?
b. Did you see similar negative impacts in other areas of the region (Lake, Porter and Laporte counties).
c. Did any parts of the built environment improve in these 3 counties during the Great Recession that surprised you? If so, what and where?

2. Infrastructure - is located at the Infrastructure flipchart only

a. What did you see in your town or neighborhood that was negatively impacted during the recession in this category? Were bridges and roads in the region well salted during the winter? How were your Internet speeds? Were potholes dealt with? Did traffic increase or decrease during this period? What about the performance of utilities (water supply, wastewater, etc.)?
b. Did you see similar negative impacts in other areas of the region (Lake, Porter and Laporte counties).
c. Did any aspects of Infrastructure improve in these 3 counties during the Great Recession that surprised you? If so, what and where?

3. Financial - is located at the Financial flipchart only.

a. What did you see in your town or neighborhood that was negatively impacted during the recession in this category? Were home improvement loans difficult to get? What about refinancing options? Were banks badly impacted by local foreclosures? Did you notice local lending to small businesses decreased during this period? Were small businesses closing their doors? If so, where?
b. Did you see similar negative impacts in other areas of the region (Lake, Porter and Laporte counties).

c. Did access to any Financial institutions in these 3 counties during the Great Recession that surprised you? If so, what and where?

4. Social & Cultural - is located at the Social and Cultural flipchart only.

a. What did you see in your town or neighborhood that was negatively impacted during the recession in this category? Did local nonprofits close? How did local churches respond to the challenge? Did plans for additional centers for seniors, or disabled close? Did food banks provide more meals and establish new outlets?
b. Did you see similar negative impacts in other areas of the region (Lake, Porter and Laporte counties).
c. Did any aspects of Social and Cultural amenities improve in these 3 counties during the Great Recession that surprised you? If so, what and where?

5. Human & Educational Resources - is located at the Human and Educational Resources flipchart only.

d. What did you see in your town or neighborhood that was negatively impacted during the recession in this category? Were lots of people out of work from a specific industry? Did any hospitals, doctor practices or health clinics close? Did you see a major decline in agriculture production and agribusiness? Did employers stop offering or funding additional training for their employees?
e. Did you see similar negative impacts in other areas of the region (Lake, Porter and Laporte counties).
f. Did any aspects in this category improve in these 3 counties during the Great Recession that surprised you? If so, what and where?

Appendix B. Quantitative Analysis

Table B4.1: Descriptive Statistics of crucial variables

Latent	Observed	Description	Mean	Std. Dev	Min	Max	Model Sign
	Out_EPR	Average Employment Population Ratio 2011-2018	0.480	0.122	0.232	0.938	
HC	STEM	Percentage of population with STEM occupations - average between 2011 and 2018	0.029	0.016	0.010	0.176	Positive

Latent	Observed	Description	Mean	Std. Dev	Min	Max	Model Sign
HC	DISA	Percentage of population with disabilities average between 2012 and 2018	0.144	0.034	0.068	0.237	Negative
HC	EDHS	Percentage of population with high school education and more - average between 2011 and 2018	0.866	0.045	0.628	0.962	Positive
HC	EDBH	Percentage of population with bachelor education and more - average between 2011 and 2018	0.189	0.084	0.090	0.560	Positive
FC	HHMOR	Average housing units without a mortgage between 2011 and 2018	0.252	0.057	0.126	0.412	Positive
FC	TRpctPI	Transfer receipts as a percent of total personal income	0.230	0.059	0.073	0.386	Positive
FC	ENT	Employment Diversification measured as Entropy	-0.262	0.122	-1.052	0.053	Positive
LC	FEMP	The average percentage of female labor participation rate 2011 to 2018	0.708	0.052	0.513	0.815	Positive
LC	MOVE	Percent population that moved within the same county and moved from a different county but the same state in the last year.	0.116	0.030	0.067	0.254	Positive
LC	LRELJ	The logarithm of Religious jobs per 10K population	4.005	0.493	0.000	4.982	Positive
S&PC	ETH	Ethnicity Index	0.145	0.113	0.021	0.607	Positive
S&PC	POLC	Political Competition in 2016	0.485	0.376	0.150	3.556	Positive
S&PC	PVOTEC	Change of vote between 2012 and 2016	-0.071	0.106	-0.578	0.155	Positive

Latent	Observed	Description	Mean	Std. Dev	Min	Max	Model Sign
S&PC	FAMHH	Family households as a percent of total households	0.675	0.045	0.515	0.817	Negative
BE&I	WALK	Population Weighted National Walkability Index	6.170	1.631	2.544	13.247	Positive
BE&I	LROADSQR	The logarithm of Roads in the county (miles)	7.388	0.554	5.503	9.920	Positive
BE&I	LEST	The logarithm of Average Total Utility Establishments between 2011 and 2018	1.087	0.878	-0.981	4.353	Positive
BE&I	LBRIDGESQR	The logarithm of Bridge density	-0.817	0.475	-2.603	0.844	Positive
BE&I	PNIA	percent no internet access	23.334	7.248	5.876	51.599	Negative
BE&I	LDIR1	Distance to rail class I from county centroid	20.577	13.785	0.044	76.417	Negative

Cutoff criteria for acceptance are also shown in Table 4.2.

Table B4.2: Goodness of fit and results for factor analysis

Latent	HC	FC	LM	S&PC	BE&I	Cut of criteria	Source
Cronbach Alpha	0.668	0.527	0.616	0.516	0.720	>0.5	(Hu & Bentler, 1999).
Reliability	0.879	0.749	0.760	0.887	0.885	closer to 1	(Hu & Bentler, 1999).
Chi-square	2.289	9.549	7.814	3.184	17.781		
df	1.000	2.000	2.000	2.000	7.000		
Chi-square/df	2.289	4.770	3.907	1.892	2.540	<5	(Hu & Bentler, 1999).
RMSEA	0.071	0.072	0.036	0.048	0.054	0.080	(Hu & Bentler, 1999).
CFI	0.995	0.846	0.939	0.996	0.984	>0.9	(Hu & Bentler, 1999).
TLI	0.972	0.839	0.817	0.989	0.965	>0.9	(Hu & Bentler, 1999).

Table B4.3: SEM Results

Path			Path Coefficient	z-value	p-value
Infrastructure and Built Environment (I&BE)					
WALK	←	I&BE	0.919	5.76	0.000
LROADSQR	←	I&BE	0.802	16.58	0.000
LEST	←	I&BE	0.684	17.38	0.000
LBRIDGESQR	←	I&BE	0.601	12.13	0.000
PNIA	←	I&BE	-1.004	-13.67	0.000
LDIR1	←	I&BE	-0.383	-4.32	0.000
Human Capital (HC)					
STEM	←	HC	0.599	12.18	0.000
EDHS	←	HC	0.662	11.93	0.000
EDBH	←	HC	0.987	15.71	0.000
DISA	←	HC	-0.407	-7.88	0.000
Social and Political Capital (S&PC)					
ETH	←	S&PC	0.848	6.26	0.000
POLC	←	S&PC	0.927	10.18	0.000
PVOTEC	←	S&PC	-0.223	-5.11	0.000
FAMHH	←	S&PC	-0.385	-6.32	0.000
Labor Characteristics (LC)					
FEMP	←	LC	0.778	5.12	0.000
MOVE	←	LC	0.346	3.42	0.001
LRELJ	←	LC	0.434	4.46	0.000
Financial Capital (FC)					
HHMOR	←	FC	0.659	6.43	0.000
TRpctPI	←	FC	0.789	8.91	0.000
ENT	←	FC	0.438	6.85	0.000
Employment-Population Ratio (Out_EPR)					
Out_EPR	←	LC	0.377	4.64	0.000
Out_EPR	←	I&BE	0.313	4.93	0.000
Structural Model					
I&E	←	SC	1.217	7.15	0.000
I&E	←	HC	-0.465	-2.85	0.006
I&E	←	LC	0.466	8.46	0.000
HC	←	SC	0.709	18.55	0.000

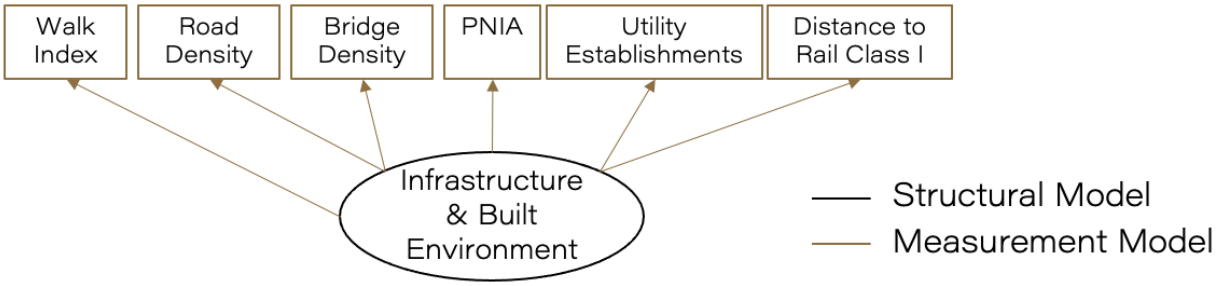

Figure B4.1: Measurement Variable Infrastructure and Built Environment

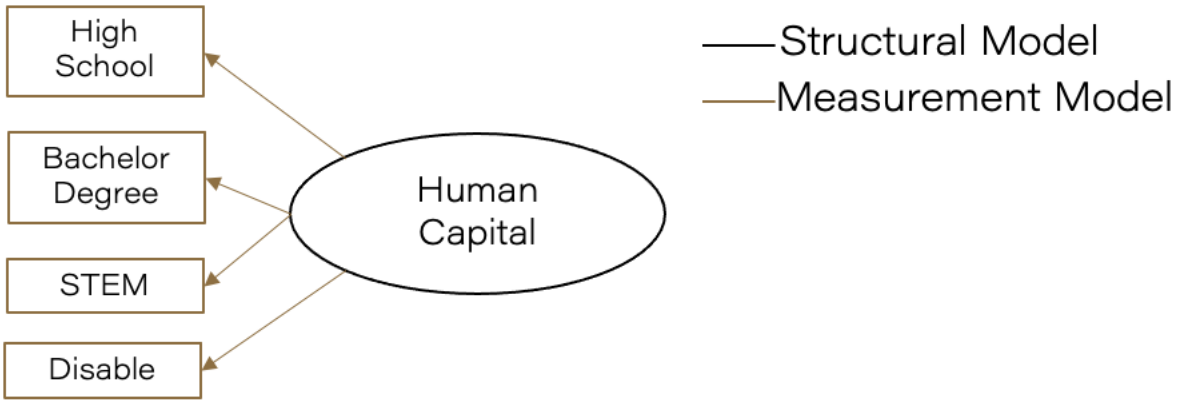

Figure B4.2: Measurement Variable Human Capital

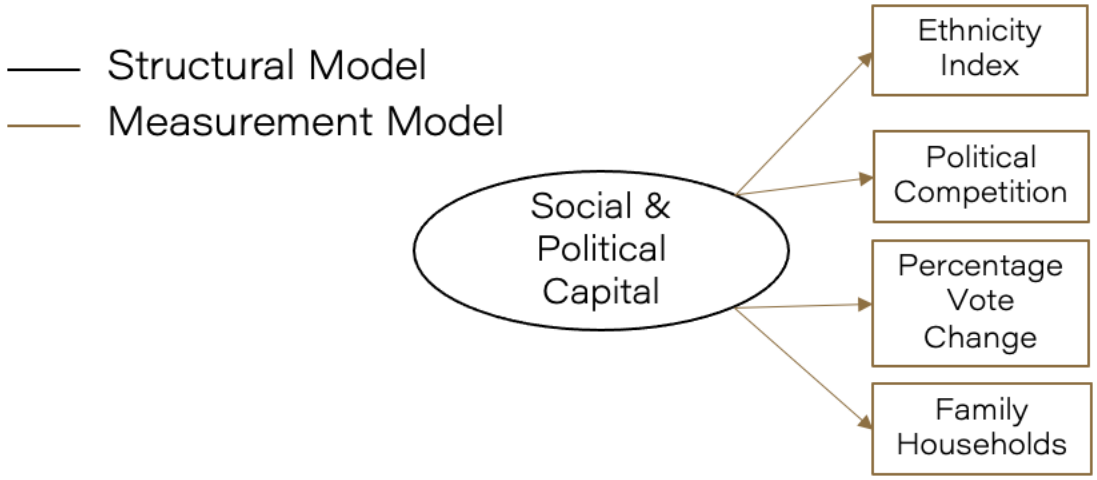

Figure B4.3: Measurement Variables Social and Political Capital

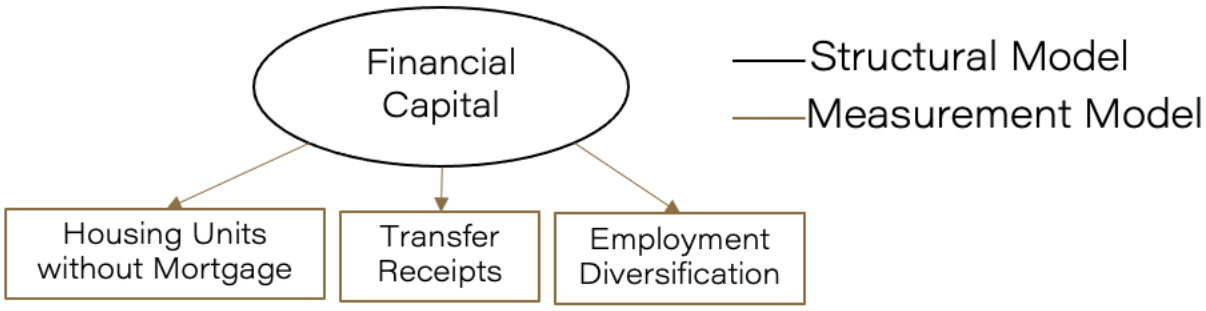

Figure B4.4: Measurement Variables Financial Capital

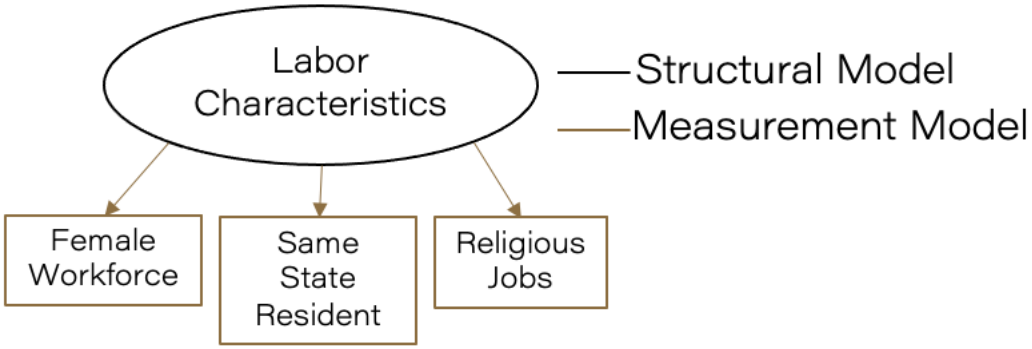

Figure B4.5: Measurement Variables Labor Characteristics