

The resilient regional labour market? The US case

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This article examines the ability of regional labour markets to rebound by growing the middle class or increasing wages. Using data on US metros, we identify regions that are transformative in terms of achieving a new equilibrium or reversing their path dependency. We then use discriminant analysis to identify the factors behind this resiliency. Regional resilience is rare, and changing a region's path is easier than achieving a new equilibrium. Among the most important factors behind regional transformation are the ability to attract immigrants, retain manufacturing, and innovate a high-tech economy. The diversity of outcomes suggests that a simple strong versus weak market dichotomy is insufficient to characterize regional resiliency, and a wide array of policies will be necessary.

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Introduction

Regional scientists and geographers have long tried to uncover the keys to regional success through comparative studies. From Chinitz's (1961) comparison of Pittsburgh and New York to Saxenian's (1994) pairing of Silicon Valley and Route 128, these studies have generally adopted an exceptionalist or historicist perspective, in which what is important is not the commonality of processes that produce the spatial world we see, but the unique results that can only be understood by deep observation of specific regions. Of particular interest in these studies is the ability of regions to adapt, to reinvent themselves after a downturn, as Silicon Valley did in the late

1980s, due in large part to the networked structure of its economy (Saxenian, 1994).

In contrast, the systematic perspective seeks to analyse the processes of change and the phenomena that they produce on a large (for example national) scale. By detecting patterns across a large number of regions, researchers hope to find commonalities that can lead to large-scale policy reform (for example Orfield 2002; Rusk 1993). The advantage of these systematic studies is that they are able to identify outliers, or regions that have performed exceptionally well, and suggest common factors behind success that are likely to be replicable across regions. The disadvantages are that they typically look at

success at one point in time, rather than success or adaptiveness *through* time, and attribute success to a set of variables that are by definition universal across regions.

In this paper, we adopt a systematic perspective on regional economic change, looking across US metropolitan areas. However, rather than looking at how regions perform according to different measures of success, we examine why, confronted with a similar challenge, some regions rebound and others falter over time. In other words, we look not at the ability to attain a certain level of success on a single outcome measure, but at the ability of a region to turn itself around on an outcome measure in the face of another dimension of change. This is what we call regional *resilience*: the ability to transform regional outcomes in the face of a challenge.

Many different fields, from ecology and psychology to economics and disaster studies, have explored the concept of resilience (for a review, see Pendall et al., 2010). Because there is little previous work on regional economic development and resilience, we explore two conceptual frameworks here to examine two emerging economic phenomena in regions: declines in real wages and growing income inequality. The first framework for resilience, which we call ‘creating a new equilibrium’, stems from the idea in ecology, psychology and economics that a system might have multiple equilibria. In a state of ‘ecological resilience’, a system can absorb a prolonged disturbance by shifting its structure or adapting its behaviour. The second resilience framework, which we call ‘reversing path dependency’, comes from the idea of path dependency from economics (for example David’s (1985) work on the lock-in of the QWERTY keyboard) and geography (for example Massey, 1984). The idea here is that history matters: the more certain conditions characterize a social or political system, the higher the cost of choosing an alternative path, even if that alternative is superior in some ways to the current one. Thus, historical contingency at certain moments is followed by historical overdetermination. However, a resilient region can diverge from this predictable course.

To test these resilience frameworks, we examine the ability to increase earnings per worker and to maintain a middle-income group in the face of ongoing economic restructuring. Since, unlike the ecologists, we are working from a normative framework, we are positing that this new equilibrium will be superior in some way. In each of these cases, economic transformation and restructuring results in improved social equity outcomes or processes.

We next revisit the debates over the challenges of improving earnings and maintaining the middle income in regions. Then, we map emerging patterns of resilience in response to these challenges and discriminant analysis to explore the factors behind these forms of resilience. A concluding section offers thoughts on future resilience research.

Emergent debates around economic, spatial, and institutional restructuring

The 1970s saw the acceleration of deindustrialization in the leading manufacturing regions of the USA and other industrialized countries (Bluestone and Harrison, 1982). Industrial transformation shifted the focus of production from manufacturing to services, and later the informational mode of development (Castells, 1996). Economic restructuring manifested itself in geographic shifts as well. The massive plant closings and unemployment in areas like the Midwest (for example the Rustbelt) helped accelerate a shift in population and employment to the South and West, while new command-and-control centres for the global economy emerged in selected metropolitan regions (Sassen, 1991).

The so-called Fordist era, roughly 1946–1973, had brought rising real wages, productivity growth, oligopolistic competition between large firms and relative labour peace. Underlying this was a set of norms held by employers and upheld by a largely unionized industrial workforce that influenced specific workplace practices such as internal job-ladders, pattern bargaining and the productivity ‘dividend’ to workers (Osterman, 1999).

However, the institutional environment that created the Fordist system broke down beginning in the 1970s, leading to a restructuring of labour market

institutions that resulted in rising income inequality and high levels of uncertainty among workers. Capitalism cannot function without mediating institutions—historically contingent temporary solutions to the crisis tendencies inherent in capitalism (Aglietta, 1979). Whether a new coherent post-Fordist mode of regulation has fully emerged, it seems clear that a key feature of labour market institutions today is their flexibility (Sabel, 1989).

Whatever its cause, economic restructuring and deindustrialization in particular are widely understood to be cumulative processes, where industrial flight shrinks the tax base and hinders efforts at transformation (Gillette, 2003). Thus, just as some places disproportionately reap the fruits of change, others increasingly experience its downside. Uneven development is a key feature of capitalist industrialization, as capital seeks out super profits (Storper and Walker, 1989). Disequilibrium growth resulting from product change, production breakthroughs, crisis and restructuring rewards some places with new clustering and punishes others in complex spatial dynamics. However, supply-side forces drive uneven development as well: high-paying service sector jobs in knowledge-intensive, creative industries may be highly concentrated because firms follow an elite workforce (the creative class) to the cities and regions in which they choose to live (Florida, 2002; Glaeser and Resseger, 2009).

Conventional debates: technological versus institutional explanations

Academic research and popular accounts of the ‘new economy’ claim that a set of new information technology and knowledge-intensive industries are now the key drivers of US international competitiveness and that the growth of these industries has fundamentally altered the labour market (Aoyama and Castells, 2002; Levy and Murnane, 2004). Researchers also argue that the rise of the new economy is closely linked to rising income inequality, and specifically to the ‘hollowing out’ of the middle class (Castells, 1996; but see Drennan, 2002). Whether relying on technological or market-based explanations or theories of changing institutional

and social norms within the labour market, these theorists associate deindustrialization with a fundamental shift to a new mode of production.

Arguments about changing social norms and labour market institutions show how corporations shed large portions of their core workforce, increasingly rely upon a flexible, contingent pool of workers whose earnings are forced down by stiff competition, and even actively deskill work to reduce costs (Appelbaum et al., 2003). Other scholars (for example Harrison and Bluestone, 1988) point to the declining power of unions, increasing profit expectations by shareholders and stagnant minimum wage levels as additional institutional factors behind rising inequality and/or the decline of middle-class jobs.

Shifts in labour market regulation do not happen in a vacuum, of course. Behind this transformation lies a fundamental shift in the social contract, or, as Peck (2002, 181) argues, a ‘neoliberal institutional fix’. In this view, deindustrialization is not merely part of a slow transition to a new mode of production, but a temporary moment in a historic transformation that was only partly about manufacturing jobs (Cowie and Heathcott, 2003). What Bluestone and Harrison (1982) saw as a battle clearly pitting capital against community gradually blurred into a larger process of reregulation to recreate the conditions for corporate profitability.

In complicating our understandings of deindustrialization, this work suggests some powerful avenues for research. Time has shown that there is no single path to deindustrialization, no archetype example like Youngstown or Flint. There is no new post-industrial reality; in fact, the number of manufacturing jobs has remained essentially the same over time, even if their quality has diminished (Cowie and Heathcott, 2003). The transformation has taken very different forms in the 1970s, 1980s and 1990s—what Peck (2002) calls the decades of rupture, recomposition and regularization. Thus, one purpose of this analysis is to begin to explore this diversity across places and time. The next section looks at specific arguments about job quality and inequality, the two phenomena to be analysed in detail.

Preserving high-quality jobs

As economic restructuring has occurred, the real hourly wage level for all but the top 10% of workers fell or remained stagnant between 1979 and 2000 (Mishel et al., 2005). USA creates many new jobs each year, but they pay, on average, much less than jobs in other industrialized countries (Freeman and Katz, 1994). This has raised questions about whether regions can increase earnings at the same time as expanding economically.

The national industry shifts away from manufacturing jobs and towards lower paying service sector industries have had uneven wage effects across regional economies; regions that experience rapid population growth, due perhaps in part to new immigrants, may see the average wage level fall (Houseman, 1995). Another factor that may lead to regional variation in average earnings over time is the uneven development pattern of new high-wage industries (Castells, 1996).

Given the overall trends towards the proliferation of low-wage jobs and the geographic concentration of high-paying jobs, in this analysis we choose to examine regional resilience simply on the basis of earnings growth. We seek to understand which regions were able to move from a relatively low-wage equilibrium to a high-wage equilibrium, in the face of this dominant trend towards the proliferation of low-paying jobs.

Maintaining a stable middle-income group in the face of deindustrialization

Scholars have also invoked both technological as well as institutional explanations for the loss of middle-income jobs. The skill-biased technological change argument claims that the implementation of new technologies (such as computers) resulted in rising demand for college-educated workers—and wage declines for less educated workers (Katz and Murphy, 1992). Another technologically driven explanation argues that industrial sectors that produce the technological inputs needed throughout the economy (information technology and knowledge-based industries) have de facto monopoly pricing power, and thus experience higher profits

and remunerate with higher wages (Galbraith, 1998).

On the institutional side, national policies and international bodies regulate trade flows and structure the relationships between trading partners, constraining the role of technological change. Feenstra and Hanson (1996) find that the global outsourcing of intermediate inputs by domestic manufacturers led to a sharp increase in relative demand for skilled labour in the USA and contributed to the declining wages for less skilled manufacturing workers.

The implication of research to date is that the middle is declining particularly in bipolarizing regions (Castells, 1996). Thus, to examine this question further, we look here at regions that move from a below-average to above-average income level for the middle income (the 50th percentile, measured relative to the 10th percentile), without achieving above-average incomes for the upper class (the 90th percentile) as well.

Data and methods

The goal of our empirical analysis is two-fold. First, we operationalize the concept of regional resilience across the three measures discussed in the preceding section by constructing and mapping typologies based on performance over time on a given dependent variable. Second, we conduct discriminant analysis on each resilience typology to explore the distinguishing characteristics of each resilience category (for example what factors distinguish transformative regions from stagnant regions).

To perform this exploratory analysis we gathered data on US metropolitan areas on a broad array of indicators of economic performance and demographic change. Because of its high level of income inequality, as well as its relatively rapid economic restructuring, the USA provides an excellent case to analyse the resilience of the labour market (Mishel et al., 2005). Our database covers all metropolitan regions ($N = 191$) with a population of at least 200,000 persons in 2000 under the 2003 US Census metropolitan area definitions.¹ The metropolitan area is the appropriate area of analysis in US regions, since it is defined based upon economic activity.

To evaluate the ability to increase earnings per worker and to maintain the middle-income group (as measured by the 50:10 ratio), we use two different conceptions of resilience. In the first, the ‘new equilibrium’ method (Figure 1), a transformative region starts below average on some indicator and ends up above average—an *outcome* of resilience. These transformative regions can be contrasted in particular with the stagnant regions, which are not able to turn themselves around. The second resilience typology—‘reversing path dependency’—adds a dynamic dimension, or a *process* of resilience (Figure 2). This compares the direction of change in the first decade versus that in a second decade. So if a region is losing its middle income in the 1980s but regains ground in the 1990s, then it is transformative, that is, able to change the course of history.

We present maps of the four regional resilience typologies and also conduct a multivariate analysis of each resilience typology to help highlight the differences between each group. Our main technique for exploring differences among regions across the categories of resilience (transformative, stagnant, faltering and thriving) is discriminant analysis.² Discriminant analysis derives functions for these groups (based on many independent variables discussed below) and assigns each region to a group on the basis of its score. The overall score for each region is calculated by summing its

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

Figure 1. Resilience typology: achieving a new equilibrium.

Change in decade 2 \ Change in decade 1	Below average	Above average
Below average	Stagnant	Transformative
Above average	Faltering	Thriving

Figure 2. Resilience typology: reversing path dependency.

weighted scores for each function, and weight is based on the percentage of the overall variation between resilience categories accounted for by that discriminant function.

Discriminant analysis has been used frequently in regional science and economics starting in the 1970s, spurring a lively (and largely unresolved) debate about its robustness relative to multiple regression (Efron 1975; Eisenbeis 1977). It is particularly useful in social science and public policy research whenever the questions centre on why people, geographic units or institutions are distributed into distinct groups or categories. As the name suggests, the methodology statistically evaluates factors that discriminate among two or more groups. It is similar in many respects to multiple regression. However, the dependent variable is structured around two or more discrete units much like logit or probit models. Further, the coefficients for the independent variables represent the values that maximize the distance between the mean values for each of these dependent variable groups. It is important to underscore that this is a tool for exploratory analysis rather than a causal model.

Understanding regional economic resilience in US metros

The two approaches to understanding resilience—achieving new equilibrium and reversing path dependency—highlight different regional capacities and trajectories in dealing with restructuring and de-industrialization. Looking at both average earnings growth and growth of the middle-class captures very different phenomena, and institutional capacity adds yet another dimension. Not surprisingly, then, these typologies characterize essentially different sets of metro areas as transformative, although there is some minor overlap. Figures 3–6 show the geographic distribution of the transformative, stagnant, faltering and thriving regions. The tremendous heterogeneity across these transformative cases, both within and across resilience typologies, suggests that there are multiple forms of resilience—and calls for a more in-depth analysis. Also of note is

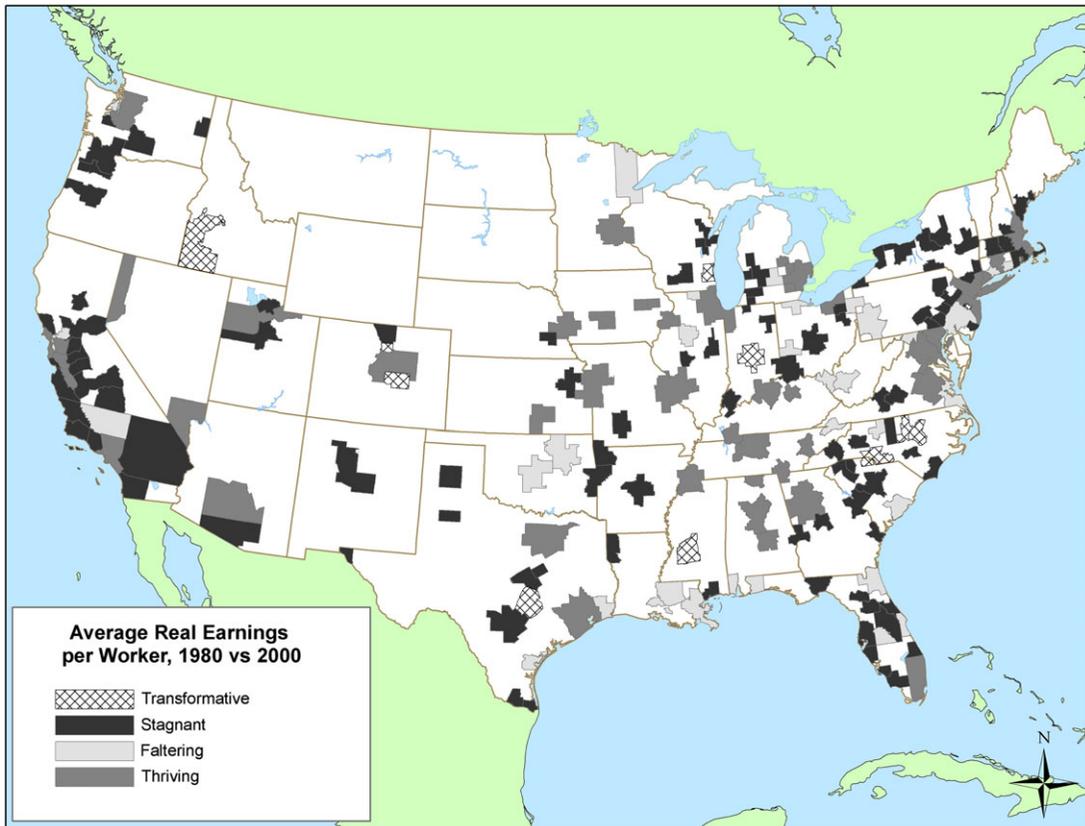


Figure 3. *Regional resilience typology: changing equilibrium on real average annual earnings per worker, 1980 and 2000.*

the prevalence of stagnant regions across types, suggesting the difficulty of transformation.

The four discriminant analyses that follow each examine variation among our four resilience categories across a set of independent variables. We note briefly the theoretical basis for including each factor in the analysis. For each group of variables we include both the level or share at the starting point (1980 or 1979) and the change in that variable in the 1980s and 1990s.³ In order to compare growth at the peak of the business cycle, we used economic data from 1979, 1989 and 2000 to represent decadal change. The primary shortcoming of this approach is that a decade is a relatively short period for change to occur; on the other hand, if the 1980s and 1990s represent discrete periods of ‘recomposition’ and ‘regularization’ of the neoliberal

regime (Peck, 2002), then they provide an appropriate framework for analysis.

This set of variables includes measures of population and employment, industry structure, innovation, human capital, demographic trends and spatial factors. Because of the difficulty obtaining data that are consistent and reliable across regions, these variables particularly underrepresent institutional variables that would shed light on the process of labour market restructuring (such as unionization). However, they provide a starting point for examining the forms resilience may take.

- *Population and employment (level and growth).* A region’s size and growth rate is likely to shape its resilience: larger regions tend to have higher wage levels, on average, than smaller ones due to both a higher cost of living as well as potentially higher

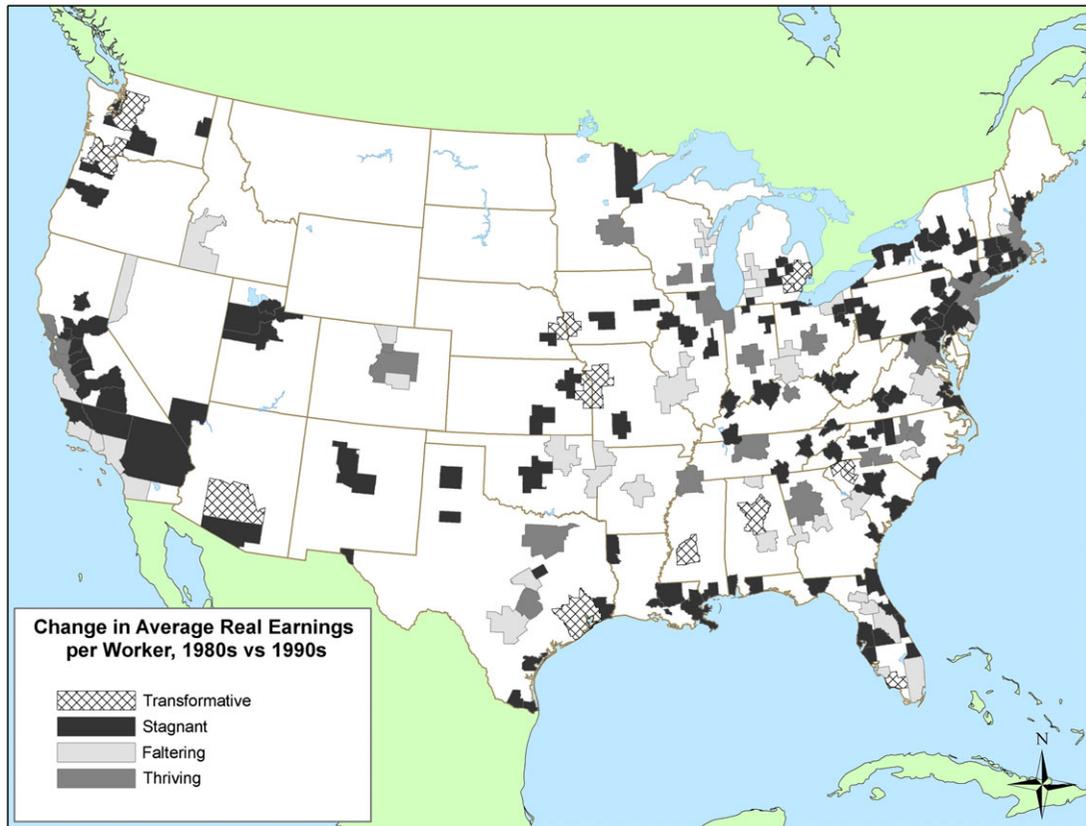


Figure 4. Regional resilience typology: reversing path dependency in real average annual earnings per worker, 1980s and 1990s

levels of productivity. However, as noted in the literature review above, the majority of job growth over the 1990s has occurred in lower skilled service sectors.

- *Industry structure.* The variables reflecting industry structure include indicators of exports and industry diversity, both of which arguably foster resilience. An export base will help a region rebound by generating revenue from other regions (North 1974); we proxy for exports via location quotients and share of regional income, as well as share of manufacturing. The ‘portfolio argument’ is often put forward as a strategy for long-term regional economic resilience (Frenken et al., 2007). Regions that begin with a more diverse industry structure will be less likely to experience drastic swings in employment and wages, since they are

insulated from exogenous changes in demand and are more likely to have industries at different points/peaks in the product cycle (Chinitz, 1961; Markusen, 1985).

- *Innovation.* Many regional development theorists argue that innovation and/or participating in a knowledge-based economy is the key to regional competitiveness (Saxenian, 1994; Storper and Scott, 1995). Innovation—it is suggested—results in higher wage jobs due to product development and productivity growth (Galbraith, 1998). We use patents as a proxy for innovation.

- *Human capital.* As noted above, both neoclassical labour market economics and recent regional development theorists privilege the role of human capital in regional transformation. We use the share of college graduates (and above) to indicate

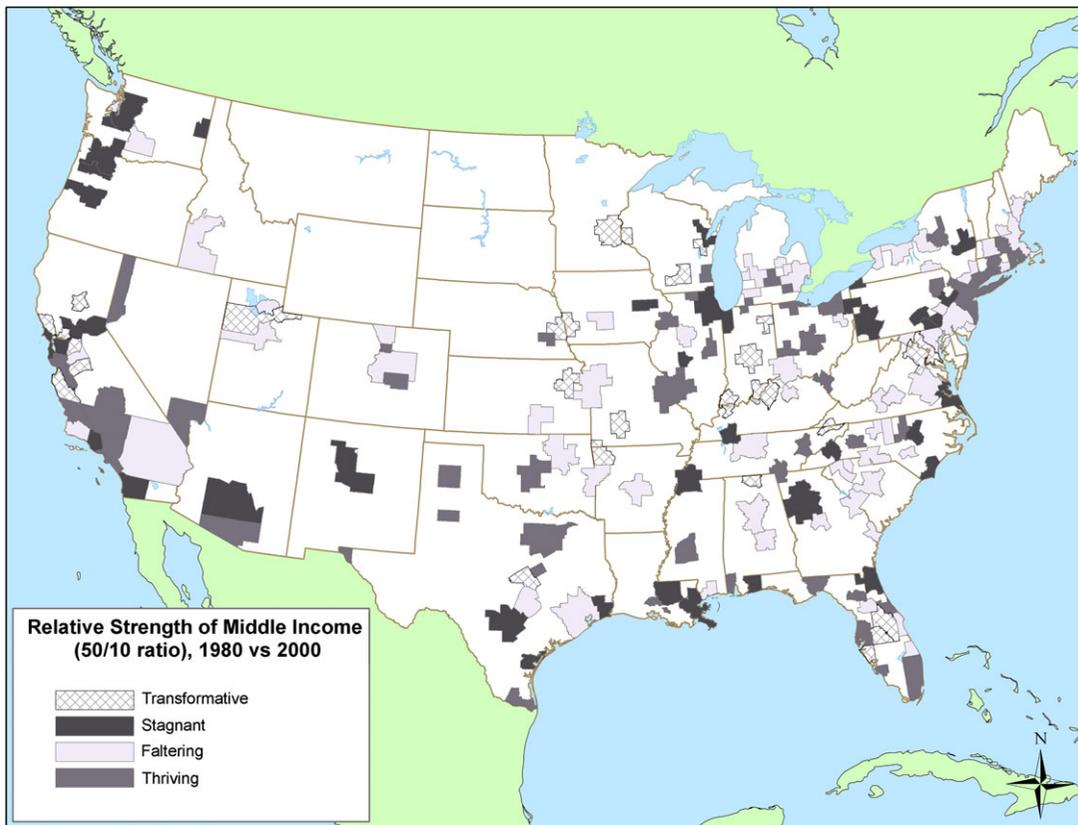


Figure 5. Regional resilience typology: changing equilibrium on the position of the middle class (50:10 household income ratio), 1980 and 2000.

regional human capital. To reflect the potential role of workforce intermediaries in preparing the workforce, we also include revenue of non-profit labour intermediaries (per 10,000 population).

- *Demographic trends.* We include a set of population and demographic change measures to control for trends that may push wages down, such as increasing labour supply (for example new immigrants).

- *Spatial factors.* The geographic pattern of employment may affect a region's economic resiliency in earnings, for instance, by making commuting more onerous. We use suburban share of regional employment to proxy for this. Although researchers (see the summary in Dreier et al., 2004) continue to debate the exact role of metropolitan fragmentation,

there is evidence that jurisdictional complexity (which we measure by number of places per 10,000 in population) affects regional growth patterns. Finally, we include super-regional (census division) dummies to account for different suburbanization patterns across the country.

Resilience in earnings growth

In the 'new equilibrium' typology, transformative regions are those that had average annual earnings per worker below the regional (census division) average in 1980 but ended up with above-average earnings in 2000. Only 11 regions were transformative on average earnings per worker. Figure 3 maps the distribution of each resilience category for the continental USA. Transformative regions are those

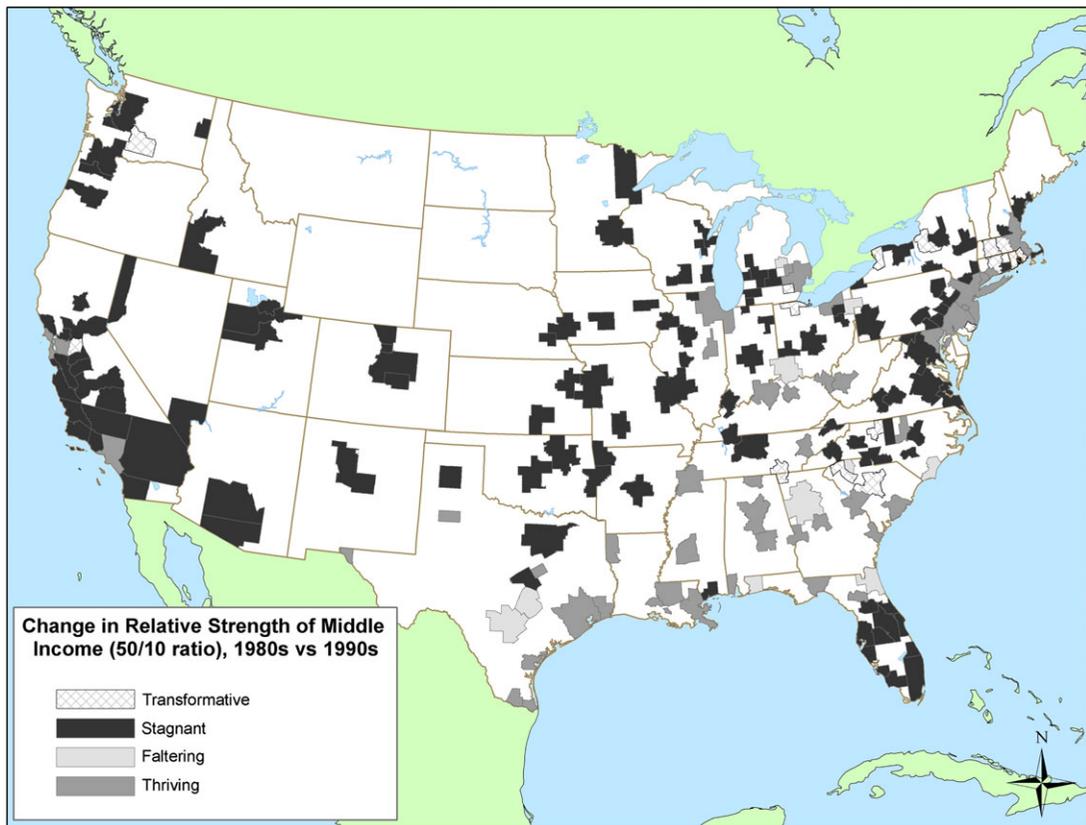


Figure 6. Regional resilience typology: changing path dependency on the position of the middle income (50:10 household income ratio), 1980s and 1990s.

that were either closely associated with the booming high-technology economy of the 1990s (for example Austin, Texas; Raleigh-Durham, North Carolina; Boulder, Colorado) or medium-sized, industrial regions that were particularly hard hit in the 1980s (for example Milwaukee, Wisconsin; Trenton, New Jersey). The vast majority of regions were classified as ‘stagnant’. This is indicative of both an overall context of relatively slow wage growth during the 1980s as well as an overall bias towards higher wages in larger regions (most of which are in the ‘thriving’ category).

Three functions, all highly significant, differentiate earnings growth patterns in the four types of regions (Table 1). Transformative regions, or regions that increased real wage levels from below to above av-

erage, scored high on Functions 1 and 2; since thriving regions also scored high Function 1, we can use Function 2 to differentiate transformative regions. Based on the highest positive correlations between variables and the functions listed in Table 2, we can see that transformative regions started off in 1979 with a higher share of workers with at least a bachelor’s degree, of patents per capita and of exports. Over the two decades, several changes differentiate these regions: they had more rapid growth in patents per capita, employment, population, immigrants and manufacturing jobs than other types of regions.

Looking at a few examples in more depth can help explain this rather contradictory set of variables. Two college towns in Texas that both started below the regional average followed very different

Table 1. Average earnings per worker, equilibrium typology: discriminant functions at group centroids.

Earnings/worker resilience typology, 1980 versus 2000	Number of cases	Functions at group centroids		
		Function 1	Function 2	Function 3
Transformative (–, +)	11	1.010	2.374	0.670
Stagnant (–, –)	103	–0.724	0.106	–0.288
Faltering (+, –)	33	–0.446	–0.609	0.884
Thriving (+, +)	44	1.716	–0.378	–0.199

trajectories in the two decades: Austin transformed itself into a fast-growth high-technology metro with a 42% increase in average earnings per worker, while Lubbock remained stagnant, with a 2% decline. Looking just at the most important variables for transformative regions reveals, predictably, that Austin vastly outperformed Lubbock in terms of growth from 1980 to 2000 in population (121 versus 14% growth), employment (172 versus 25% growth), patents per capita (463 versus 35% growth), immigrants (195 versus 23% growth) and even manufacturing (3% gain versus 55% loss). There is no one simple formula for transformation, however, as the example of Trenton, which saw a 30% increase in average earnings per worker, illustrates. Though it experienced rapid growth in its immigrant population (+83%), Trenton performed even more poorly than Lubbock on indicators such as patents (–8%) and manufacturing (–63%). Its path to higher wages likely reflects the growth of government jobs, which comprised 21% of the economy of New Jersey's state capital in 2000. Although not always a key factor in differentiating transformative regions, high levels of educational attainment also played a role in transforming Austin and Trenton.

Function 1 shows that thriving regions (and likely some transformative regions as well) started out bigger and with higher income inequality, with a lower share of Hispanic population. Over time, they became less fragmented and less unequal and gained in highly educated residents. The stagnant regions were the opposite, starting out smaller and becoming more fragmented and unequal, without attracting educated residents. Faltering regions (Function 3) started out with a diverse economy, relatively small export base and large share of African-American

population; over time, the share of Hispanic and immigrant population declined. Thus, faltering regions are clearly associated with a declining industrial economy. It is interesting to note that having a relatively diverse employment base at the starting point does not provide a cushion against adverse economic change in terms of wages.

The 'reversing path dependency' typology yields a different pattern of transformation in average earnings (Figure 4 and Tables 3 and 4). Regions that reversed their path had earnings growth below the regional average from 1979 to 1989 but above the regional average from 1989 to 2000. Unlike the first 'equilibrium' measure of resilience, this measure captures regions that may be able to turn themselves around, but not necessarily with an outcome of above-average earnings. Thus, the list of transformative metros is relatively diverse, including both large Sunbelt metros like Phoenix and Houston, well-known rebounders like Portland and Seattle, Prairie Belt cities of Omaha and Kansas City and smaller metros like Greenville and Spartanburg, South Carolina.

The 12 transformative regions score positively on Function 1 and negatively on Function 2 (as do the 24 thriving regions). What, then, differentiates these regions? As indicated by the positive score on Function 1, they start out with a high share of highly educated residents, a high degree of innovation (as measured by patents), a high share of immigrants and relatively low metropolitan fragmentation. The negative score on Function 2 (with opposite scores indicating an inverse interpretation of the correlations) suggests that they also start out with a relatively high share of manufacturing jobs and a specialized economy. Over time, the most important changes are an increase in share of

Table 2. Average earnings per worker, equilibrium typology: discriminant function–variable correlation matrix.

Variable name	Function 1	Function 2	Function 3
Total non-farm wage and salary employment, 1979	0.4144	−0.2186	−0.0950
Population, 1979	0.3852	−0.2206	−0.0893
East South Central	0.3362	−0.1227	0.0157
Change in jurisdictional complexity, 1980–2000	−0.2518	−0.2245	0.0371
West North Central	0.2369	−0.1695	−0.1617
Percent Hispanic in 1980	−0.1693	−0.0864	−0.0175
Change in 80:20 income ratio, 1980–2000	−0.1675	−0.1122	0.0119
80:20 income ratio, 1980	0.1638	−0.0029	0.1222
Change in % of residents aged >25 years with a BA or higher, 1980–2000	0.1407	0.0178	−0.0711
Suburban share of regional jobs, 1980	−0.1230	−0.0106	−0.0734
% Foreign born, 1980	−0.0857	−0.0254	−0.0681
Pacific	−0.0752	−0.0367	−0.0196
East North Central	−0.0706	−0.0561	0.0644
Change in patents per capita, 1979–1998	0.0906	0.6870	0.2118
Change in employment, 1979–2000	0.0193	0.4504	−0.3114
Change in population, 1979–2000	−0.0549	0.3683	−0.2968
% of residents aged >25 years with a BA or higher, 1980	0.1664	0.2790	0.0973
Change in % of jobs in manufacturing, 1979–2000	−0.0631	0.2047	−0.0641
Patents per capita, 1979	0.1621	0.1860	0.1652
South Atlantic	−0.0100	0.1459	0.0207
Change in % of employment in suburbs, 1980–2000	−0.0840	−0.1151	0.0323
Mid-Atlantic	0.0232	−0.1076	0.0490
Number of export industries, 1979	−0.1168	0.1926	−0.5372
Industry diversity index (employment based), 1979	0.0210	−0.1996	0.3698
% African-American, 1980	0.2047	0.0186	0.3551
Change in % Hispanic, 1980–2000	0.0349	0.0549	−0.2938
Change in exports, 1979–2000	−0.1802	−0.2540	0.2767
Change in % foreign born, 1980–2000	0.0728	0.1118	−0.2040
Jurisdictional complexity (no. of places per 10,000 population), 1980	0.0516	−0.0878	−0.1321
Change in industry diversity index, 1979–2000	−0.0742	−0.0411	−0.1262
New England	−0.1087	0.0468	−0.1112
West South Central	−0.0890	−0.0448	0.0987
% of employment in manufacturing, 1979	−0.0271	−0.0878	−0.0911
Labour intermediary income per 10,000 population, 1995	−0.0423	−0.0463	0.0649
Change in % African-American, 1980–2000	0.0169	0.0259	−0.0340
Function significance	***	***	***
Percentage of variance explained	61.6	25.7	12.8

Note: Bold text indicates that a variable scored highest under that particular function.

immigrants, an increase in patents per capita and (looking at the inverse of Function 2) little increase in manufacturing.

Two contrasting regions that had the ability to change direction in the decades were Detroit and Phoenix, with Phoenix in particular experiencing high growth in earnings per worker in the 1990s (18%) after losses in the 1980s (−5%); Detroit gained 14% in earnings per worker in the 1990s

after a 9% loss in the 1980s. The form of transformation differed between the two. Phoenix gained in innovation (81% increase in patents per capita in the 1990s) and immigrants (+96% in the 1990s) while losing manufacturing jobs (−25% in the 1990s). Detroit also saw gains in patents (87% in the 1990s) and immigrants (38% in the 1990s), but differentiated itself by its ability to stanch its loss of manufacturing jobs (−12% in the 1990s, after

Table 3. Average earnings per worker, path dependency typology: discriminant functions at group centroids.

Change in earnings/worker resilience typology, 1980s versus 1990s	Number of cases	Functions at group centroids		
		Function 1	Function 2	Function 3
Transformative (–, +)	12	0.905	–0.653	0.273
Stagnant (–, –)	106	–0.700	–0.114	–0.031
Faltering (+, –)	38	0.221	0.598	0.065
Thriving (+, +)	24	2.290	–0.116	–0.105

–29% in the 1990s) somewhat. The comparison between the trajectories of Detroit and Youngstown, both manufacturing centres located in the same census division, suggests that what kept Youngstown from transforming like Detroit was a lesser capacity for innovation, a poorer ability to stem manufacturing loss and most obviously, its inability to attract and retain immigrants (experiencing a 34% loss of immigrants in the 1980s and 13% loss in the 1990s).

Overall, this exploratory analysis illustrates the diverse paths to resilience. We find evidence that participating in the knowledge-based economy is strongly associated with resilience, in terms of attaining high wages or reversing a downward trend—but growing an immigrant base and retaining some manufacturing is important as well. Though immigrants can depress wages by expanding the labour pool, they may also help grow the overall economy or bring new skills and industries, and thus increase wages.

Resilience in both outcome (achieving new equilibrium) and process (reversing path dependency) requires high levels of education and innovation at the start, and increasing innovation over the two decades. But there the two types of resilience part ways. The regions achieving gains in real earnings per worker are growing in population, employment and share of manufacturing jobs. At its simplest level, a growth shock fosters resilience in these areas. The regions changing their earnings trajectories, without necessarily achieving higher earnings, are not so reliant on manufacturing, and not growing as rapidly; what they share is a steady gain in immigrant population. Adding immigrants may not lead to growth, but it does stem decline, which is arguably another form of resilience.

Thus, some transformative regions attract highly skilled workers and are engaged in innovation, creating enough regional income to increase the average earnings per worker over time; others increase wages by retaining some manufacturing and attracting immigrants. However, rising average wages may likely be associated with rising inequality. In the next discriminant analysis, we explore the factors that enable some regions to maintain its middle-income group in the face of deindustrialization.

Maintaining a stable middle-income group

In this typology we measure the position of the middle-income relative to low-income households as an indicator of the degree to which regional economies generate opportunities for the median worker, without disproportionate income inequality. In creating our typologies we construct the 50:10 and 90:10 household income ratios for metropolitan areas based on the 1980, 1990 and 2000 Census Public Use Microdata Sample.

In the ‘new equilibrium’ model, we compare the 50:10 ratio in 1980 and 2000 relative to the regional (census division) average; we also look at the 90:10 ratio at the 2000 endpoint relative to the regional average. A transformative region will have a ratio of middle- to low- (10th percentile) income households lower than the regional average in 1980, but higher in 2000—without also achieving a higher degree of income inequality (measured by the 90:10 ratio) than the regional average. There is not much variation in 50:10 ratios across the country, with a ratio of 3.5 in Mountain metros and 4.8 in the Mid-Atlantic; however, the 90:10 ratio does vary, from a low of 8.7 in the West North Central regions to 13.2 in the Mid-Atlantic. It is important

Table 4. Average earnings per worker, path dependency typology: discriminant function–variable correlation matrix.

Variable name	Function 1	Function 2	Function 3
% of residents aged >25 years with a BA or higher, 1980	0.5498	0.0981	0.3157
Change in % foreign born, 1990s	0.4957	-0.0954	-0.1050
Patents per capita, 1979	0.3367	-0.1885	-0.0417
Change in % foreign born, 1980s	0.2825	-0.0443	0.0548
% Foreign born, 1980	0.2640	-0.0627	-0.0585
Change in % African-American, 1990s	-0.2332	0.0192	0.0544
West South Central	-0.2192	-0.0408	0.1250
Change in patents per capita, 1990s	0.2142	-0.0300	0.0581
Change in patents per capita, 1980s	0.1780	-0.0254	-0.0222
Jurisdictional complexity (no. of places per 10,000 population), 1980	-0.1641	0.0704	-0.0115
Pacific	0.1601	0.1492	0.0812
Change in population, 1990s	0.1540	0.1355	0.0844
% African-American, 1980	-0.1280	-0.0545	-0.0637
West North Central	-0.1114	0.0978	-0.0765
Labour intermediary income per 10,000 population, 1995	-0.1044	0.0667	0.0619
Change in % of jobs in manufacturing, 1980s	0.0484	0.6653	0.3288
% of employment in manufacturing, 1979	-0.0623	-0.5188	-0.2284
Change in % of jobs in manufacturing, 1990s	0.0352	0.4249	0.3070
% Change in employment, 1980s	0.2382	0.3538	-0.1824
% Change in population, 1980s	0.1363	0.2916	-0.0480
Industry diversity index (employment based), 1979	-0.1058	0.2640	0.1100
Change in jurisdictional complexity, 1990s	-0.0984	-0.2044	0.0886
Change in jurisdictional complexity, 1980s	-0.1180	-0.1962	0.1011
Change in industry diversity index, 1980s	-0.0675	-0.1494	-0.0818
% Change in suburban share of regional jobs, 1980s	-0.0537	-0.1387	-0.1346
Change in % African-American, 1980s	-0.0600	-0.1043	0.0593
% Change in suburban share of regional jobs, 1990s	0.0315	0.0726	0.0391
% Change in share of residents with a BA or higher in region, 1980s	0.1786	-0.0333	-0.8098
East South Central	0.0829	-0.2292	0.3874
Mid-Atlantic	-0.0198	-0.2365	-0.3583
South Atlantic	-0.1791	0.1058	-0.3258
New England	0.1185	-0.1704	-0.2834
East North Central	0.0858	0.1901	0.2813
Suburban share of regional jobs, 1980	-0.0646	-0.1060	-0.2780
% Change in employment 1990s	0.0587	0.1689	0.2566
% Change in share of residents with a BA or higher in region, 1990s	-0.1158	0.0249	-0.2340
Change in % Hispanic, 1980s	0.1794	0.1706	-0.2247
Population, 1979	0.1025	-0.1153	-0.2051
Total non-farm wage and salary employment, 1979	0.1095	-0.1215	-0.2017
Change in % Hispanic, 1990s	0.0143	-0.1107	-0.1797
Change in industry diversity index, 1990s	0.0002	-0.0745	0.1668
% Hispanic in 1980	0.0130	-0.0276	0.1033
Function significance	***	**	
Percentage of variance explained	89.7	9.7	0.7

Note: Bold text indicates that a variable scored highest under that particular function.

to note that the 50:10 ratio can change or vary from region to region based on differences in either the denominator (the 10th percentile) or the numerator (median income). Although this means that our

findings should be interpreted with caution, this analysis can still provide useful information if we consider this ratio as only a relative measure of the health of the middle income.

Sixteen regions are transformative, a diverse set of regions including metros from all parts of the country including older New England and upstate New York areas such as Providence, RI, and Syracuse, NY; South Atlantic areas like Columbia, SC, and Winston-Salem, NC; older Midwestern regions such as Toledo and Ann Arbor, and Pacific metros of Stockton and Honolulu (Figure 5). Worcester, for example went from a 50:10 ratio of 4.0 in 1980 to a 4.5 ratio in 2000, with a 90:10 ratio of 10.6 in 2000 compared to 11.5 in New England as a whole.

Tables 5 and 6 summarize the 50:10 resilience typology and discriminant function scores. The discriminant analysis on this typology resulted in two significant functions. Transformative regions scored highly negative on Function 2, while thriving regions were best described by Function 1. At the starting point, again interpreting transformative regions as the correlations' inverse, transformative regions tended to have a relatively high share of employment in manufacturing, patents per capita and suburban jobs, but relatively less economic diversity. Over time, these regions saw a declining share of immigrants and manufacturing jobs (and population/jobs generally), but an increasing share of college-educated residents. This suggests that the transformation to an above-average 50:10 ratio came about not because of economic growth but because of a tight labour market.

This time, Stockton and Hartford illustrate the variety within transformative regions. Both increase from a 50:10 ratio around 3.7 or 3.8 in 1980 to 4.1 in 2000, with a 90:10 ratio that, although high (10 or over) is still below average in their larger context. But they follow different models: Stockton is a fast-

growth city driven in part by immigrants (+84% from 1980 to 2000), while Hartford scores low on most indicators except increases in college education (+50% from 1980 to 2000, compared to +26% for Stockton). Fresno provides an example of a stagnant metro within the same region as Stockton; though its 50:10 ratio increased (from 3.7 to 4.1), its 90:10 ratio (11.4) was above average in the region. It resembles Stockton in many key aspects, but has higher immigration increases (99%) and lower educational gains (16%). Most likely its increase in 50:10 ratio came via the growth of low-wage immigrant workers, not the middle-income group (in other words, the denominator instead of the numerator).

Thriving regions are those that started with a higher share of African-American residents and a smaller share of college-educated residents. Like transformative regions, they are relatively slow growing. Overall, these tended to be lower growth regions that did not attract either highly skilled workers or new immigrants in the 1980s and 1990s. Thus, the economies of these places are not faced with the implicit trade-off between economic growth and growing inequality.

Stagnant regions on the other hand did experience economic and population growth (the inverse of Function 1) and exhibit some evidence of being part of the new economy (higher increase in patents per capita). Stagnant regions are also the most numerous (114), indicating that the majority of metropolitan areas cannot reverse the broad national trend of hollowing out the middle class.

A relatively large number of regions (26) were able to reverse their trajectory in the 50:10 ratio, going from a declining ratio (relative to the

Table 5. 50:10 ratio, equilibrium typology: discriminant functions at group centroids.

50:10 income ratio resilience categories, 1980 versus 2000	Number of cases	Functions at group centroids		
		Function 1	Function 2	Function 3
Transformative (–, +)	16	0.359	–0.924	0.116
Stagnant (–, –)	114	–0.700	0.052	–0.018
Faltering (+, –)	10	0.816	0.569	0.364
Thriving (+, +)	44	1.499	0.073	–0.077

Table 6. 50:10 ratio, equilibrium typology: discriminant function–variable correlation matrix.

Variable name	Function 1	Function 2	Function 3
% African-American, 1980	0.6313	0.3964	0.3322
% of residents aged >25 years with a BA or higher, 1980	-0.2315	-0.0923	0.1453
Jurisdictional complexity (no. of places per 10,000 population), 1980	-0.1999	-0.1906	-0.1525
Change in % African-American, 1980–2000	-0.1721	-0.1663	-0.0742
Pacific	-0.1698	0.1359	-0.0909
Change in patents per capita, 1979–1998	-0.1344	0.0471	0.0993
% Foreign born, 1980	0.0556	0.0159	-0.0480
New England	0.1065	-0.8660	0.4378
% of employment in manufacturing, 1979	0.1285	-0.3505	-0.2560
Change in % foreign born, 1980–2000	-0.0085	0.3168	0.2753
Change in % of jobs in manufacturing, 1979–2000	-0.2639	0.2706	0.0863
Patents per capita, 1979	-0.0795	-0.2696	-0.1036
Change in % of residents aged >25 years with a BA or higher, 1980–2000	0.0461	-0.2338	0.1486
Industry diversity index (employment based), 1979	0.0527	0.2296	-0.0295
Suburban share of regional jobs, 1980	0.0474	-0.2028	0.1179
West South Central	0.1168	0.1402	-0.1061
East South Central	0.0507	0.0838	0.0427
Change in population, 1979–2000	-0.2541	0.5177	0.6784
Change in employment, 1979–2000	-0.3119	0.4845	0.6437
Change in jurisdictional complexity, 1980–2000	0.1439	-0.0069	-0.4936
South Atlantic	0.1881	0.2903	0.3667
East North Central	0.0019	-0.1008	-0.2989
Mid-Atlantic	-0.0131	-0.0561	-0.2815
Change in % Hispanic, 1980–2000	-0.0635	0.0521	0.2555
Change in exports, 1979–2000	-0.0197	-0.1258	-0.2409
Labour intermediary income per 10,000 population, 1995	0.0865	0.0089	-0.2385
% Hispanic in 1980	0.1698	0.2229	-0.2355
Number of export industries, 1979	-0.1156	0.1269	0.2042
West North Central	-0.0480	-0.0847	-0.1799
Change in industry diversity index, 1979–2000	0.1014	-0.0998	-0.1485
Change in % of employment in suburbs, 1980–2000	0.0877	-0.0858	-0.1453
Population, 1979	0.0050	-0.0339	-0.0524
Total non-farm wage and salary employment, 1979	0.0030	-0.0385	-0.0468
Function significance	***	***	
Percentage of variance explained	89.5	9.5	1.0

Note: Bold text indicates that a variable scored highest under that particular function.

regional average) in the 1980s to an increasing ratio in the 1990s—and still ending up with a 90:10 ratio less than the regional average. Once again, this is a diverse set of regions (Table 2 and Figure 6); what is notable is that almost all come from the middle of the country, or, if from the coasts, are in smaller interior areas like California's Central Valley. For instance, in the 1980s the 50:10 ratio in Stockton declined by 12%, compared to -1% for the Pacific region as a whole, but in the 1990s it

increased by 10%, compared to 4% for the Pacific region.

As shown in Table 7, the discriminant analysis differentiates clearly between transformative regions, which score positively on Function 2, and stagnant regions, which score positively on Function 1. The transformative regions start with a relatively low share of African-American population, a relatively diverse economy and a low share of manufacturing jobs (Table 8). Over time, they

Table 7. 50:10 ratio, path dependency typology: discriminant functions at group centroids.

Change in 50:10 ratio, 1980s versus 1990s	Number of cases	Functions at group centroids		
		Function 1	Function 2	Function 3
Transformative (–, +)	24	–0.215	1.591	–0.548
Stagnant (–, –)	36	1.304	0.173	0.548
Faltering (+, –)	61	0.143	–0.631	–0.528
Thriving (+, +)	54	–0.936	–0.110	0.474

see growth in manufacturing jobs, decreasing industry diversity and an increasing share of immigrants. In contrast, stagnant regions start with a relatively low share of immigrants and Hispanic residents, and over time see a declining share of immigrants, along with a growing share of college-educated residents.

Orlando and Vallejo-Fairfield, California, provide examples of ways to reverse path dependency; both saw small gains (4–5%) in the 50:10 ratio in the 1990s after declines (–24% in Orlando and –50% in Vallejo) in the 1980s. Here there is less variation among cases, and in fact it is hard to differentiate between the transformative regions and the stagnant cases such as Jacksonville, Florida, which had a very similar profile (for example manufacturing job loss and increases in education) to nearby Orlando's. But as the case of Orlando suggests, one resilient path may be through increasing immigration (79% in the 1990s) and economic specialization (11% decrease in the 1990s), while Vallejo-Fairfield is again an example of transformation via retaining manufacturing (20% growth in the 1990s).

Overall, this analysis suggests that there are multiple paths to growing middle-income groups. One route to obtain an above-average 50:10 ratio is a tightening labour market in a climate of slow economic growth and economic restructuring that places a premium on human capital. Another path, one that may not result in higher median incomes relative to the 10th percentile, but will reverse the region's trajectory, is to attract immigrants and rebuild the manufacturing base. Retaining manufacturing may not bring back the middle income, in the absence of the labour-management

social contract that existed in post-World War II USA. Yet, at a minimum, it may stem the decline in the middle.

Conclusion

We provide an empirical exploration of the concept of regional resilience that helps illuminate factors that shape the different responses of metropolitan economies to external challenges. Our study differs from previous work in that we focus our attention mainly on those regions that reversed trends (changed path dependency) or changed equilibrium over the past two decades, rather than those that are currently on top. This approach allows us to analyse normative outcomes (higher wage jobs and a stable middle class) and processes simultaneously.

Regions face challenges that are beyond their purview: the decline in real wage levels and the loss of the middle income are national phenomena. Despite this, we identify regions that transform themselves by achieving a new equilibrium or reversing path dependency. Regions that transform their earnings per worker tend to have rapid growth and concentrations of high-skilled workers participating in a knowledge-based economy. Regions with a resilient middle-income group tended to be low growth, with a stable manufacturing base. But these are not recipes; there are multiple paths to transformation, and many regions will fail to transform themselves at all.

The different analytic approaches adopted suggest multiple ways to understand the resilience of a regional labour market in the face of income inequality. Even when analysed in four different ways, as done here, resilience is rare: out of almost 200 regions, just a handful (5–15%) are transformative, and just seven

Table 8. 50:10 ratio, path dependency typology: discriminant function–variable correlation matrix.

Variable name	Function 1	Function 2	Function 3
% Change in share of residents with a BA or higher in region, 1990s	0.2719	-0.0394	-0.1145
Mid-Atlantic	0.1908	-0.1596	0.1038
Change in jurisdictional complexity, 1990s	-0.1762	-0.1422	0.1564
East North Central	-0.1225	0.0748	0.0258
Change in % of jobs in manufacturing, 1980s	-0.0484	0.3497	-0.0904
% African-American, 1980	0.1101	-0.3299	-0.0788
Pacific	0.1666	0.2903	0.1094
Industry diversity index (employment based), 1979	0.2030	0.2747	-0.0550
Change in % of jobs in manufacturing, 1990s	0.0749	0.2606	0.1346
% of employment in manufacturing, 1979	-0.0323	-0.2286	-0.1261
New England	-0.1547	-0.1848	-0.0246
South Atlantic	0.0584	-0.1797	-0.1580
Change in industry diversity index, 1980s	-0.0640	-0.1735	-0.0965
Change in % foreign born, 1990s	-0.0800	0.1731	0.1053
Change in patents per capita, 1990s	-0.0565	-0.1701	-0.0017
% Change in population, 1980s	-0.0306	0.1444	-0.0687
% Change in employment 1990s	0.0671	0.1265	0.0314
Change in % Hispanic, 1980s	-0.0610	0.1202	0.0426
% Change in population, 1990s	0.0757	0.0943	-0.0540
% Change in share of residents with a BA or higher in region, 1980s	0.0702	-0.0843	0.0181
% Change in suburban share of regional jobs, 1980s	-0.0190	-0.0611	-0.0055
% Change in suburban share of regional jobs, 1990s	0.0014	-0.0585	0.0165
Change in % African-American, 1980s	0.0292	-0.0533	-0.0120
Jurisdictional complexity (no. of places per 10,000 population), 1980	-0.0040	0.2070	-0.3303
% Foreign born, 1980	-0.2208	0.1172	0.3129
% Hispanic in 1980	-0.1072	0.0533	0.3079
Change in jurisdictional complexity, 1980s	0.1294	-0.0154	0.2542
West South Central	0.0100	-0.0325	0.2428
Suburban share of regional jobs, 1980	0.0709	-0.0696	-0.2360
Population, 1979	-0.0201	-0.0713	0.2353
Total non-farm wage and salary employment, 1979	-0.0217	-0.0662	0.2352
West North Central	-0.1271	0.2079	-0.2171
Change in % Hispanic, 1990s	0.0694	0.0226	-0.2171
% of residents aged >25 years with a BA or higher, 1980	-0.1443	-0.0386	0.2118
Change in % foreign born, 1980s	-0.1530	0.1250	0.2115
Change in industry diversity index, 1990s	0.0676	-0.0883	0.1973
Patents per capita, 1979	-0.0733	-0.1007	0.1681
% Change in employment, 1980s	-0.0313	0.1189	-0.1485
Change in % African-American, 1990s	0.0238	-0.1291	-0.1479
Labour intermediary income per 10,000 population, 1995	0.0031	0.0320	-0.1346
Change in patents per capita, 1980s	-0.0739	0.0924	0.1065
East South Central	-0.0350	0.0642	-0.0999
Function significance	***	*	
Percentage of variance explained	45.3	35.4	19.3

cities are transformative according to more than one indicator.⁴ Few of the metros that perform above average or reverse their trajectory seem to have ‘comeback city’ stories. Those that do come back

in the 1990s, relative to the 1980s, are perhaps not transforming their economies so much as reflecting the overall settling of the economy and its system of regulation (in the regularization decade). Resilience

here is perhaps not so much about the ability to transform, but the ability to stem decline in the face of the neoliberal settlement.

It is perhaps not an accident that this study found that more regions were transformative in terms of reversing path dependency than in achieving a new equilibrium. Looking simply at the ability to achieve a new equilibrium may provide deceptively simple policy prescriptions. Simply trying to change the region's path may be the more readily achievable approach.

Likewise, the diverse geography of regional resilience outcomes suggests that a simple strong versus weak market dichotomy is insufficient to characterize regions: some weak market regions are relatively resilient, while some strong market regions are unable to transform themselves. In fact, these outcomes challenge the classic dichotomy of the late 20th century—the Rustbelt in decline, Sunbelt in ascendance. The list of cities transforming themselves in terms of earnings per worker includes the usual suspects—the Research Triangle, Phoenix, Houston—but also Jackson, Mississippi and Trenton, New Jersey. The turnaround cities in terms of the middle-income range from the unsurprising (Minneapolis) to the almost obscure (Merced), with few Sunbelt cities even making the list. This suggests that the early stages of economic restructuring, with its new winners and losers, were followed by a period of adjustment in which some of the losers were able to reinvent their economies.

This also indicates that a wide array of policies will be necessary to foster economic resilience: for instance, a weak market region might best rely on upgrading the educational levels of its residents, while a strong market region might embrace immigration and manufacturing jobs. Yet, this exercise has suggested just how difficult it is to rebound and how important a role starting point plays in eventual outcomes. Austin does not outperform Lubbock out of the blue, but due at least in part to the presence of a world-class university with longstanding expertise in high technology and R&D.

A systematic analysis often suggests the need for a more exceptional approach. This empirical exercise serves as a first step to identify transformative cases

for in-depth comparative case studies. The ability to bounce back, or even to stem decline, derives in part from a region's industrial history and structure, i.e. the types of industries that remain, their internal restructuring processes and their workforce strategies, all of which may vary greatly by industry and region (Massey, 1984). Likewise, conceptions of the middle income, wage levels, and job quality vary over time and across places, and more research is needed to identify the types of industries and occupations that still support the middle income (other than those unionized government jobs in Trenton). With over 60 resilient metros to choose from, comparative case studies should be able to control for the regional economy, industrial structure, regional culture, resident skill levels and other key factors.

The ultimate test for research on resilience will be to add the decade of the 2000s, with its two recessions and jobless recovery. Much of the systematic research on regions has provided just a snapshot of one decade. With three decades of consistent data, it should be possible to unpack the roles of the housing and financial bubbles in creating what is perhaps a false resilience in some regions. Examining how our regions have weathered this most recent decade will help clarify which of these multiple paths of resilience, if any, has proven sustainable over time.

Endnotes

¹ <http://www.census.gov/population/www/estimates/metrodef.html>

² We used SPSS statistical software for the discriminant analysis.

³ Variable construction methodology is available upon request from the authors.

⁴ These are Ann Arbor, Michigan; Greenville, South Carolina; Honolulu, Hawaii; Indianapolis, Indiana; Jackson, Mississippi; Omaha, Nebraska; and Stockton, California—a set of mostly small cities that outperform their counterparts in struggling regions.

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