The Resilience of Cities to Economic Shocks
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Ron Martin
University of Cambridge (rlm1@cam.ac.uk)
With: Ben Gardiner, Peter Sunley, Emil Evenhuis, Peter Tyler, David Bailey and Andy Pike

‘Structural Transformation, Adaptability and City Economic Evolution’
An ESRC-Funded Project (ES/N0006135/1) (www.cityevolutions.org.uk)
The Rise of ‘Resilience Thinking’

- Rapidly increasing interest in notion of resilience across physical, natural, social and organisational sciences
- Succession of major natural, environmental and economic disruptions has focused attention on how local communities, cities, regions, nations, recover from shocks
- General belief that we live in more shock-prone world (economic change and instability, global economic crises, disruptive technologies, climate change, terrorism, etc) – is instability the ‘new norm’?
- Resilience has become key notion for how we respond to and cope with such disruptions
The Rise of ‘Resilience Thinking’

The Growth of the Concept

Published Items

Web of Science
Subject fields:
Geography
Urban Studies,
Economics,
Environmental
Studies,
Business, Planning

Accessed 1 November 2017
The Rise of ‘Resilience Thinking’
City Resilience Index
Understanding and measuring city resilience

Rockefeller Foundation/ARUP City Resilience Index

52 Indicators (Critical factors that contribute to resilience)
12 Goals (that cities should strive towards to achieve resilience)
4 Dimensions (Health/wellbeing; Economy/society; Infrastructure/environment; Leadership/strategy)
On the Nature of Economic Shocks

• What constitutes an economic shock?
• Do shocks have merely transient or more permanent effects (‘remanence’, ‘hysteresis’)?
• How is a city’s (region’s) resilience to shocks influenced by its developmental pathway?
• How do shocks in turn influence a city’s (region’s) developmental pathway?
• What about ‘slow-burn’ processes? Are these ‘shocks’? Or do they become shocks when they reach a ‘tipping point’ or threshold?
• In what sense are shocks opportunities?
• Who gains and who loses from shocks?
What is a Shock?

**SPEED**

- **Sudden**
  - Local firm closure
  - Local natural disaster
  - Contractionary policy change
  - National Recession
  - Technological disruption
  - Global financial crisis

- **Slow**
  - Gradual loss of local industrial competitiveness
  - Persistent adverse national policy
  - Global climate change

**SCALE**

- **Local**
  - Slow-burn processes

- **Global**

**Threshold Effects?**

Shock events ➔ Slow-burn processes
<table>
<thead>
<tr>
<th>Type of Resilience</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-restorative ‘Bounce back’</strong></td>
<td>Speed of recovery (return) to pre-shock (equilibrium) state (or path)</td>
</tr>
<tr>
<td><strong>Absorptive Capacity</strong></td>
<td>Stability of structure and functionality (‘robustness’) when subjected to shocks</td>
</tr>
<tr>
<td><strong>Adaptive Resilience or ‘Bounce forward’</strong></td>
<td>Capacity for positive adaptation to restore certain ‘core’ functionalities/performances</td>
</tr>
<tr>
<td><strong>Transformative Resilience</strong></td>
<td>Capacity for major system transition in order to achieve stability/sustainability</td>
</tr>
</tbody>
</table>
The Interdependence of Shocks and Development?

How does a city’s previous system and pattern of economic development and growth path shape its reactions to shocks?

City’s economic development path

City’s resilience to shocks and disruptions

How does a city’s reaction and response to shocks shape its subsequent development and growth path?
City Economic Resilience as Process (The Four Rs)

1. Scale, Nature and Duration of Shock
   - City’s Pre-Shock Growth and Development Path
   - Vulnerability and Exposure to Shocks
   - Depth of Reaction to Shock

2. Nature and Extent of Supportive Policies and Measures
   - City’s Economic Structures, Resources, Capabilities, Competences
   - Business Cultures, Confidences and Expectations
   - Local (and National) Institutions
   - Nature and Extent of Supportive Policies and Measures

3. Nature and Extent of Adjustment to Shock
   - Nature and Extent of Supportive Policies and Measures

4. City’s Post-Shock Growth and Development Path
   - Nature and Extent of Supportive Policies and Measures
<table>
<thead>
<tr>
<th>Theoretical Framework</th>
<th>Role of Shock/Implied Interpretation of Resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Economic Geography (NEG)</td>
<td>Resilience as stability of an equilibrium regional/urban pattern of economic activity. Shock above critical threshold induces shift to new equilibrium pattern.</td>
</tr>
<tr>
<td>Urban Economics</td>
<td>Resilience as self-restoring equilibration through (geographical) mobility of labour and capital, and real wage adjustment.</td>
</tr>
<tr>
<td>Evolutionary Schumpeterian Theory</td>
<td>Shocks as ‘gales’ of creative destruction and competitive selection. Resilience as economic ‘fitness’ and adaptive capacity.</td>
</tr>
<tr>
<td>Path Dependence Theory</td>
<td>Resilience as self-reinforcing development; sufficiently severe shocks serve to ‘delock’ established development paths.</td>
</tr>
<tr>
<td>Institutionalist Theory</td>
<td>Institutions and governance as buffers against shocks. Stickiness of outmoded institutions reduces resilience; supportive and proactive institutions promote resilience.</td>
</tr>
</tbody>
</table>
# Measuring Resilience

<table>
<thead>
<tr>
<th>Method</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case Study</strong></td>
<td>Mainly narrative based, may use simple descriptive data, interviews with key actors, interrogation of policies, etc. May be comparative. Focus on ‘story telling’.</td>
</tr>
<tr>
<td><strong>Resilience Indices</strong></td>
<td>Singular or composite measures and ‘dashboards’, comparative across cities or regions, using key system variables of interest. May involve ‘resilience rankings’ of cities (regions).</td>
</tr>
<tr>
<td><strong>Statistical Time Series Models</strong></td>
<td>Impulse response models, error correction models. Focus on time taken for initial impact of shock to dissipate (how much of shock eliminated per unit time period).</td>
</tr>
<tr>
<td><strong>Causal Structural Models</strong></td>
<td>Using urban (and regional) economic models to generate counterfactual positions of where system would have been in absence of shock. Results dependent on model specification.</td>
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</tbody>
</table>
Friedman’s (1988) ‘Plucking’ Model of Economic Shocks

Focus is on time taken to return to long-run growth path (A-B) and (a)symmetry of downturn (C-D) and recovery (D-E)

Assumed that growth path A-B is unaltered by shocks

Shocks as downward 'plucks' from long-run growth path
Stylised Possible Reactions of an Economy to a Shock

Positive Hysteretic Response:
Bounce Forward to Raised Growth Path and Resumption of Pre-Shock Growth Rate

Positive Hysteretic Response:
Bounce Forward to Raised Growth Path and Resumption of Pre-Shock Growth Rate

Bounce Back to Pre-Shock Growth Path and Growth Rate

Negative Hysteretic Response:
Lowered Growth Path and Resumption of Pre-Shock Growth Rate

Negative Hysteretic Response:
Lowered Growth Path and Slower Growth
Measuring City Economic Resilience

• Simple Indices of City Resistance and Recoverability

\[
RESIS_c = \frac{(\Delta Y / Y)_c^{CONTRACTION} - (\Delta Y / Y)_c^{EXPECTED}}{|(\Delta Y / Y)_c^{EXPECTED}|}
\]

\[
RECOV_c = \frac{(\Delta Y / Y)_c^{RECOVERY} - (\Delta Y / Y)_c^{EXPECTED}}{(\Delta Y / Y)_c^{EXPECTED}}
\]

• Need to define the ‘expected’ (counterfactual) position
• Egs. what a city’s employment or output would be if pre-shock trends had continued; or what a city’s response would be if it had behaved the same as national economy
Measuring City Economic Resilience

- **MOST RESILIENT**: Good resistance and good recoverability
- **LEAST RESILIENT**: Weak resistance but weak recoverability
- **Resistance**
  - Weak resistance but good recoverability
  - Good resistance but weak recoverability

- **Recoverability**
  - Weak resistance and weak recoverability
Major Recessionary Shocks to the British Economy

Major Post-War Recessionary Shocks, 
(With Great Depression of 1930-1934 for Comparison)

- 1990-1993
- 1973-1976
- 1930-1934
- 1979-1983
- 2008-2013
City (Employment) Resilience to 1973-76 Recessionary Shock


- Northern Cities
- Southern Cities

Milton Keynes
Aberdeen
Basingstoke
Northampton
Reading
Blackburn
London
Liverpool
Glasgow
Sunderland

R = 0.632
City Employment Resilience to the 1979-82 Recessionary Shock

1979-82 Recession, 1982-1990 Recovery

Recoverability vs. Resistance

Northern Cities
Southern Cities

Milton Keynes
Northampton
Crawley
Peterborough
Swindon
Middlesbrough
Liverpool
Merthyr Tydfil
Northampton
Newcastle
London

R=0.560
City (Employment) Resilience to the 1990-1992 Recessionary Shock


- Northern Cities
- Southern Cities

R = -0.157

Locations:
- Milton Keynes
- Swindon
- Durham
- London
- Durham
- Stoke on Trent
- Eastbourne
- Aberdeen
- Telford

Resistance

Recoverability
City (Employment) Resilience to the 2008-2010 Recessionary Shock

2008-2010 Recession, 2010-2015 Recovery

Recoverability vs. Resistance

Northern Cities
Southern Cities
Preston
Motherwell
Dudley
Blackpool
Kettering
Milton Keynes
London
Birmingham

R = -0.164
<table>
<thead>
<tr>
<th>Recovery from Recession</th>
<th>Resistance to Recession</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976-1979</td>
<td>0.632</td>
</tr>
<tr>
<td>1982-1990</td>
<td>0.562</td>
</tr>
<tr>
<td>1992-2008</td>
<td></td>
</tr>
<tr>
<td>2010-2015</td>
<td></td>
</tr>
</tbody>
</table>

Correlation between Resistance and subsequent Recovery

Correlation between Recovery and subsequent Resistance
Types of City Resilience to the 2008-2010 Recessionary Shock

- **Brighton**: Positive Hysteretic Response
  - Pre-Shock Trend
  - Post-Shock Trend

- **Glasgow**: Negative Hysteretic Response Type 1
  - Pre-Shock Trend
  - Post-Shock Trend

- **Sunderland**: Negative Hysteretic Response Type 2
  - Pre-Shock Trend
  - Post-Shock Trend

- **London**: Positive Hysteretic Response
  - Pre-Shock Trend
  - Post-Shock Trend
City Resilience to the 2008-2010 Recessionary Shock – Employment Reactions

<table>
<thead>
<tr>
<th>Types of Reaction</th>
<th>Southern Cities</th>
<th>Northern Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return to Pre-Shock Growth Path and Growth Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Hysteretic Shift to Lowered Growth Path</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Hysteretic Shift to Higher Growth Path</td>
<td></td>
<td></td>
</tr>
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Southern Cities
- Return to Pre-Shock Growth Path and Growth Rate
- Negative Hysteretic Shift to Lowered Growth Path
- Positive Hysteretic Shift to Higher Growth Path

Northern Cities
- Return to Pre-Shock Growth Path and Growth Rate
- Negative Hysteretic Shift to Lowered Growth Path
- Positive Hysteretic Shift to Higher Growth Path
Recessionary Shocks and Long-Run Growth: London and Glasgow Compared

Total Employment, 1971=100

- **London**
  - Recovery Phase
  - London gains more from KIBS growth
  - London has very strong recovery

- **Glasgow**
  - Recessionary Shock
  - Glasgow hard hit by deep manufacturing recession
  - London hard hit by services recession
  - Glasgow hard hit by Great Recession
Resilience to the Great Recession: London and Glasgow Compared

2008-2010 Recession

2010-2015 Recovery
The role of industrial structure in shaping regional reactions to economic cycles.

The resilience of regional and local economies to recessions is determined by a complex array of factors (see Figure 6). As depicted in Figure 1, these factors shape the vulnerability of a region's economy to recessionary shocks, its resistance to such shocks, its adaptability, and its recoverability. In the process, those very same characteristics and factors may themselves undergo permanent change and transformation so that regional reactions to the next recessionary shock may alter accordingly (see Martin and Sunley, 2015). It is this context that the notions of resilience as 'positive adaptation' or as a new developmental pathway (Figure 1) are relevant.

Figure 6: Determinants of Regional Economic Resilience

Source: Martin and Sunley, 2015

Isolating the contribution of the multifarious determinants shown in Figure 6 would be a major task, assuming that the requisite data were even available, and would require a case-study orientated research strategy. Our aim here is much more modest. Of the various factors assumed to exert a formative influence on the sensitivity of regional and local economies to cyclical shocks and perturbations, industrial structure has frequently been...
The Determinants of City Economic Resilience

• Some initial explorations/conjectures

• Economic Structure - the more specialised (diverse) a city’s economy, the less (more) resilient it should be to shocks

• Relative Specialisation in Manufacturing – the greater a city’s dependence on manufacturing, the less resilient it will be to shocks

• Relative Specialisation in KIBS – the greater a city’s dependence on KIBS, the more resilient it will be to shocks

• Export Intensity – the more orientated towards exports, the more vulnerable (less resistant) a city will be to shocks
The Determinants of City Economic Resilience

- **Productivity** – the more productive and competitive is a city’s economy, the more resilient it should be to shocks, and more able to adjust and adapt to new market opportunities

- **Skills** – the higher the proportion of a city’s workforce in high skill occupations, the more resilient and adaptable its firms and workers should be

- **City Size** – the larger a city the greater its potential agglomeration economies, the more diverse its economy, and the more resilient it will be
## Correlates of City Resilience

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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Specialisation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing (%)</td>
<td>-0.072</td>
<td>-0.088</td>
<td>-0.138</td>
<td>-0.041</td>
</tr>
<tr>
<td>KIBS (%)</td>
<td>-0.137</td>
<td>-0.465</td>
<td>-0.163</td>
<td>0.083</td>
</tr>
<tr>
<td>Export Intensity</td>
<td>-0.036</td>
<td>0.264</td>
<td>-0.051</td>
<td>-0.161</td>
</tr>
<tr>
<td>Productivity</td>
<td>-0.037</td>
<td>-0.397</td>
<td>-0.082</td>
<td>0.239</td>
</tr>
<tr>
<td>High Skills</td>
<td>0.124</td>
<td>0.449</td>
<td>0.241</td>
<td>0.092</td>
</tr>
<tr>
<td>City Size</td>
<td>-0.328</td>
<td>-0.129</td>
<td>-0.136</td>
<td>-0.029</td>
</tr>
<tr>
<td>With Recovery</td>
<td>1976-1979</td>
<td>RECOVERY</td>
<td>PHASES</td>
<td></td>
</tr>
<tr>
<td><strong>Specialisation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing (%)</td>
<td>-0.072</td>
<td>-0.241</td>
<td>-0.286</td>
<td>-0.021</td>
</tr>
<tr>
<td>KIBS (%)</td>
<td>-0.327</td>
<td>-0.187</td>
<td>-0.225</td>
<td>-0.186</td>
</tr>
<tr>
<td>Export Intensity</td>
<td>0.283</td>
<td>0.204</td>
<td>0.216</td>
<td>0.412</td>
</tr>
<tr>
<td>Productivity</td>
<td>-0.351</td>
<td>-0.359</td>
<td>-0.084</td>
<td>-0.169</td>
</tr>
<tr>
<td>High Skills</td>
<td>0.475</td>
<td>0.172</td>
<td>0.077</td>
<td>0.338</td>
</tr>
<tr>
<td>City Size</td>
<td>0.425</td>
<td>0.391</td>
<td>0.239</td>
<td>0.344</td>
</tr>
</tbody>
</table>

### Analysis
- **Specialisation** and **KIBS** show negative correlations during recessions, indicating that cities with higher specialisation in manufacturing and KIBS sectors tend to be more resilient during economic downturns.
- **Productivity** and **High Skills** correlate positively with resilience, suggesting that more productive and skilled cities can better withstand economic shocks.
- **City Size** has a mixed correlation pattern, with negative correlations during recessions and positive correlations during recoveries, indicating that larger cities may be more resilient during recoveries.

This table provides insights into how different economic and demographic factors influence city resilience during both recessions and recoveries.
The Determinants of City Economic Resilience

- City responses to (recessionary) shocks depend on depth and nature of recession (e.g., manufacturing based, or financial shock)
- Northern cities tend to take longer to recover, and have greater incidence of negative hysteretic effects
- **Specialisation** - a negative effect on resilience, but the association is weak
- **Export intensity** - a negative effect on resilience, but positive effect on recovery from recent recession
- **Productivity** – consistently positive influence on resilience
- **High Skills** – no significant effect on resistance, but positive influence on recoverability
The Impact of the Brexit Shock on Cities

- Brexit likely to represent major shock to national economy, and its regions and cities
- But estimating effects very difficult because -
  - Effect will depend on nature of Brexit deal – ‘Soft’ or ‘Hard’ (or variant in between!)
  - Also on nature of WTO trade deals with non-EU countries (‘most favoured nation’?)
  - On the sort of model used to estimate sectoral impacts
  - Lack of data on city trading patterns, supply chains, capital flows
- Highly variable estimates have been made of impacts on major sectors of national economy (eg. Ebel et al, 2016; Dhingra et al, 2016; HM Treasury, 2016, etc)
The Impact of the Brexit Shock on Cities

• Estimates of geographical impacts across the UK differ quite markedly:
  • Los, McCann et al – at subregional level, impact greatest on northern areas (typically those that voted to leave EU)
  • Dhingra, Overman et al – at local authority and primary urban area levels, impact greater in southern areas (and those which voted to remain in EU)

• Studies use sectoral employment weights to generate impact for individual local areas
• Dhingra et al (2016) – based on multi-sector general equilibrium trade model
The Impact of the Brexit Shock on Cities

- We also use Dhingra’s sectoral impact estimates.
- But our analysis is for our 85 cities, defined in TTWA terms.
- And we use sector output weights in each city to derive impacts.
- (Heroic) Assumption is that a given sector’s trade orientation, and exposure and reaction to Brexit, is the same from city to city.
- So results simply reflect different sectoral structures of cities.
Sectoral Impacts of Brexit

Estimates Computed by Dhingra et al (2016)

Reduction in Gross Value Added (Percent)

-15 -10 -5 0 5 10 15 20

Wood and Products of Wood and Cork
Air Transport
Water Transport
Pulp, Paper, Printing and...Basic Metals and Fabricated Metal
Agriculture, Hunting, Forestry and...Food, Beverages and Tobacco
Manufacturing, nec; Recycling...Other Non-Metallic Mineral
Machinery, nec
Hotels and Restaurants
Rubber and Plastics
Coke, Refined Petroleum and Nuclear...
Transport Equipment
Inland Transport
Retail Sale of Fuel; Wholesale Trade...
Electricity, Gas and Water Supply
Retail Trade, Except of Motor Vehicles...
Public Admin, Defence, Soc. Security...
Health and Social Work
Other Supporting and Auxiliary...
Construction
Real Estate Activities
Post and Telecommunications
Renting of M&Eq and Other Business...
Textiles and Textile Products; Leather...
Financial Intermediation
Electrical and Optical Equipment
Mining and Chemical Products

Soft
Hard
The Possible Impact of the Brexit Shock on Cities

Decline in GVA from 'Soft' Brexit (%)

Decline in GVA from 'Hard' Brexit (%)

-2.5 -2 -1.5 -1 -0.5 0

-4 -3.5 -3 -2.5 -2 -1.5 -1 -0.5 0

Southern Cities
Northern Cities

R=0.930
City Productivity and the Possible Impact of Brexit

Labour Productivity (GVA per Employed Worker, £), 2015

Decline in GVA from 'Hard' Brexit (%)

R = -0.526

-4 -3.5 -3 -2.5 -2 -1.5 -1

20000 25000 30000 35000 40000 45000 50000 55000 60000

London
Milton Keynes
Reading
Aberdeen
Swindon
Oxford
Middlesbrugh
Crewe
Dudley
Sunderland
Plymouth
Exeter
Barnsley
Dudley

Southern Cities
Northern Cities
City Output Resilience (Recoverability) and the Possible Impact of Brexit

Decline in GVA from Hard Brexit (%)

Recoverability Index (2010-2015)

-2 -1.5 -1 -0.5 0 0.5 1 1.5

-4 -3.5 -3 -2.5 -2 -1.5 -1 -0.5 0

Northern Cities
Southern Cities

Dundee
Blyth
Glasgow
Aberdeen
Doncaster
Milton Keynes
Cambridge
London

Northern Cities
Southern Cities
Findings suggest (but only suggest!) that Brexit will impact as many southern cities as severely as northern ones.

Southern cities have higher proportion of exporting firms.

But generally higher productivity of southern cities may suggest that they will recover faster and better.

Overall, however, we really do not know precisely how Brexit will work out across urban (or regional) Britain!
City Resilience and Policy

- Policy should incorporate explicit recognition of importance of shocks in shaping long-run growth and development cities (and regions)
- This relationship has distinct spatial dimension - northern cities have tended to be less resilient than southern cities
- Reinforces need for place-base dimension to industrial policy (cf Government’s new policy)
- Local industrial strategies need to think about ‘resilience building’
- European Commission is seeking ways of incorporating ‘resilience building’ into its various policies (including Structural Funds)
Building City Economic Resilience?

**Structure**
- Structural diversity
- Switchable markets
- Supply-chain flexibility
- Innovation and creativity
- Skilled/educated workforce
- Modern infrastructures
- Access to finance

**Governance**
- Supportive institutions
- Leadership
- Proactive attitude
- Coordinated policy making
- Developmental stance
- Long-term vision
- Resource allocation

**Culture**
- Locally committed business culture
- Entrepreneurship
- Positive attitude and outlook
- Situation awareness
- Effective networking

**Dynamic Competitiveness**
- Business Confidence
- Institutional Support

**RESILIENCE**
City resilience not just a local governance issue
Also depends on national policy stance and measures
Mindset in which shocks are seen as inherent feature of growth and development, not ‘incidental’ or autonomous events
Key issue is distributional dimension: resilience of what for whom?
More research needed!