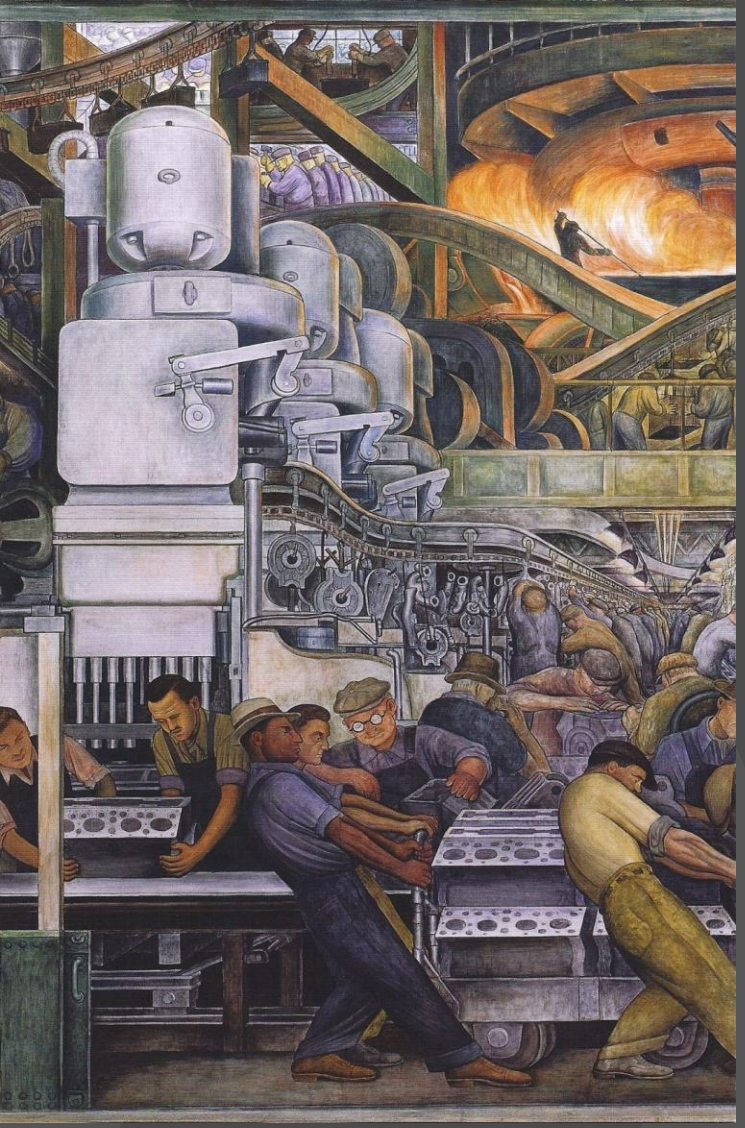
Detroit

University of Oxford
Seminar, June 2014



*Ram Mudambi**

Temple University

and

the University of Reading

Marcelo Cano-Kollmann, Temple University

T.J. Hannigan, Temple University

Hongryol Cha, Temple University

Thriving innovation amidst manufacturing decline:

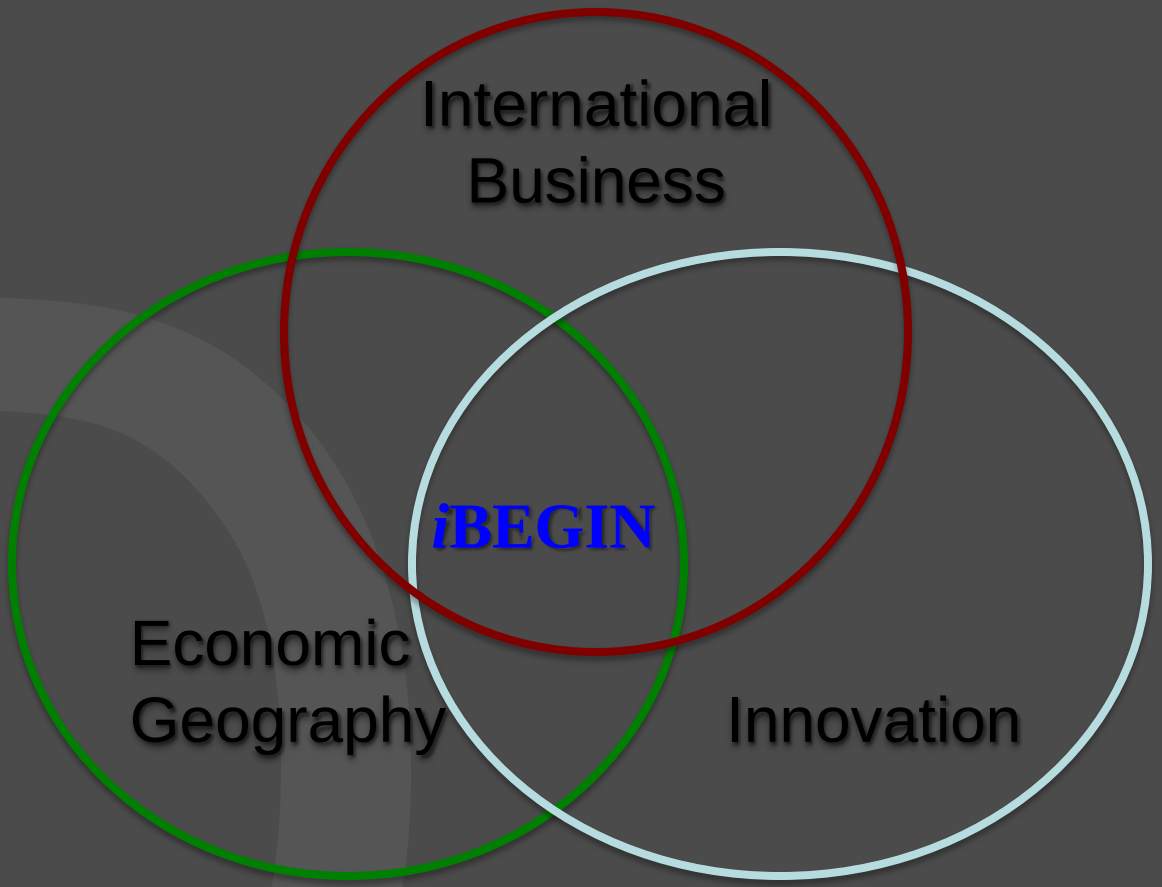
The Detroit auto cluster and the stickiness of local knowledge

***Presenting author**

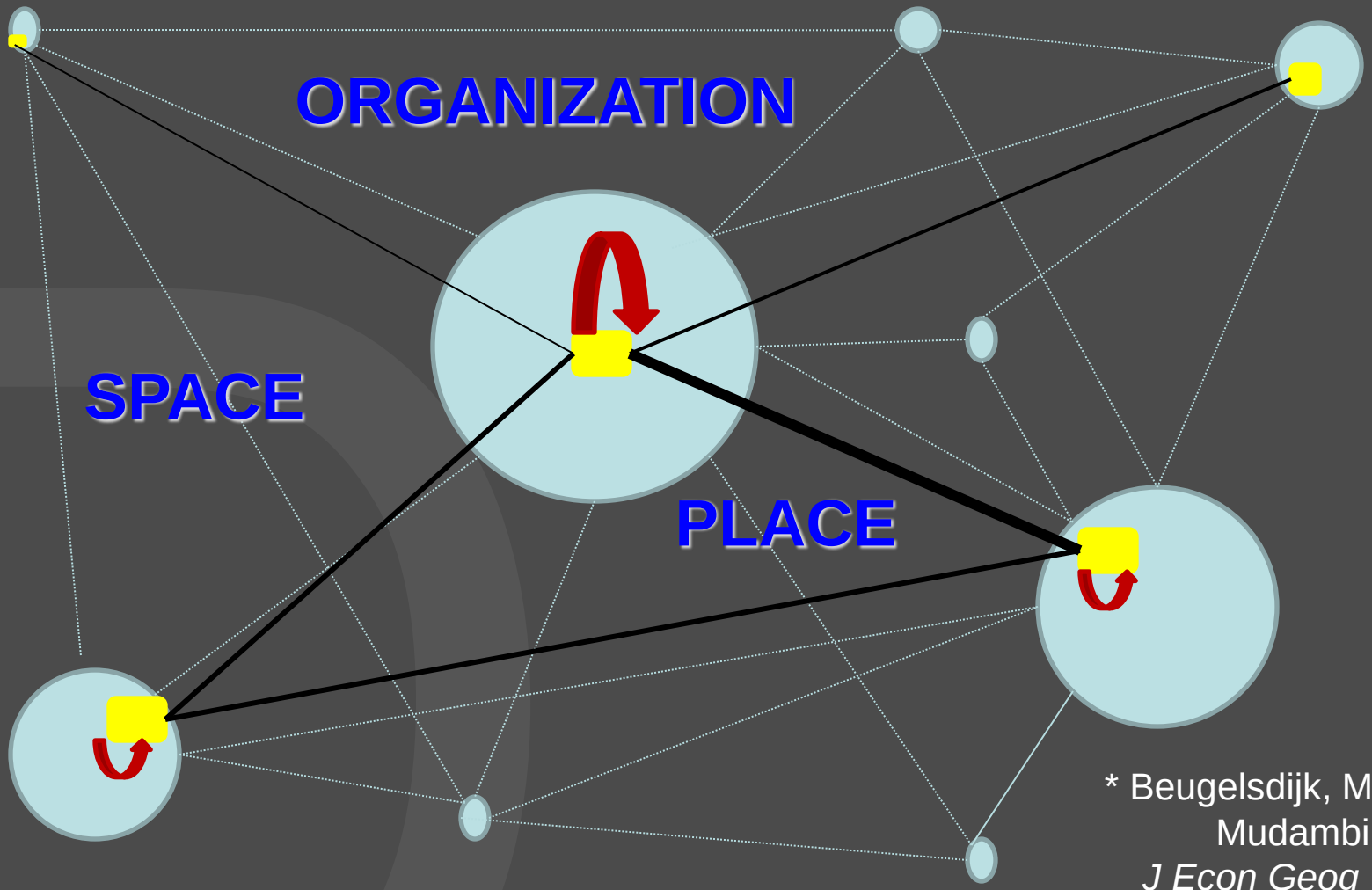
International Business, Economic Geography and Innovation (iBEGIN)

- iBEGIN is more than a workshop, more than a conference – it is a research agenda
- It is mooted by researchers at the Fox School of Business at Temple University.
- The current iBEGIN team includes members from Temple, Reading, Copenhagen Business School, Politecnico di Milano, Venezia among others.

Three research literatures



The *i*BEGIN research agenda

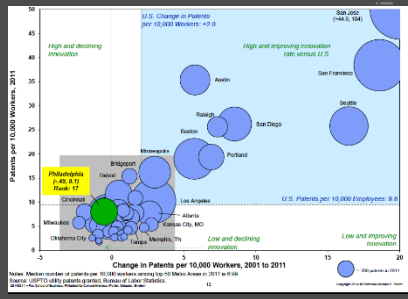


* Beugelsdijk, McCann, Mudambi, *J Econ Geog* 2010

Cluster research is about nodes
Our focus is the edges

Place, Space and Organization

- **Place** – lumpy agglomerations of resources
  - Industrial districts, clusters (Marshall)
  - "sticky places" (e.g., Markusen)
- **Space** – distance between and within agglomerations
  - Physical, psychic, cultural, institutional
- **Organization** – harnessing and leveraging resources ***from*** places ***across*** space
  - E.g., Multinational firms, diasporas, virtual communities



Three key points

1. The world has changed from "trade in goods" to "trade in activities".
   - What is important to a location is *NOT* the local industry or the identity of local firms, but the nature of local activities
2. Local value creation is based on high knowledge activities stemming from BOTH
   - Domestic firms
   - MNE subsidiaries
3. Both require global connectivity

Knowledge maps project

- Main data source: the US PTO database.
  - Analysis of over 9 million records each with dozens of fields.
  - Ancillary data drawn from Compustat.
- Co-inventor networks, mapped to the 917 Core-based Statistical Areas (CBSAs) designated by the U.S. Office of Management and Budget (OMB).
- Mapped in selected emerging economies, including India, Brazil, Turkey, China

Metrologic patent 8,457,013, June 4, 2013

7 co-inventors – Philadelphia (1) Marlton NJ (1) Aston PA (1) Suzhou CH (1) Jiangsu CH (3)

Summary of today's paper

- We analyze
  - The evolution of innovative activity in the Detroit auto cluster
  - Its degree of connectivity to global innovation networks
- We explore the evolution of innovative activity as the industrial cluster suffers structural changes associated with a long-term decline in manufacturing activity
- Our analysis confirms that knowledge is "sticky": innovation in clusters can be resilient to industrial decline

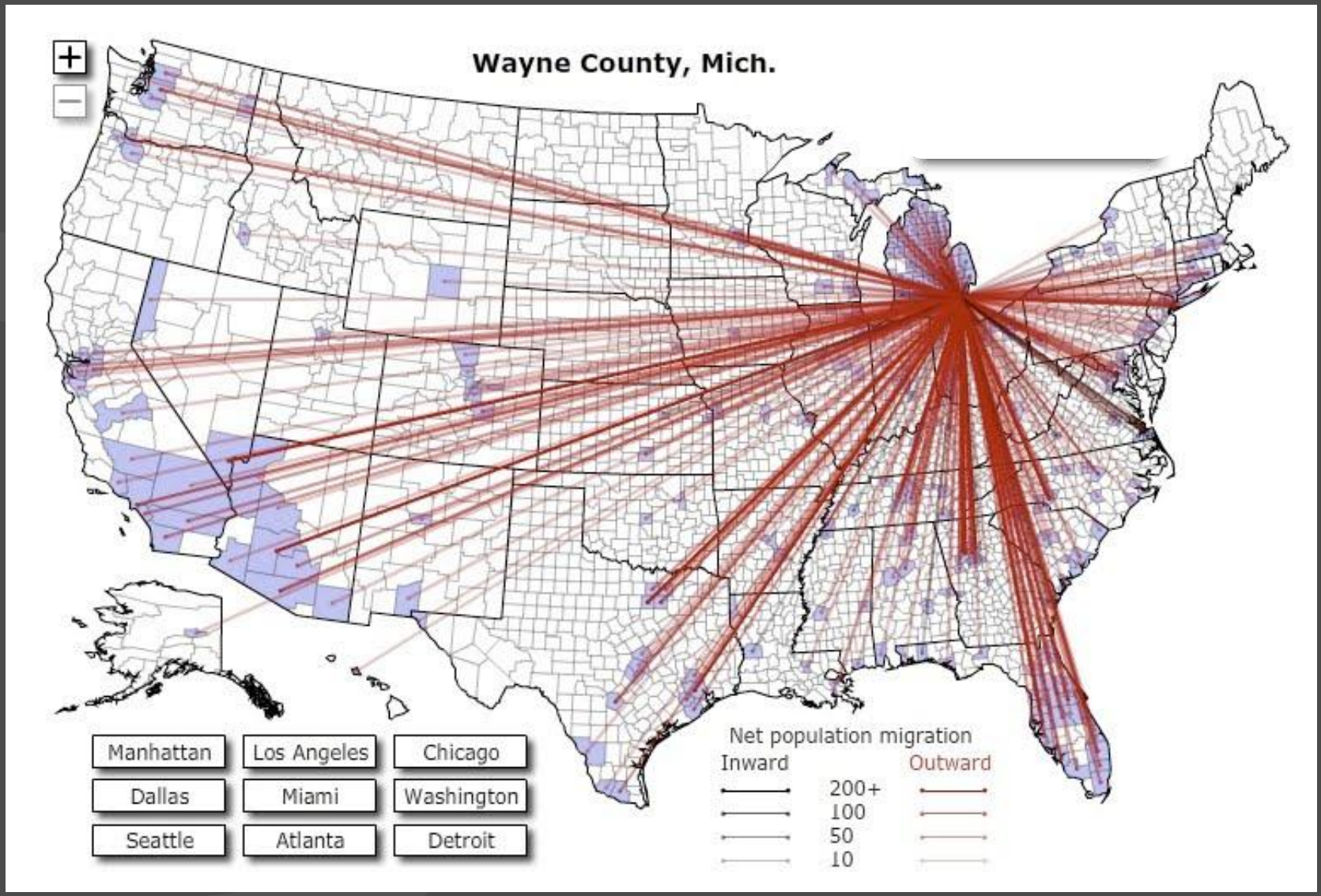
The Detroit cluster

- Detroit was a model of growth for the better part of the 20th century
  - The specialization of the auto industry in the Detroit area generated the typical agglomeration benefits of a Marshallian cluster:
    - *Economies of scale in inputs*
    - *Access to common labor pools*

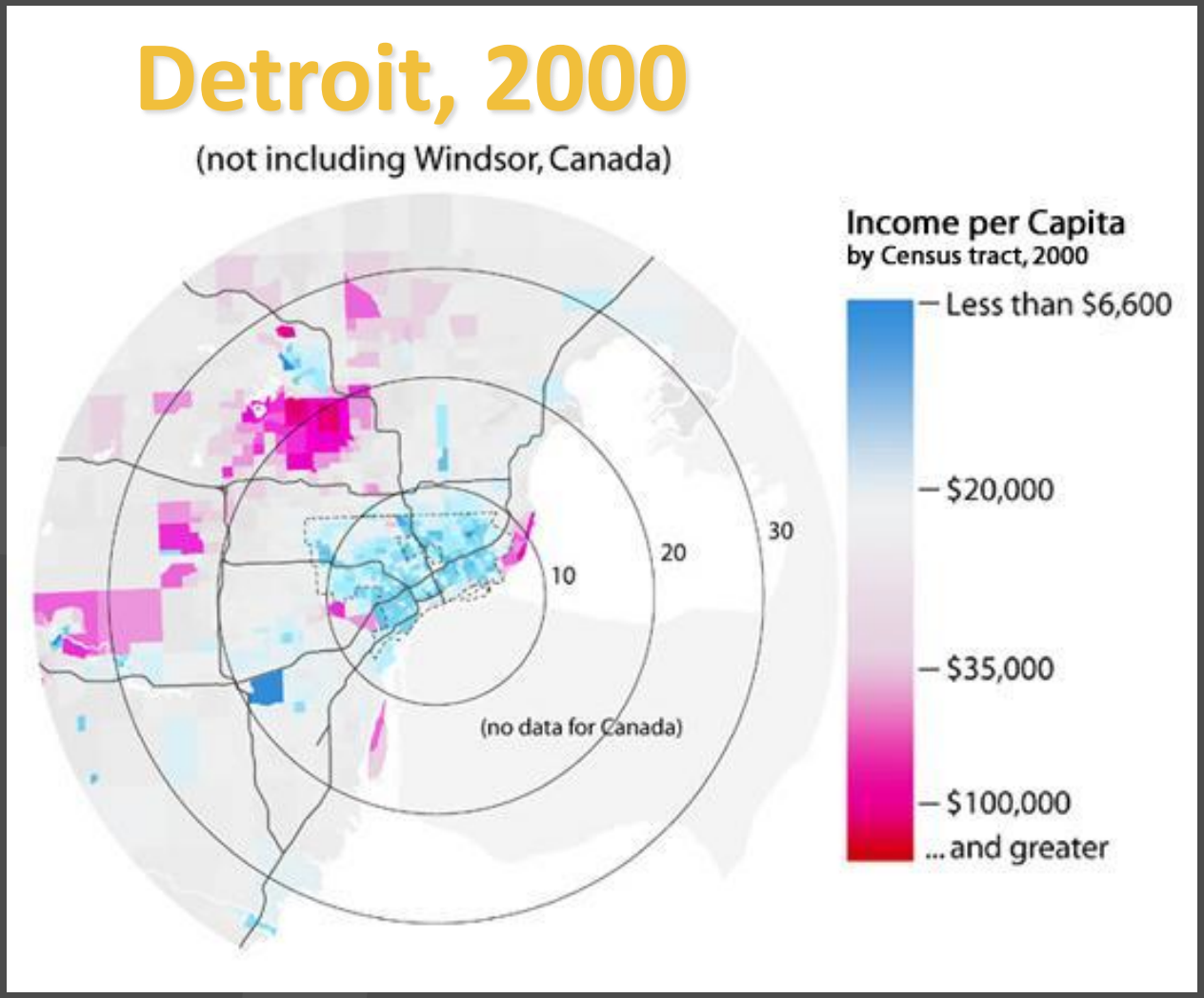
- In 1960, Detroit had the highest per capita income in the United States(!)

Detroit population

Detroit cluster – in- and out-migration, 2008



Detroit, 2000



- From 2000 to 2010, Michigan lost **48%** of its manufacturing jobs
- Over this period Detroit's estimated median household income fell from $29,526 to $26,098.

Key change, 1975 - 2010

- The “Big Three” auto makers transformed from vertically integrated manufacturers to orchestrators of multinational global value chains (GVCs).
- GVC orchestration places these lead firms at the center of the production and innovation ecosystems
  - They still determine the location of value creation
  - They moved low-skill assembly activities to cost-effective locations
  - The cluster’s continued gravitational pull is evident:
    - The co-location of suppliers
    - The increase in their concentration over time

Clusters and innovation

- There is considerable evidence that innovation networks are highly localized (Jaffe et al, 1993)
- However, cluster health and resilience has been linked to both local characteristics as well as global connectivity (Lorenzen and Mudambi, 2013)
- MNEs use their networks to transfer and integrate knowledge – setting up "pipelines" to do so. These pipelines links clusters to one another (Bathelt et al, 2004)
- It has been shown that knowledge networks are bi-modal, with collaboration occurring either locally or at long distances (Gittelman, 2007)

Proposition 1

- Falling spatial transaction costs and relocation of production activities to more efficient locations can make a cluster vulnerable.
- The resilience of value creation in the cluster may be linked to its knowledge generation capabilities.
- When the lack of knowledge in the local milieu impels firms to establish external connections, the same falling spatial transaction costs make global knowledge search cost effective. A dense network of connections increases the "stickiness" of the local knowledge creation.

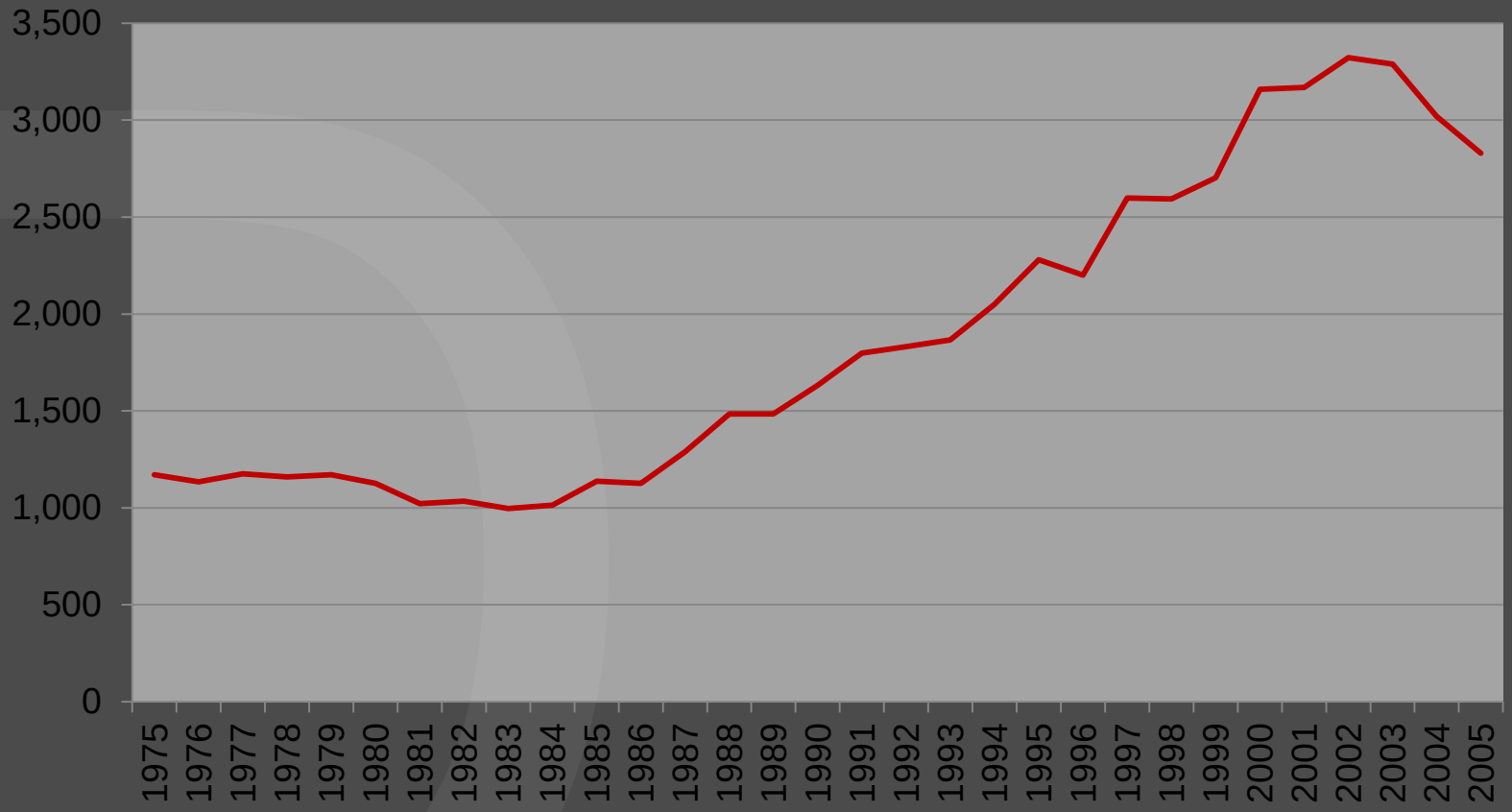
The resilience of a cluster to structural change is contingent on the degree of connectivity to global innovation networks

Proposition 2

- Local knowledge exchanges and long distance knowledge exchanges motivated by different factors.
- Local "buzz" and spillovers facilitated by geographical proximity can extend to neighboring regions in adjacent countries, despite the natural filters that come from national borders.
- When knowledge cannot be found within geographic proximity, firms create "organized proximity": the main reason to go beyond geographic proximity is the presence of "knowledge proximity" elsewhere.

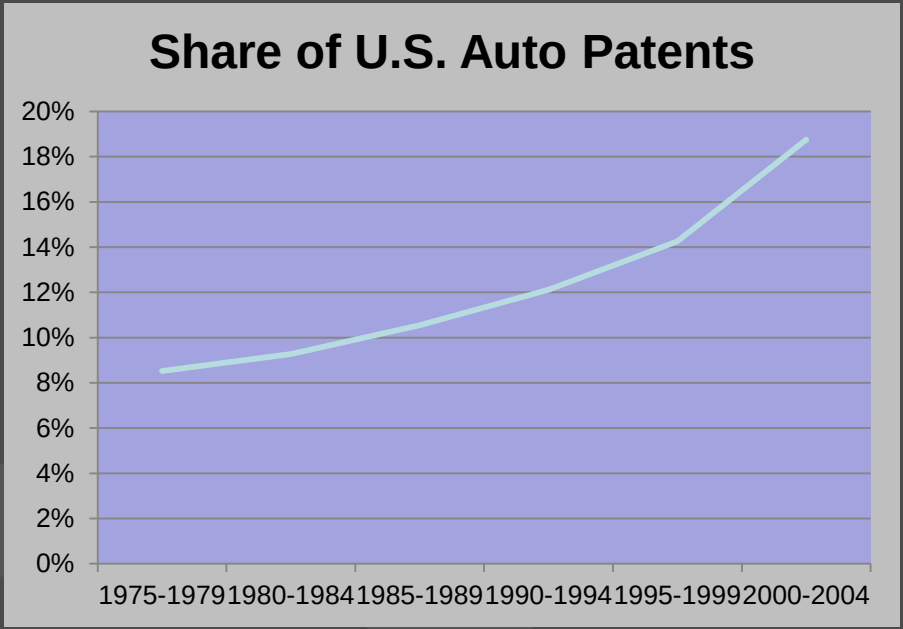
The connectivity to global innovation networks is based on two drivers: geographic proximity and knowledge proximity

Number of USPTO granted patents with Detroit-based inventors



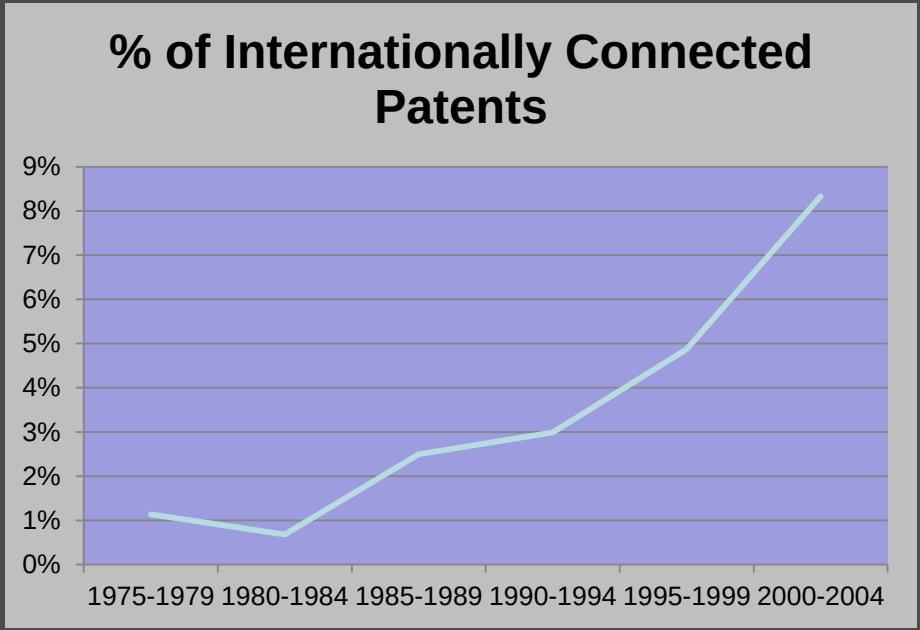
Comparison of the innovation activity in Detroit vs. the U.S.

	Detroit			United States			
Year	CBSA population ('000)	Patents[1] w/inventors based in the CBSA	Patents[1]/ million	USA population ('000)	Patents[1] w/inventors based in the US	Patents[1]/ million	Ratio of patents per capita Detroit/USA
1975	4,330.4	1,171	270.4	215,465.0	42,163	195.7	1.382
1980	4,353.4	1,127	258.9	226,545.8	38,841	171.4	1.510
1985	4,367.8	1,137	260.3	237,924.0	37,866	159.2	1.636
1990	4,382.3	1,631	372.2	248,709.9	53,784	216.3	1.721
1995	4,417.4	2,280	516.1	266,278.0	84,179	316.1	1.633
2000	4,452.6	3,159	709.5	281,421.9	115,946	412.0	1.722
2005	4,374.4	2,830	646.9	295,753.0	97,136	328.4	1.970
Growth 1975-2005	1.0%	141.7%	139.2%	37.3%	130.4%	67.8%	42.5%

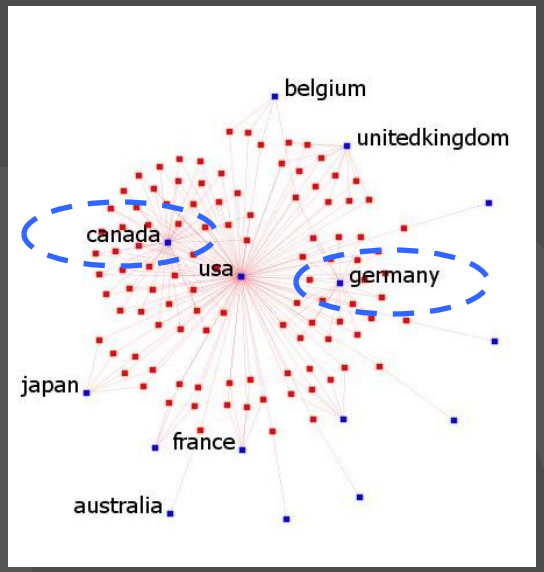


Detroit is becoming more important in the U.S. auto industry …

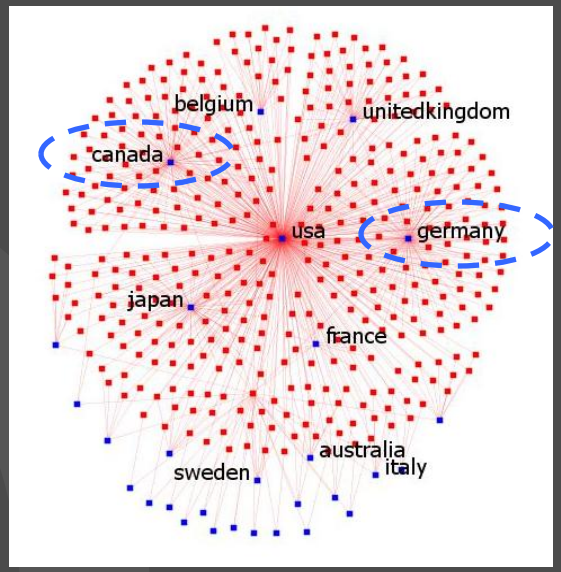
… and more globally connected



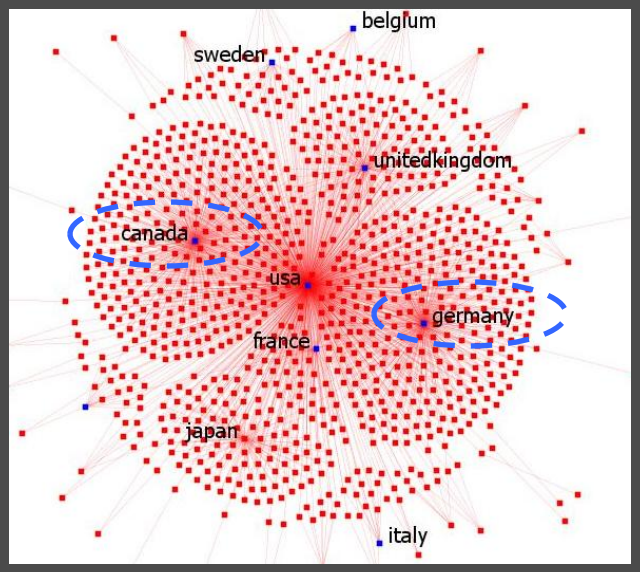
Detroit connectedness to global innovation networks



1975-1984



1985-1994

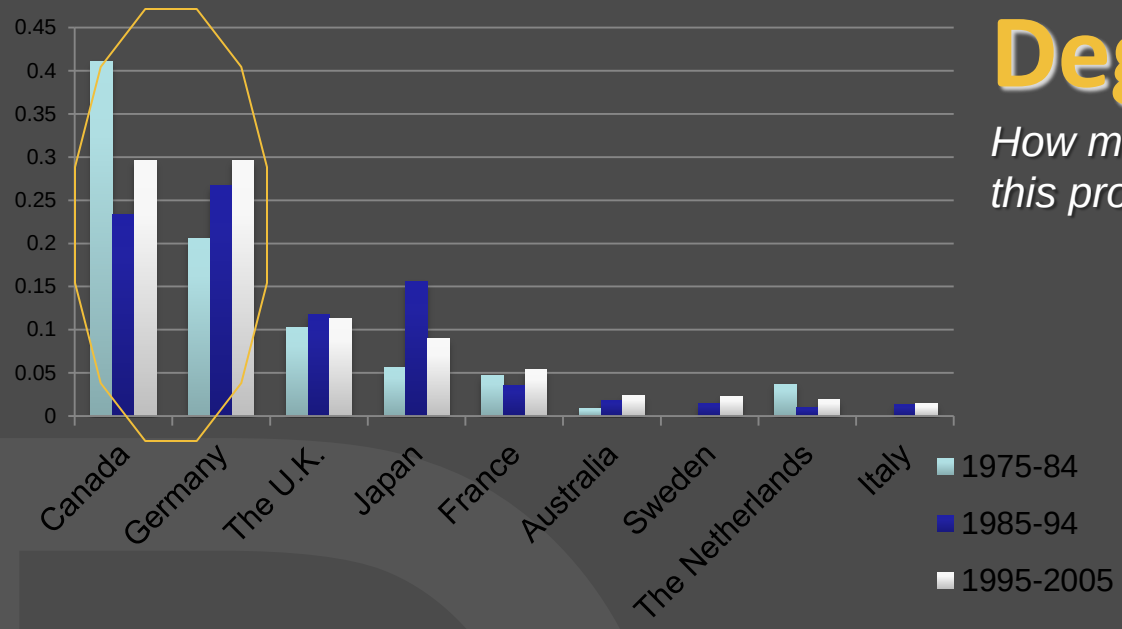


1995-2004

Germany and Canada are the countries most connected to Detroit

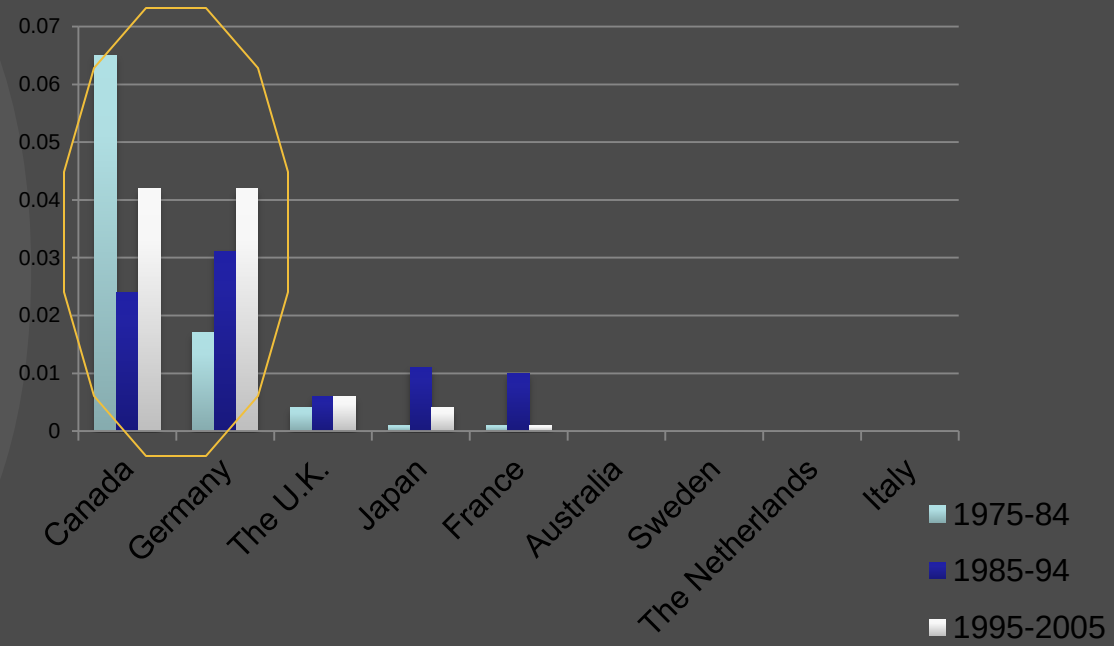
Degree centrality

How many edges touch nodes with this property?



Betweenness centrality

How often do nodes with property act as bridges between other nodes?



Detroit's two main partners:

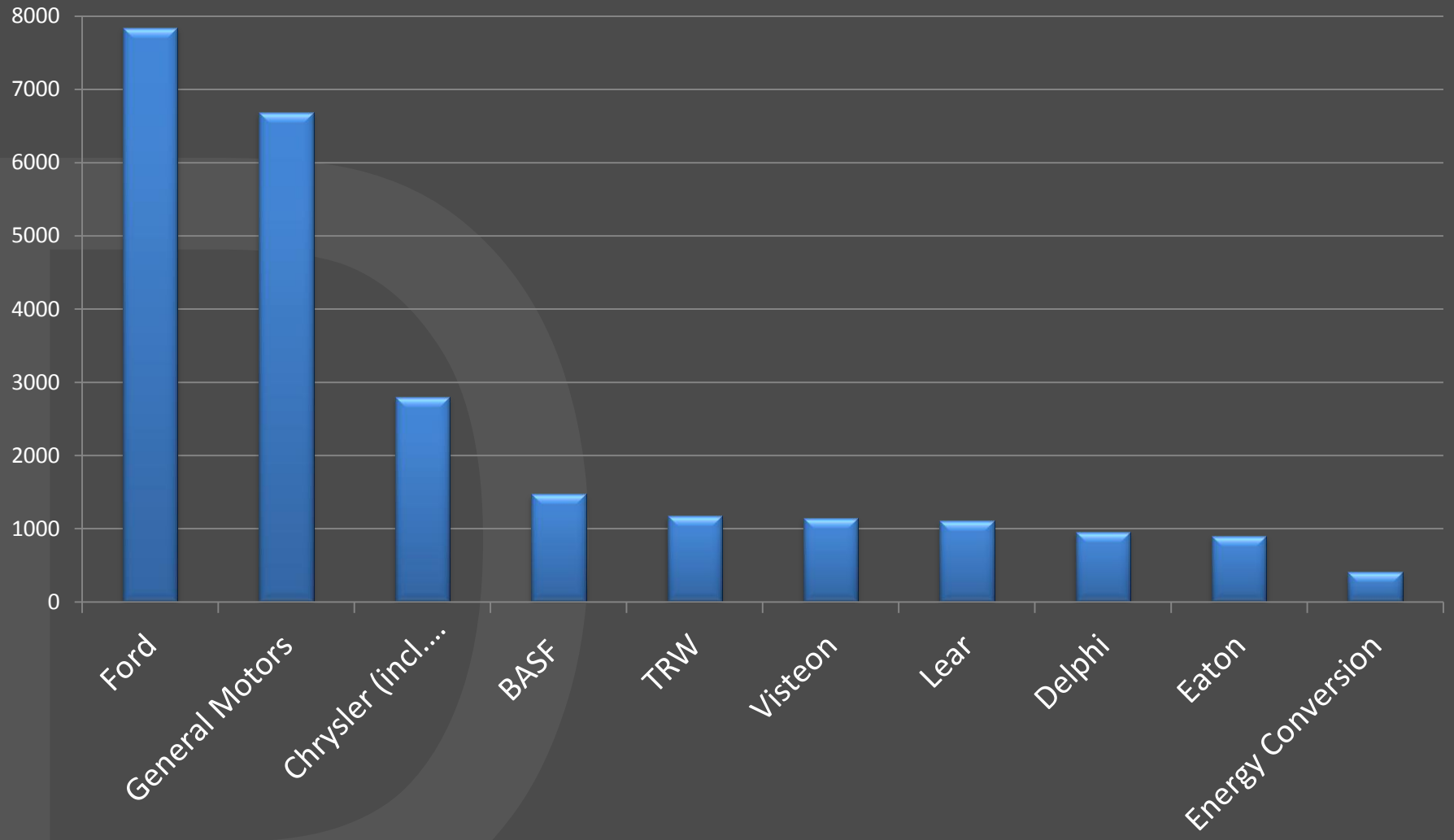
Germany and Canada

The connectedness with Germany is driven by "knowledge proximity"

The connectedness with Canada Canada is driven by geographical proximity"

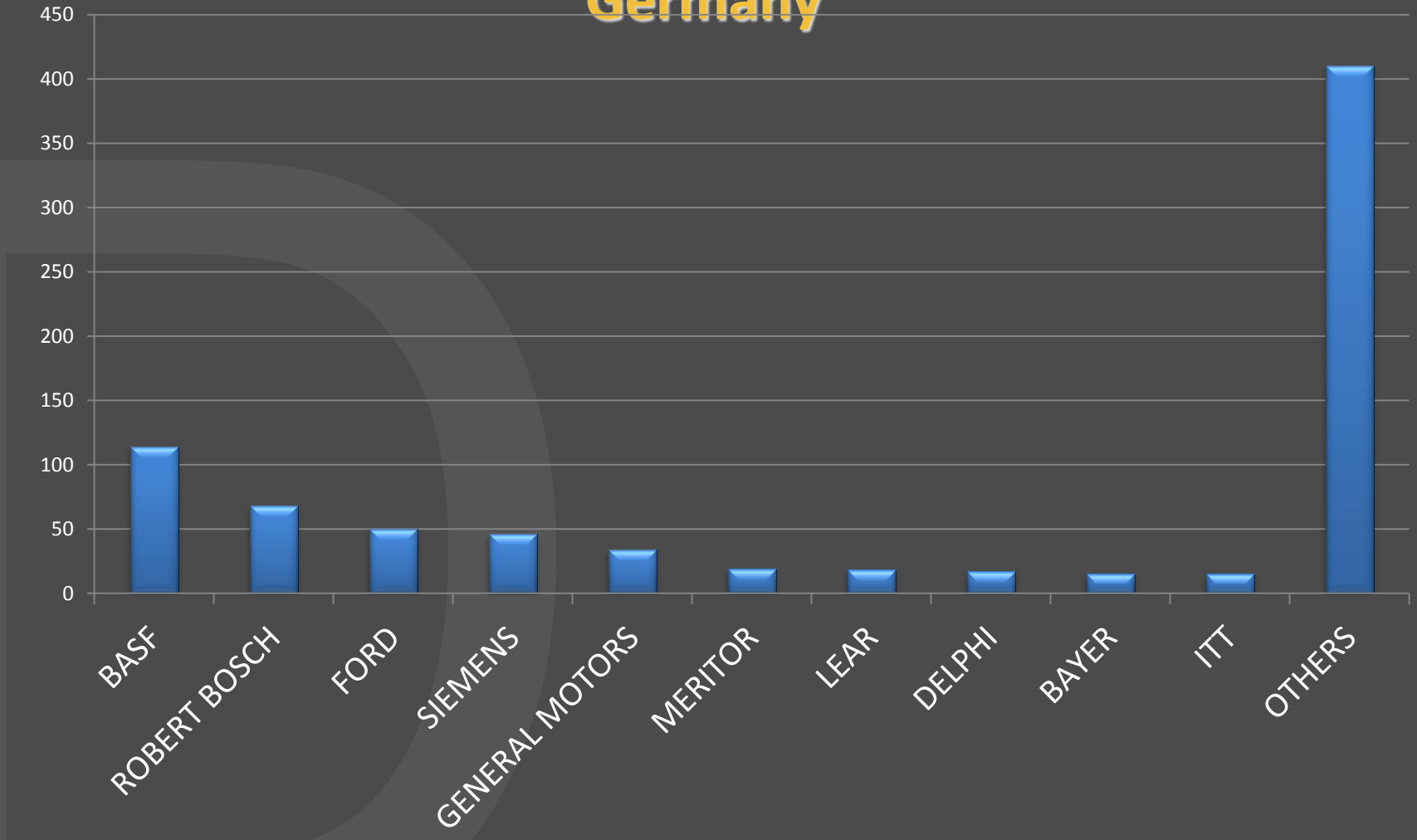
Detroit CBSA

Top 10 assignees by number of patents (1975-2010)



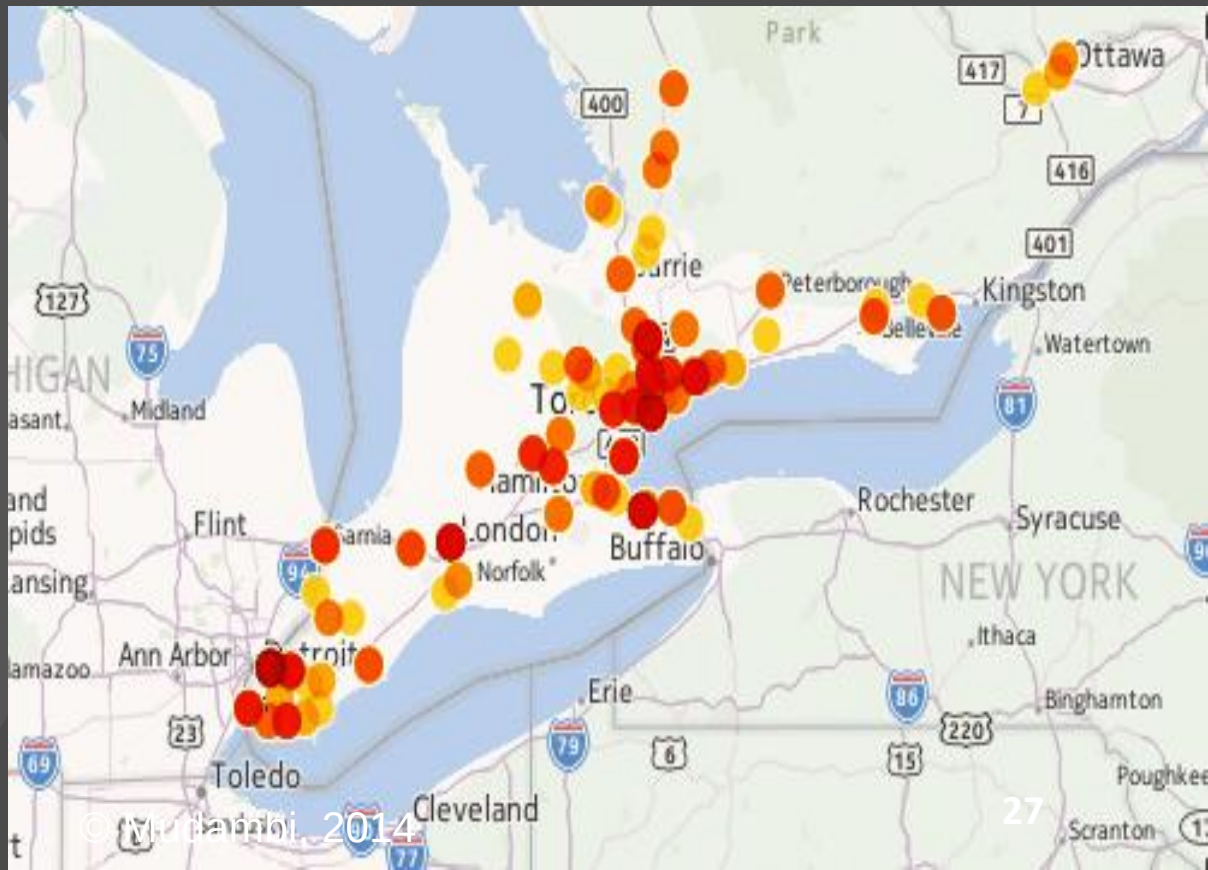
Detroit CBSA:

Top 10 assignees by number of patents connected to Germany

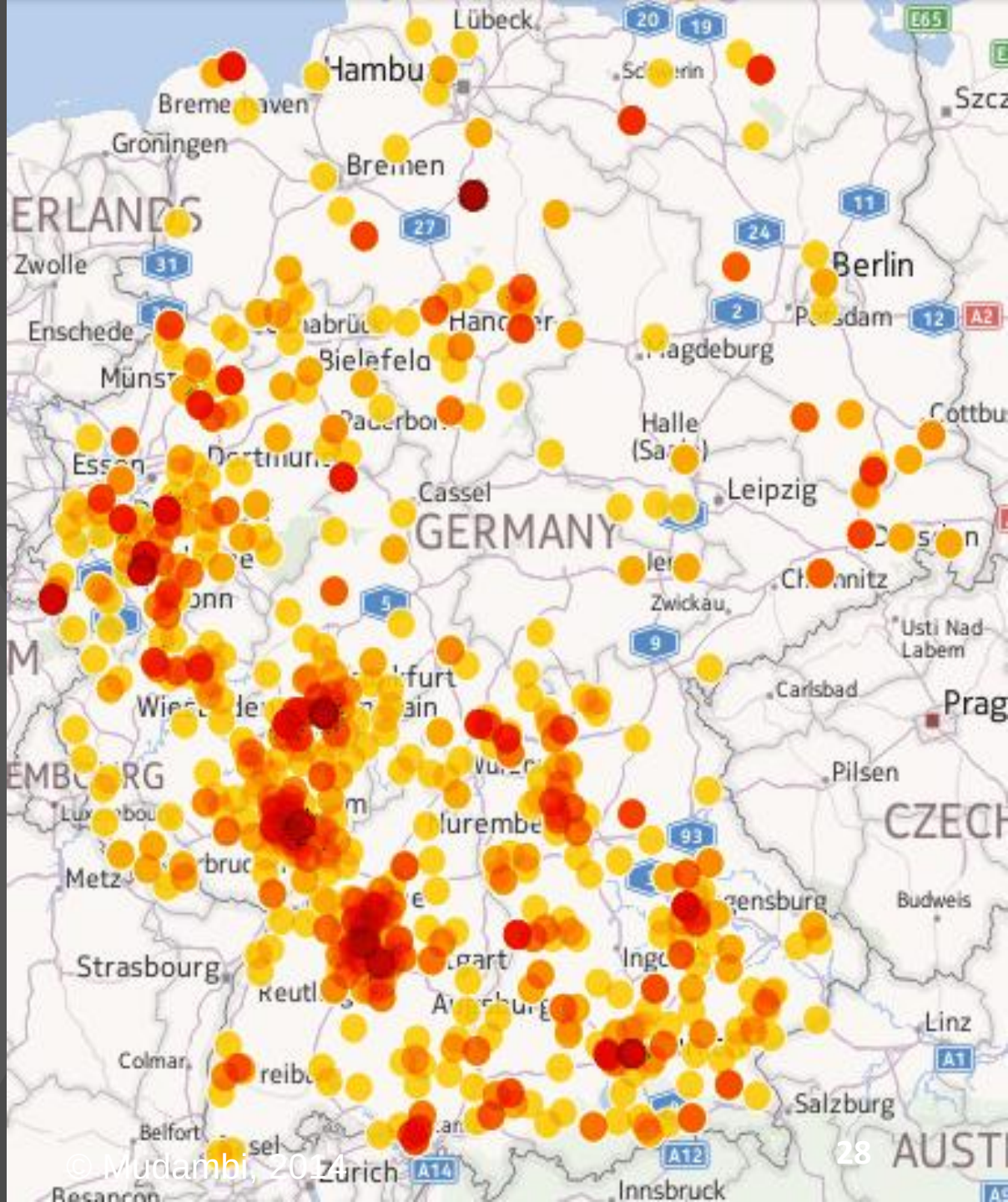


Location of inventors connected to Detroit in **Canada**

A vicinity story



Location of inventors connected to Detroit in **Germany**



Conclusions

Resilient Innovation in Detroit sustained by **sticky knowledge in auto industry** and **connectivity**

- In spite of the manufacturing decline, Detroit *continued to innovate* at a pace higher than national average
- Innovation performance is correlated with *connectedness* to global networks
- These connectedness has two drivers: geographic and *knowledge* proximity
- The Detroit CBSA per capita income $49,160 is the 19th highest in the US.

BACK-UP

Summary (continued)

We map and measure the global connectivity of Detroit's innovation networks

We found that as manufacture declined, Detroit became:
- More innovative
- More relevant within the U.S. auto industry
- More connected both globally and domestically

We disentangle the drivers of this connectivity and distinguish between:
- Geographic proximity to neighboring clusters and
- "Knowledge proximity" to remote locations

Michigan Central Station Detroit

Derelict