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## Tools and Methods to Anticipate Local Job Creation & Suppression: Opportunities and Threats

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# TOOLS AND METHODS TO ANTICIPATE LOCAL JOB CREATION & SUPPRESSION: OPPORTUNITIES AND THREATS

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*Presentation to:*  
OECD/LEED Capacity Building Seminar:  
**Local Strategies for Greening Jobs and Skills**

*Randall W. Eberts*  
*W.E. Upjohn Institute for Employment Research*

9-11 June, Trento Italy

# Questions to be Addressed

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- What does a shift to a low-carbon economy mean for jobs and skills?
- In which sectors are jobs likely to be created?
- In which sectors are jobs likely to disappear?
- Does moving to a low-carbon economy necessarily mean slower job growth?
- Or is the green economy the next wave of growth and innovation?
- Which skills should be provided to match future jobs?
- This session will review the key principles of local labour market monitoring and forecasting to support evidence-based policy making

# More Questions

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- What does a low-carbon “Green” economy look like? How might the economy change?
  - Products, processes, input requirements
- What does a green worker look like? How do job activities and requirements differ from typical jobs today and how will they differ in the future?
  - Greater skill requirements, more service or product oriented?
- What are appropriate public policies to promote growth in the green economy and to ease the transition?



# Why Do We Care?

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At the global and national levels:

- “Growing concerns about the environmental unsustainability of past and current economic growth patterns and the risk of irreversibly altering the environmental base needed to sustain economic prosperity” (OECD, May 2010).
- “Green growth is a way to pursue economic growth and development, while preventing environmental degradation, biodiversity loss and unsustainable natural resource use.” (OECD, May 2010).
- “The financial and economic crisis creates room for public policies aimed at encouraging recovery and renewed growth on more environmentally and socially sustainable grounds.” (OECD, May 2010).

# Why Do We Care?

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At the regional level:

- Opportunities for growth: regions (including U.S. states) are implementing policies to capitalize on the green economy to foster economic growth
- “The new green economy provides a dynamic opportunity to rebuild the state’s job base, attract new investment, and diversify the state’s economy” (Michigan Green Jobs Report, 2009)
- “The greening of the Maine economy is part of a necessary progression and an opportunity for renewed economic growth...it can expect to see the benefits of increasing the productivity of its business, improving its energy efficiency and lowering the cost of heating and cooling its buildings” (Maine’s Green Economy, 2010)

# Why Do We Care?

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At the regional level:

- Concern about job destruction and the reallocation of resources across regions
- Regions dependent upon current forms of high-carbon energy extraction and generation may be losers
- Regions dependent upon products that use high-carbon energy, such as car production, may be losers
- Market forces and government policies can place regions at an economic advantage or disadvantage with respect to a green economy

# Outline

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- Conceptual framework for defining Green
- Stress the continuum of the green economy and how it relates to the rest of the economy
- Present the basic tools needed to address many of the question posed earlier
- Examples
  - Counting green jobs
  - Estimating the impact of demand for green
  - Estimating the impact of increased energy efficiency
- Reminder that regional shocks happen and green growth strategies are no protection
- Regional green strategies need to follow basic principles of regional economic development



# Green Industries or Jobs?

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- No one “official” definition of Green Industries or of Green Jobs
  - Several organizations have offered their definitions
  - Most statistical agencies have yet to classify green sectors or green jobs
- Common themes emerge from the various definitions

## **Products:**

Environmentally friendly and enhancing products and services

Renewable energy products and services

Clean transportation and fuels

Green buildings

## **Processes:**

Energy efficient manufacturing, distribution, construction

Reduce energy, materials, and water consumption through high efficiency strategies

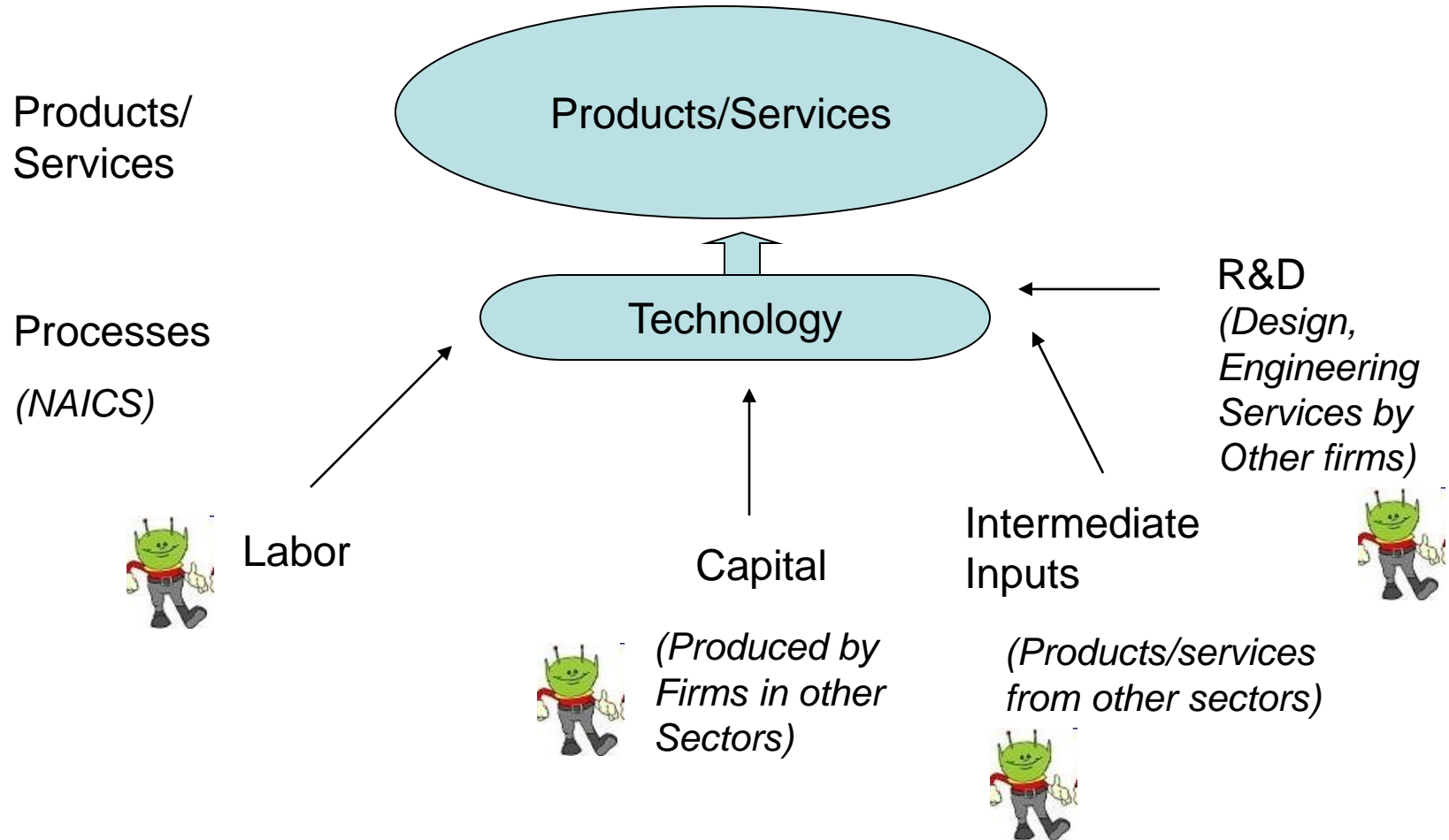
De-carbonize the economy

# Conceptual Framework for Defining Green

- US Bureau of Labor Statistics plans to use a two-tiered approach in identifying environmental economic activity and jobs:
  - The output approach—identifies establishments that produce green goods and services and counts the associated jobs
  - The process approach—identifies establishments that use environmentally-friendly production processes and practices and counts the associated jobs.

# Conceptual Framework

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# Counting Green Jobs

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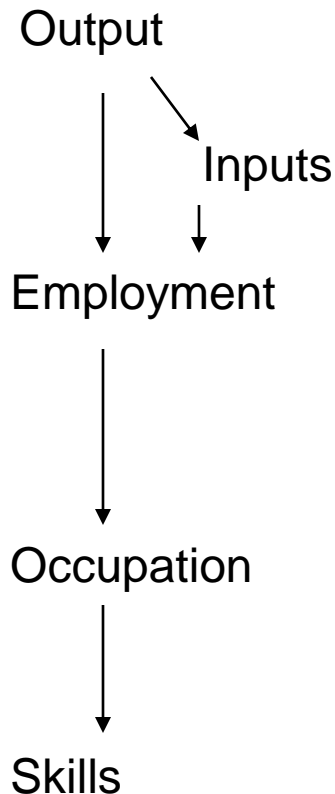
- Difficulty arises because some occupations are “green” one day and “non-green the next, or may be only partially “green”
  - Construction firm may install solar heating systems for one project and not for the next. When is this construction firm and its workers a “green firm”?
  - Some employees in an auto plant may be building vehicles that run on biofuels, electricity, hydrogen, or fuel cells. At the same time, other employees for the same company will be producing traditional gas-powered vehicles.
  - What about manufacturing plants that construct auto parts that reduce auto emissions, yet use inefficient production process? (Jolly, 2008)
- California Survey: two-thirds of green workers on green aspects of job more than half the time

# Assessing Green Worker Skills

- **Green Increased Demand** occupation — green economy activities and technologies are likely to increase the employment demand, but will not lead to significant changes in the work and worker requirements.
  - Chemical technicians: Conduct chemical and physical laboratory tests to assist scientists in making qualitative and quantitative analyses of solids, liquids, and gaseous materials
- **Green New & Emerging** occupation — the impact of green economy activities and technologies is sufficient to create the need for unique work and worker requirements, which results in a generation of new occupations.
  - *Nanotechnology engineering technologist*—Implement production processes for nanoscale designs to produce and modify materials, devices, and systems of unique molecular or macromolecular composition.

# Tools

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- **National input-output tables**
  - Show the linkages among industries
- **Regional input-output multipliers**
  - Estimate how much a one-time or sustained increase in economic activity in a particular region will be supplied by industries located in the region.
- **Industry-employment tables**
  - Estimates the employment of each industry
- **Industry-occupation tables**
  - Identifies the occupations employed by each industry
- **Occupation-skills tables**
  - Estimates the set of skills required by each occupation

# Tools for Analyzing and Monitoring Green Jobs in Michigan

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- Define Green Economy
- Survey employers to see who is engaged in green economy activities
- Survey employer expectations
  - Hiring
  - Filling vacancies
  - Unique skills
  - Training
- Analyze standard employment data
  - Cluster analysis
  - Job change
  - Wage prospects
  - Competitive analysis
- Track job trends among Green businesses
  - Use firm-specific data from UI wage records to follow specific firms over time
- Occupational trends
  - Identifying green-related occupations
  - Characteristics
  - Forecasts
  - Educational and training requirements
  - Career progressions
  - Critical skills and knowledge sets

# Michigan Direct Green Jobs, 2009

Direct Green Jobs:

- 1) Asked employers if they engaged in specific green activities
- 2) Asked employers the number of workers and job titles of those engaged in such activities

Core Area	Total Direct Jobs	Share of Total Direct Green Jobs
Total Direct Green Jobs	96,767	100.0%
Clean Transportation and Fuels	39,317	40.6
Increasing Energy Efficiency	22,236	23.0
Pollution Prevention and Environmental Cleanup	12,345	12.8
Agriculture and Natural Resource Conservation	11,986	12.4
Renewable Energy Production	8,843	9.1
Green Jobs not assigned to a core area	2,040	2.1
Total private employment	3,227,600	3.4% of total employment



## Top Michigan Industries Generating the Largest Number of Direct Green Jobs

Linked survey responses to NAICS codes, which allows one to compare green jobs with rest of economy

NAICS	Industry	Total Direct Green Jobs	Total Industry Employment	Green Jobs % of Industry Employment
336	Transportation Equipment Mfg	25,780	176,254	14.6%
541	Professional, Scientific, and Technical Services	22,178	241,786	9.2
238	Specialty Trade Contractors	9,825	102,467	9.6
236	Construction of Buildings	3,571	34,423	10.4
111	Crop Production	3,503	15,942	22.0
562	Waste Management and Remediation Services	2,168	11,410	19.0

## Relation of Transportation Equipment Mfg to other Industries

Note how auto production is linked to so many other industries, which may or may not be green—in fact the last one listed is the second sector with the most green jobs in Michigan

Motor vehicle bodies, trailers, and parts	110,011.0	59.1%
Wholesale trade	13,978.8	7.5%
Management of companies and enterprises	8,075.6	4.3%
Plastics and rubber products	8,014.2	4.3%
Turbine and power transmission equipment	7,389.3	4.0%
Other fabricated metal products	5,471.3	2.9%
Semiconductors and electronic components	4,091.2	2.2%
Nonmetallic mineral products	3,593.8	1.9%
Electronic instruments	2,600.6	1.4%
Audio, video, and communications equipment	2,492.8	1.3%
Noncomparable imports	2,335.5	1.3%
Truck transportation	2,171.7	1.2%
Nonapparel textile products	1,843.4	1.0%
Paints, coatings, and adhesives	1,553.7	0.8%
Computer and peripheral equipment	924.9	0.5%
Leather and allied products	919.1	0.5%
Converted paper products	898.4	0.5%
Other general purpose machinery	807.4	0.4%
HVAC and commercial refrigeration equipment	638.2	0.3%
Other miscellaneous manufactured products	606.7	0.3%
Scientific research and development services	601.3	0.3%

## Michigan Green-Related Occupations Forecasts to 2016

Linked occupations from surveys to SOC which allows one to link to forecasts and skill requirements

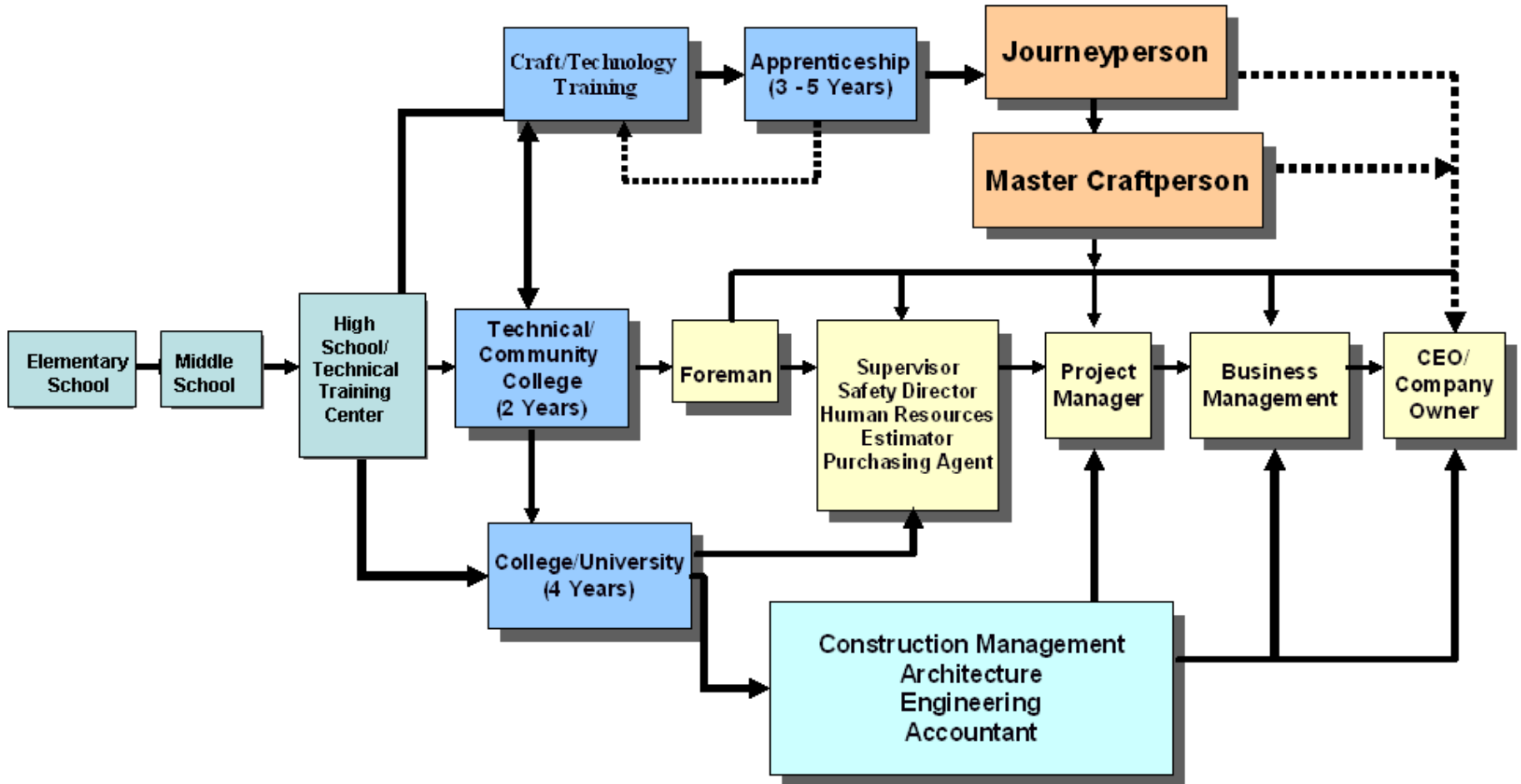
SOC	Occupational Title	Employment		Change		Education
		2006	2016	Number	%	
17-2112	Industrial Engineers	22,290	26,480	4,190	18.8	Higher
17-1022	Surveyors	1,230	1,450	220	18.3	Higher
37-3011	Landscaping workers	33,380	38,160	4,780	14.3	Low
17-2081	Environment Engineers	1,860	2,100	240	13.2	Higher
17-1011	Architects	2,860	3,220	360	12.5	Higher
17-1012	Landscape Architects	690	770	80	11.7	Higher
17-2051	Civil Engineers	6,190	6,870	680	11.0	Higher
17-2041	Chemical Engineers	1,050	1,160	110	10.5	Higher
49-9041	Industry Machinery Mechanics	10,200	11,170	970	9.5	Moderate
11-9121	Natural Sciences Managers	460	510	50	9.5	Moderate

# Skills

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- Can link the occupation to the O\*NET to show the:
  - Tasks
  - Tools and Technology
  - Knowledge
  - Abilities
  - Work Context
  - Work Styles
  - Work Values
  - Related Occupations
  - Wages
  - Projected Growth
- California publishes a guide to green jobs using O\*NET as a source

# Career Pathways Map to Green Jobs



# Employment Trends for 358 Green-related Firms, by Cluster

Cluster	2005 Jobs	2008 Jobs	Emp. Change	% Change
Total Private Employment	3,683,821	3,485,775	-198,046	-5.4%
358 Green-Related Jobs	32,533	35,049	2,517	7.7%
Clean Transportation and Fuels	5,363	5,321	-42	-0.8%
Increasing Energy Efficiency	12,041	12,334	293	2.4%
Misc. Green Manufacturing	3,926	4,068	142	3.6%
Renewable Energy Production	6,243	8,183	1,895	30.4%
Other	4,960	5,188	228	4.6%

# Impact of Green Demand

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- Example of estimating the impact of installing and operating a wind farm on a small region (county)
- Popular tool for estimating the impact of Green Job Creation (or the loss of Green Jobs) to a region is the Job and Economic Development Impact Model (JEDI) developed by the Department of Energy (DOE) National Renewable Energy Laboratory (NREL).
- The JEDI model offers an input-output economic impact model to determine the employment and output effect of a dollar spent on a power generation project in a state, county or region.
- Local spending results from using:
  - local labor (e.g., concrete pouring jobs),
  - services (e.g., engineering, design, legal),
  - materials (e.g., wind turbine blades),
  - or other components (e.g., nuts and bolts).

# Estimated Regional Impacts

Estimated Regional Impact of Constructing and Operating Wind Energy Generation in a region

Types of Economic Impacts					
Project A	Direct	Indirect	Induced	Total	Multiplier
<b>Employment</b>					
Construction1	146	46	67	259	1.77
<i>Local Hires</i>	3		3	6	
Operation	17	4	8	29	1.71
<i>Local Hires</i>	12	2	4	18	
<b>Earnings (thousands)</b>					
Construction1	\$6,910	\$1,850	\$2,280	\$11,040	1.60
<i>Earnings/worker</i>	\$47,329	\$40,217	\$34,030	\$42,625	
Operation	\$850	\$160	\$290	\$1,300	1.53
<i>Earnings/worker</i>	\$50,000	\$40,000	\$36,250	\$44,828	
Types of Economic Impacts					
Project B	Direct	Indirect	Induced	Total	Multiplier
<b>Employment</b>					
Construction1	858	266	393	1,517	1.77
<i>Local Hires</i>	18	2	14	34	
Operation	101	24	50	175	1.73
<i>Local Hires</i>	63	11	19	93	
<b>Earnings (thousands)</b>					
Construction1	\$40,520	\$10,870	\$13,370	\$64,760	1.60
<i>Earnings/worker</i>	\$47,226	\$40,865	\$34,020	\$42,690	
Operation	\$4,890	\$960	\$1,690	\$7,540	1.54
<i>Earnings/worker</i>	\$48,416	\$40,000	\$33,800	\$43,086	
Types of Economic Impacts					
Project C	Direct	Indirect	Induced	Total	Multiplier
<b>Employment</b>					
Construction1	176	55	81	312	1.77
<i>Local Hires</i>	5		2	7	
Operation	21	5	10	36	1.71
<i>Local Hires</i>	14	1	2	17	
<b>Earnings (thousands)</b>					
Construction1	\$8,320	\$2,158	\$2,750	\$13,228	1.59
<i>Earnings/worker</i>	\$47,273	\$39,236	\$33,951	\$42,397	
Operations	\$1,030	\$200	\$350	\$1,580	1.53
<i>Earnings/worker</i>	\$49,048	\$40,000	\$35,000	\$43,889	
1. Note I placed the 3 non-construction job that JEDI listed in Direct Impact in to the Indirect Impact					



# Impact of Energy Efficiency: Regional Winners and Losers

Direct Impact	Ohio Economic Sectors	
	Energy	All Others
Employment (Jobs per million \$s)	1.4	7.6
Contribution to Gross State Product (per \$)	0.4	0.5

- \$44,493 million for total energy consumption in 2006
- Suppose reduced by 6%, what effect would this have on jobs and output? (6% reduction in carbon emission)
- Assume savings is spent in Ohio

Winners: All other sectors

$$\$44,493 \times .06 \times 7.5 = 20,022$$

Losers: Energy sector

$$\$44,493 \times 0.6 \times 1.4 = 3,737$$

Net gain: 16,284 net jobs

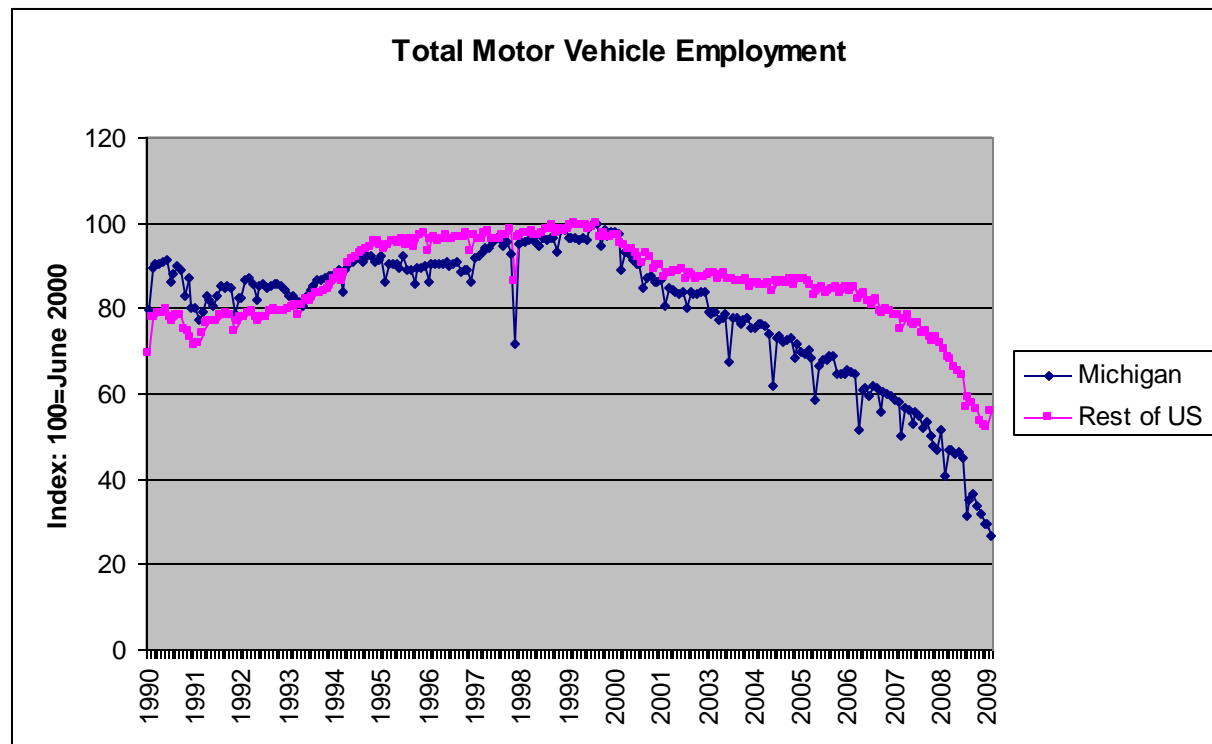
\$267 million in GSP

# Regional Shocks Happen

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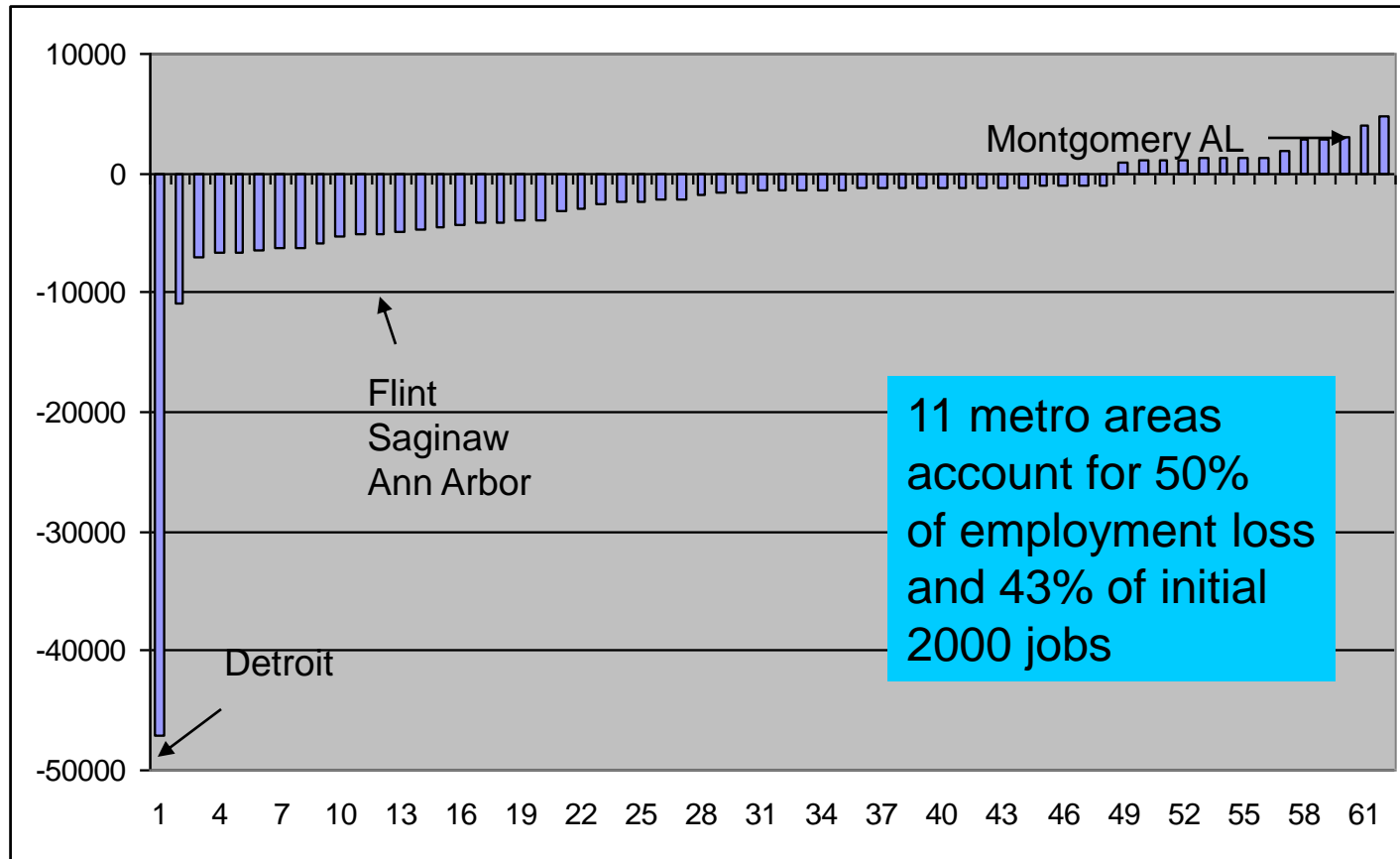
- Regions are susceptible to shocks and even a clean growth strategy does not prevent shocks or necessarily mitigate their effects
- During a 30-year period, 1,476 shocks to metropolitan areas were identified
- Half of the regions were shock-resilient:
  - Diversified industrial structure: less durable goods manufacturing, more health care and social assistance
  - Export base diversification
  - High levels of formal education
  - More flexible labor market
  - Small income gap

- Michigan's auto employment (3361, 3363) peaked in June 2000 at 333,000
  - From then till December 2007, Michigan lost 211,000 auto jobs
  - By December 2009, auto employment had dropped to 109,000, or 33% of the jobs it had in 2000
  - The rest of the US retained 46% of its 2000 employment levels at that time
- 



Source: Bureau of Labor Statistics

# Where are the Auto Losses Concentrated?

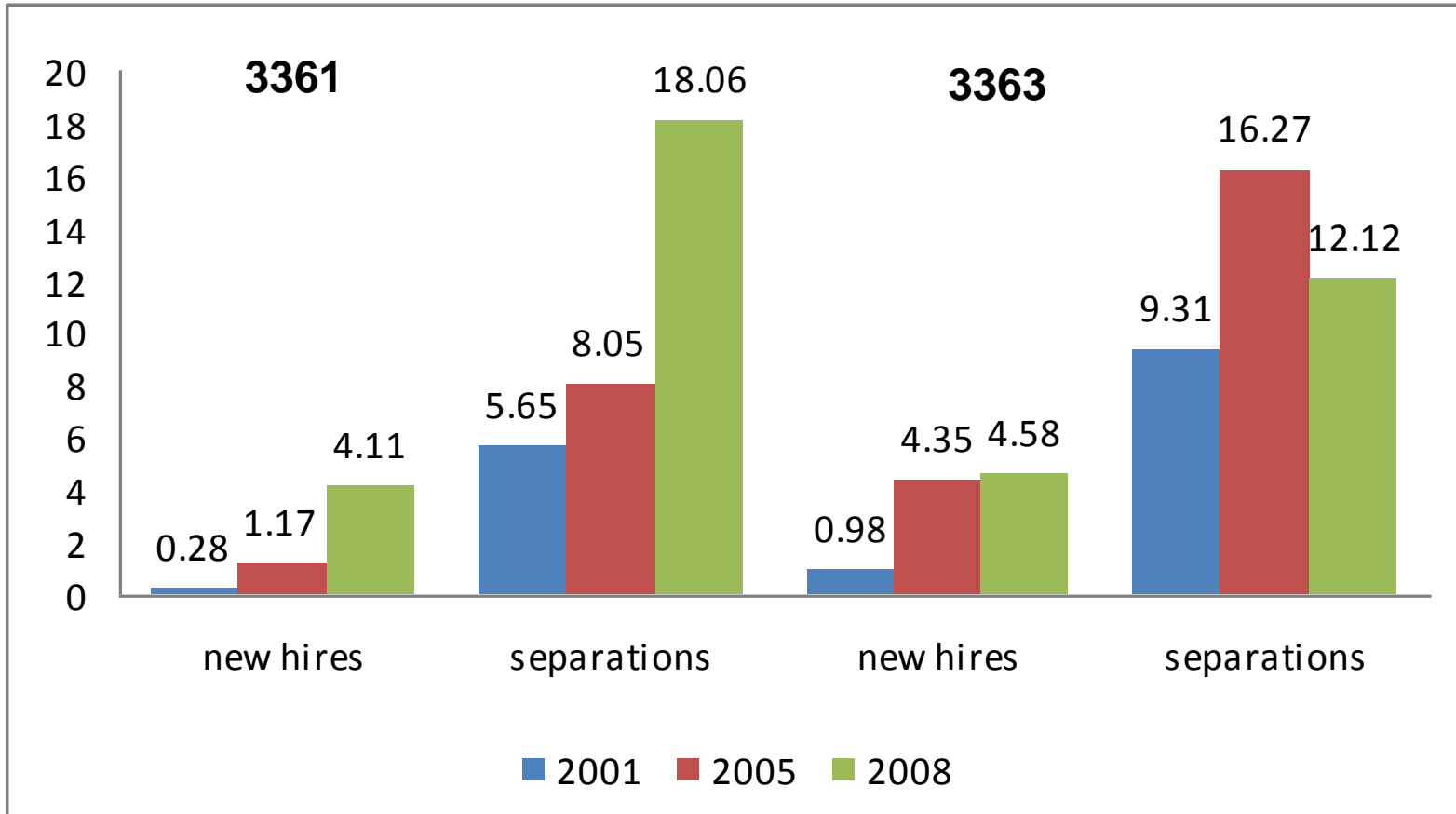


## Auto assembly and parts, 2000-2006

Source: Whole Data (an analysis by Isserman and Westervelt of the County Business Pattern data base that uses algorithms to fill in suppressed county/industry cells).

**Where have all the auto jobs gone?**

# Michigan Employment Dynamics



Source: QWI

# Principles of Regional Rebuilding

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A regional green growth strategy must focus on the basic principles of regional rebuilding, particularly in these challenging economic times

- **Vision**
  - Know your core assets and their potential for growth
- **Understanding of regional dynamics**
  - Keen understanding of core assets, their contribution to growth, and their challenges and opportunities
- **Strategic planning**
  - Align resources and activities around a common vision
- **Manage by fact:**
  - emphasize results and adding value
  - Track agreed upon indicators
  - Hold parties accountable
- **Trust and confidence among partners--solidarity**
- **Valuing human capital**
  - Focus on worker talent
- **Agility**
  - Monitor regional performance to make adjustments to gaps and mismatches
  - Ensure that institutions/agencies can respond quickly to local needs
- **Strong leadership:**
  - Positioning for future competitiveness and driving short-term results
  - Creating conditions for other people to contribute
  - Set high expectations and hold people/institutions accountable

# Strategies

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- Strategies for regional economic and workforce development must be "SMART" - Specific, Measurable, Achievable, Realistic and with a Timeline
- A region's strategy must account for its:
  - Infrastructure (including roads, buildings, and technology)
  - Investment (availability of risk capital)
  - Available talent
  - Social capital and institutional assets: schools, universities, etc.
- Develop strategies that spur transformation by focusing on:
  - Supporting existing businesses
  - Building innovation (through R & D and intellectual property formation)
  - Bringing innovation to market
  - Identifying new industries/recognizing potential in existing ones
  - Developing new markets
  - Creating new initiatives for capital creation
- Develop and nurture partners among businesses and intermediaries
  - Workforce development, economic development, educational institutions
  - Social capital: leadership, community identity and regional solidarity

# Summary

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- Global climate change, market forces and government policy present opportunities and challenges for regions
- Effective regional green strategies require the ability to define and measure green job and output and to assess their impacts on the rest of the regional economy
- Offered a framework and examples of assessing impacts
- Must follow sound regional economic strategies tied to:
  - regional partnerships,
  - building from existing regional assets,
  - understanding how the green economy relates to the rest of the economy and
  - preparing for future skill needs of a green economy
- Helping workers with the transition



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