



The Development of Innovative Industries and the Role of Public Research Institutions: The Case of Renewable Energy

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Agenda

- Motivation
- Research Questions
- Project Phases
- Universities and Economic Development
- Knowledge Exchange between Research Universities and Industry
- Preliminary Findings
- Next Steps





Motivation

- Sustainable economic development is increasingly linked to innovation in products, processes, and services (Cosh et al. 2006)
- Universities as “engines of innovation” (Lester 2005) and “creators for wealth” (Holland 1999)
- The role of research universities in technological development is not well understood (Lester and Piore 2004)
 - challenges for public policy in different countries
- Need to diversify the industrial base and to develop domestic capabilities for wealth creation based on knowledge assets





Research Questions

- What is the *relative importance*, for innovation and economic development, of public research institutions in knowledge creation, problem-solving, education and training, and in the provision of public space?
- How should the *links between universities and industry* evolve so as to serve the goals of both kinds of institutions?
- What types of indicators (metrics) are most useful for evaluating the effectiveness of public spaces for interpretive processes in local innovation systems (LISs)?



Project Phases

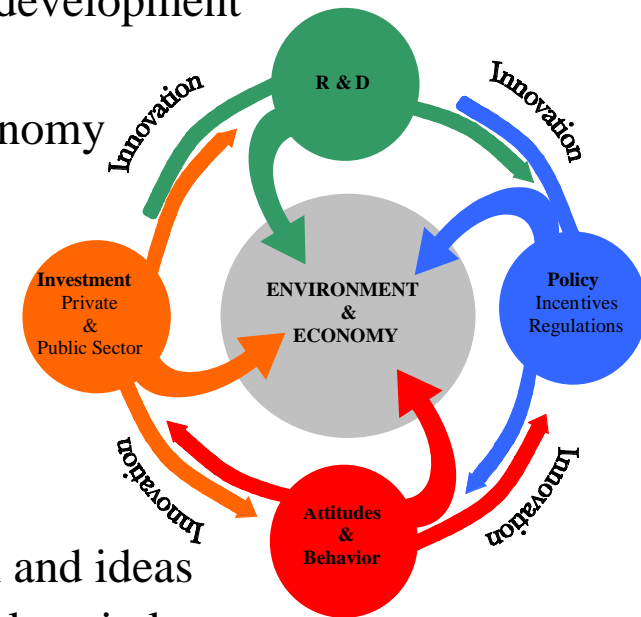
- **Phase I: Industry focus**
 - Comparative studies of the development of solar photovoltaic industry
 - U.S. (MA, CA) and Germany

- **Phase II: Regional focus**
 - Comparative studies of the specific role of local universities in the development of three different industries in MA
 - Solar PV, energy services, robotics (example of indigenous creation)

- **Phase III: Abu Dhabi focus**
 - Examine local capabilities for innovation in renewable energy technologies
 - Draw on comparative cases from UK & Norway (industrial transition & diversification)

Universities and Economic Development

- “One-size-fits-all” approach to economic development is not desirable
 - Universities need a stronger awareness about the development pathways and innovation processes
 - More active participation in shaping the local economy rather than adapting to external changes
- Need for a broader view of universities’ role in local economies
 - Creators, receptors, and interpreters of innovation and ideas
 - Key components of social infrastructure and social capital



Research Universities and Industry

Multiple Mechanisms for Knowledge Exchange

Educating people

- Training skilled undergraduates, graduates & postdocs

Increasing the stock of 'codified' useful knowledge

- Publications
- Patents
- Prototypes

Providing public space

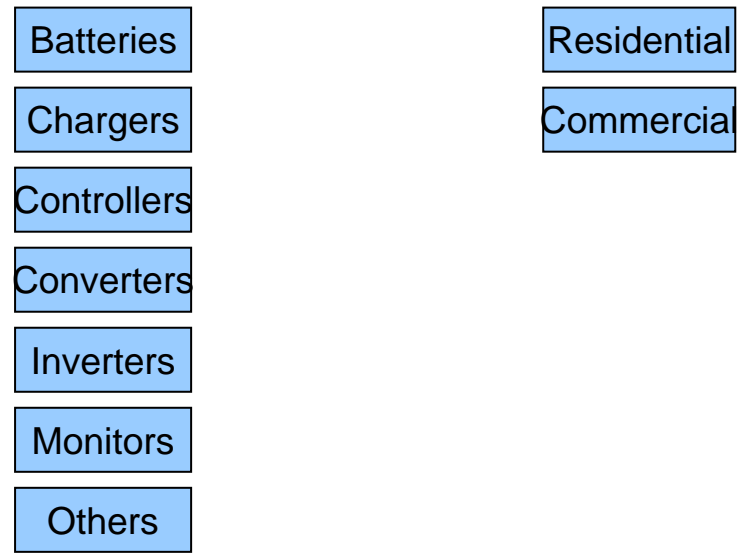
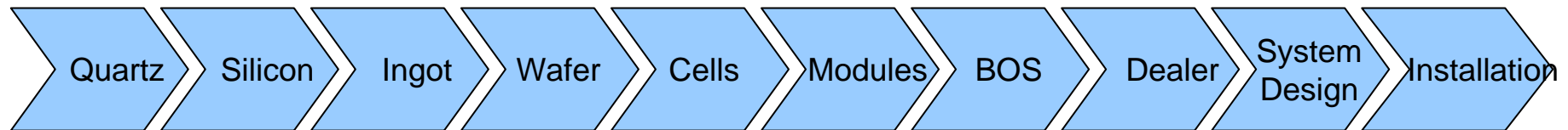
- Forming/accessing networks and stimulating social interaction
- Influencing the direction of research process among users and suppliers of technology and fundamental researchers
 - meetings and conferences
 - hosting standard-setting forums
 - entrepreneurship centers
 - alumni networks
 - personnel exchanges (internships, faculty exchanges, etc.)
 - visiting committees
 - curriculum development committees

Problem-solving

- Contract research
- Cooperative research with industry
- Technology licensing
- Faculty consulting
- Providing access to specialized instrumentation and equipment
- Incubation services

Source: Cosh et al. (2005)

Preliminary Findings - US Case

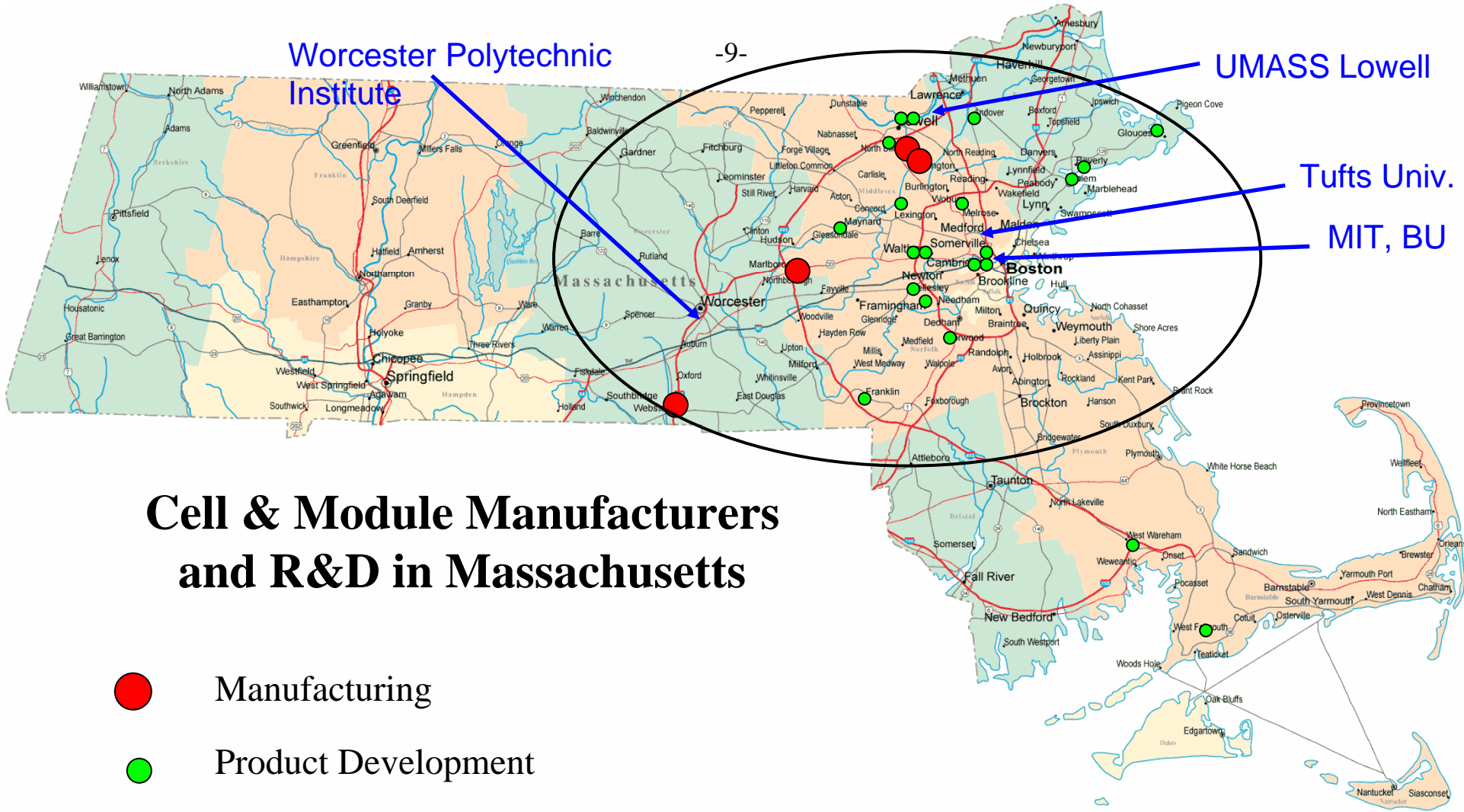


University - Industry

- Where is knowledge exchange more relevant?
- Does proximity matter for specific phases?

Economic development

- How integrated is the industry locally?
 - Tightly coupled vs. Loosely integrated
- How labor intensive are these phases?
- Who is benefiting from the outcomes of innovation?



Cell & Module Manufacturers and R&D in Massachusetts

- Manufacturing
- Product Development



Cell & Module Manufacturers in California

UC Berkeley

Lawrence Berkeley Lab.

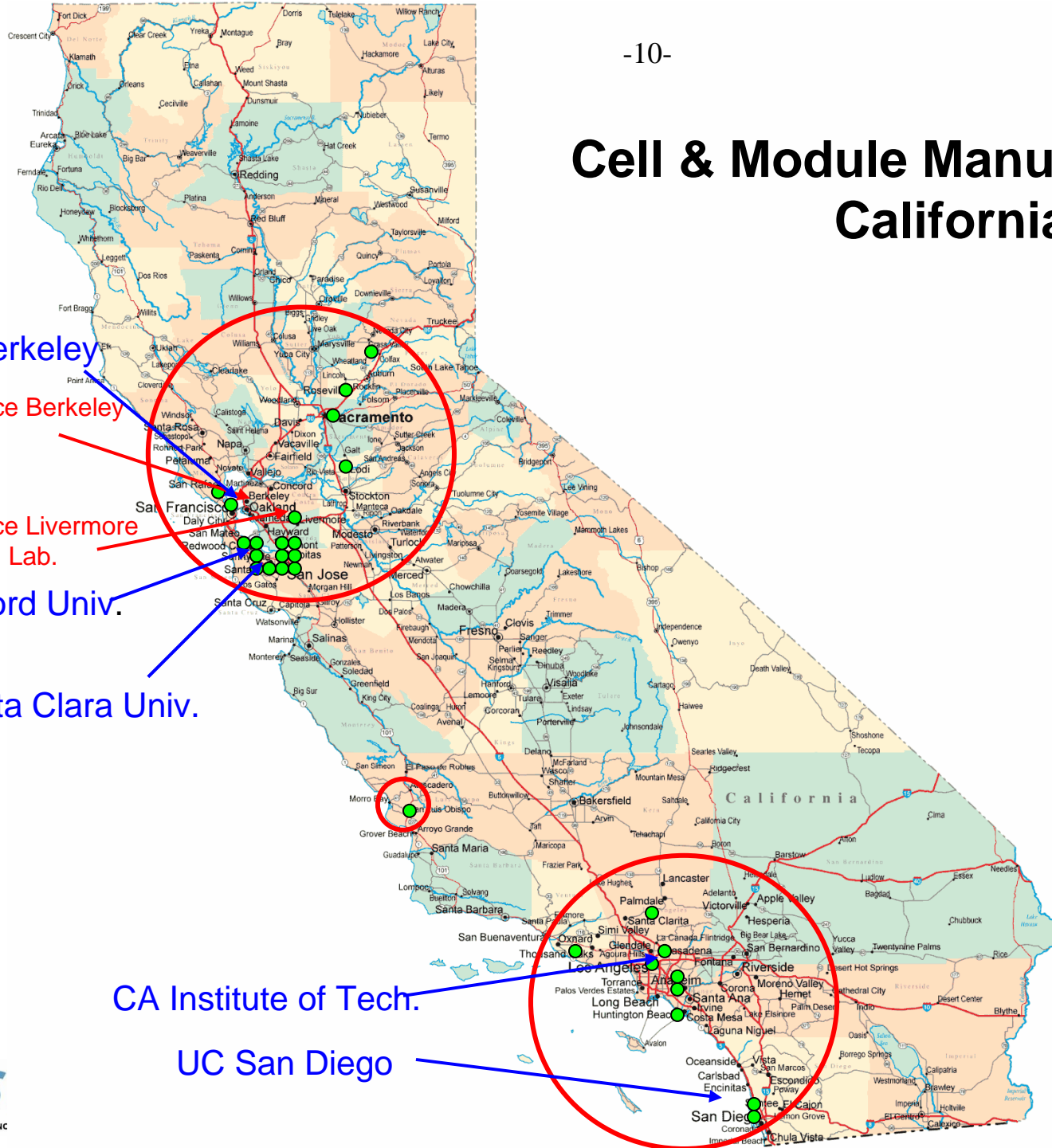
Lawrence Livermore National Lab.

Stanford Univ.

Santa Clara Univ.

CA Institute of Tech.

UC San Diego



Preliminary Findings

- Great potential in university involvement, but effort for consolidation is just emerging
 - Universities at the center of the innovation eco-system
 - MIT: large community of practice around energy issues since 2004
 - Need to enhance collaboration between universities
- National labs (i.e. NREL): key role in the survival and growth of the sector
 - Cost-sharing R&D projects with federal funding
- MA was the center of R&D in 1970s (Lincoln Labs)
 - Technology was “shelved” for more than 20 years
 - The technology cluster of PV companies in MA led the country until ‘90s
- Universities: focus on new materials, training, assistance in deployment
- State and federal policy & local development agencies play a key role in supporting university research and in defining the scope of the sector



Next Steps

- How different is the innovation system in the solar sector as compared to other sectors?
- What are the most valuable ways of interaction between universities and industry?
- What are the economic development outcomes of developing a solar cluster? Upstream or downstream?
- What is different in California as compared to Massachusetts?
- How does Germany compare to the US in terms of technology development?
- What can we learn for cases such as Abu Dhabi?





Questions and Suggestions

Thank You!

