

Economic Geography of Workforce Development in the Biotechnology Industry

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Objective

To determine the degree to which community college capacity to produce associate degree graduates is an attractor to biotechnology firms

Presentation is more descriptive than analytical.

Significance of Workforce Development Policy

- With increasing globalization, there is increasing dislocation of industries
- Workers now typically have more than one career in a lifetime
- Increasing pace of technological change requires retraining or additional training even to pursue a given profession or occupation
- U.S.'s relative competitive position is deteriorating

Salient Recent Book on Workforce Development

Claudia Goldin and Lawrence F. Katz, *The Race between Education and Technology*, Harvard University Press (2010)

Policy Significance of Workforce Development

President Obama's policy initiative

In announcing the **American Graduation Initiative** in July 2009 the President said, "Community colleges are an essential part of our recovery in the present -- and our prosperity in the future." The President noted that, "... jobs requiring at least an associate degree are projected to grow twice as fast as jobs requiring no college experience. We will not fill those jobs ---- or even keep those jobs here in America -- without the training offered by community colleges."

Significance of Geography to Workforce Development Policy

- *Access* is the key workforce development issues
- Construed two ways:
 - Low monetary cost
 - Nearby (close to work or home)

Geography of Presentation

- Statewide
- San Francisco Bay Area
- Santa Clara County

(mostly driven by data considerations)

California Community Colleges

- Total Headcount 1,724,226
(Fall 2007)
- 110 Colleges; 72 Districts

A Theory of the Geography of Enrollment

Older people who enroll in community colleges are more likely to come from the immediate area (due to greater reluctance to bear the costs of longer commutes or temporary residence) – because of higher opportunity cost of time

Literature on Geography of Workforce Development

- Christopher Jepsen and Mark Montgomery, “Miles to Go Before I Learn: The Effect of Travel Distance on the Mature Person’s Choice of a Community College,” *Journal of Urban Economics*, 65 (2009) 64-73
- Gregory D. Packin, “California Community Colleges: Student Transportation and Carbon Emissions,” MS Thesis, University of Redlands (CA) December 2009

Jepsen-Montgomery “Miles to Go”

- 150,000 observations in Greater Baltimore area of “working aged” students.
- Possible selection bias because only about 50% of target population geocoded.
- One group of “middle aged” students

Contribution	Jepsen-Montgomery
Problem	impact of travel distance on community college enrollment
Economic Model	implicit: enrollment choice; discrete (conditional) choice of educational institution
Empirical Implications	how does distance from home to nearest community college affect the decision whether to enroll; among attendees, how does distance affect the choice of schools; elasticity estimate of effect of increasing distance on enrollment
Policy Implications	effect on enrollment of expanding the community college system; effect on earnings (see p. 65, col 2) not addressed in this paper but mentioned; tuition effects mentioned note 3, p. 65
Data	Life Long Learning Demonstration project data (Abt Associates)
variables	
sources	Abt Associates (see Literature Cited)
level of aggregation	individual observations
geographic coverage	Greater Baltimore area
time period	confused - different for different variables; mean earning reported only for 1994-95, but sample drawn from 1990-98 (see p. 66)
number of observations	150,000 approx.
representativeness	approximately half of 300,000 not matched with location
missing value/treatment	eliminated from study
sample questions	Descriptive Statistics provide limited assurance that self-selecting sample is representative; mean income statistic is similar, but no information on distribution of income and no information on income other than 1994-95
measurement issues	age, income, house price in what year? Seems at times to be a point-in-time data set, but some data collected over 1990-98
descriptive statistics	generated for some variables; Table 1, p. 66
Literature Cited	Larry Buron, Larry Orr, and Satyendra Patrabansh, <i>The Lifelong Learning Demonstration: Final Evaluation Report on the Experimental Site</i> (Abt Associates, June 1999)

Gregory D. Packin,
“California Community Colleges”

- Similar data to Pogodzinski-Kos but at campus level.
- Only one year (2007).
- No age breakdown.
- Drive-time analysis
- Focus on “carbon footprint”

Our Data About Community Colleges*

- For 2003-2006, Fall enrollment (headcount) by CCD, Zipcode, and age ranges (0-17; 18-19; 20-24; 25-29; 30-34; 35-39; 40-49; 50-64; over 64)
- CCD boundaries (not de facto service areas)

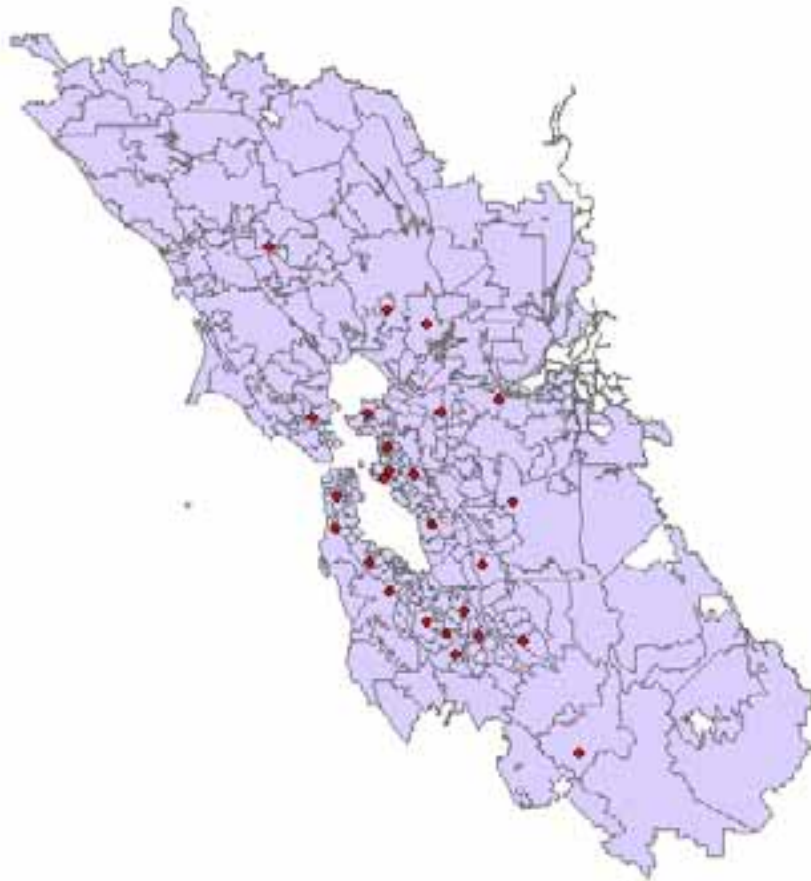
*Thanks to John Roach, Foundation for California Community Colleges

NAME	YEAR	AGE 0-17	AGE 18-19	AGE 20-24
Southwestern	2003	5.07	5.65	6.18
Southwestern	2004	5.60	5.71	6.19
Southwestern	2005	5.93	5.63	6.19
Southwestern	2006	5.37	5.68	6.28
Los Rios				
Los Rios	2003	19.59	22.30	18.39
Los Rios	2004	18.18	21.99	18.29
Los Rios	2005	19.60	22.54	18.97
Los Rios	2006	18.36	21.71	18.47
State Center				
State Center	2003	20.18	19.38	18.58
State Center	2004	18.57	18.96	18.72
State Center	2005	18.65	19.29	19.56
State Center	2006	19.37	20.00	19.19
Los Angeles				
Los Angeles	2003	15.98	16.02	16.05
Los Angeles	2004	15.88	16.30	16.23
Los Angeles	2005	15.41	16.56	16.60
Los Angeles	2006	15.49	16.25	16.53

NAME	YEAR	AGE 25-29	AGE 30-34	AGE 35-39
Southwestern	2003	7.69	7.03	6.48
Southwestern	2004	7.23	7.49	6.41
Southwestern	2005	7.61	7.61	6.63
Southwestern	2006	7.51	7.31	7.33
Los Rios				
Los Rios	2003	19.39	22.61	25.15
Los Rios	2004	19.54	22.03	24.37
Los Rios	2005	20.79	24.76	25.03
Los Rios	2006	20.79	23.94	26.38
State Center				
State Center	2003	18.25	18.77	19.21
State Center	2004	17.94	18.95	19.43
State Center	2005	20.18	23.71	30.15
State Center	2006	18.12	19.23	18.74
Los Angeles				
Los Angeles	2003	15.94	15.92	16.09
Los Angeles	2004	15.90	15.83	15.91
Los Angeles	2005	16.44	16.08	15.89
Los Angeles	2006	16.16	16.11	15.85

NAME	YEAR	AGE 40-49	AGE 50-64	AGE OVER 64
Southwestern	2003	6.84	6.65	6.03
Southwestern	2004	6.02	7.23	7.06
Southwestern	2005	6.94	7.11	5.49
Southwestern	2006	6.29	7.67	5.46
Los Rios				
Los Rios	2003	24.25	22.34	16.66
Los Rios	2004	23.16	21.32	15.03
Los Rios	2005	24.90	23.62	15.06
Los Rios	2006	25.65	22.69	15.02
State Center				
State Center	2003	20.20	20.94	18.45
State Center	2004	21.00	21.74	18.13
State Center	2005	31.20	28.16	18.35
State Center	2006	19.46	18.72	17.89
Los Angeles				
Los Angeles	2003	16.75	16.90	15.51
Los Angeles	2004	16.06	16.17	15.67
Los Angeles	2005	15.99	15.84	15.14
Los Angeles	2006	15.97	16.31	15.74

San Francisco Bay Area Community Colleges



25 Public Community Colleges

Alameda	7
Santa Clara	7
Contra Costa	3
San Mateo	3
Napa	1
Sonoma	1
Solano	1
Marin	1
San Francisco	1

Measuring Educational Capacity

- Enrollment
 - Headcount
 - Full time-equivalent students
- Degrees granted
- California Postsecondary Education Commission
- <http://www.cpec.ca.gov/>

Classifying Educational Programs

- Classification of Instructional Programs (CIP) codes (<http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2002165>)
 - National – originates from National Center for Education Statistics (NCES), U.S. Department of Education (<http://nces.ed.gov/>)
 - 2- to 6-digit level
- California Community Colleges (<http://www.cccco.edu/>)
 - TOP (Taxonomy Of Programs) code

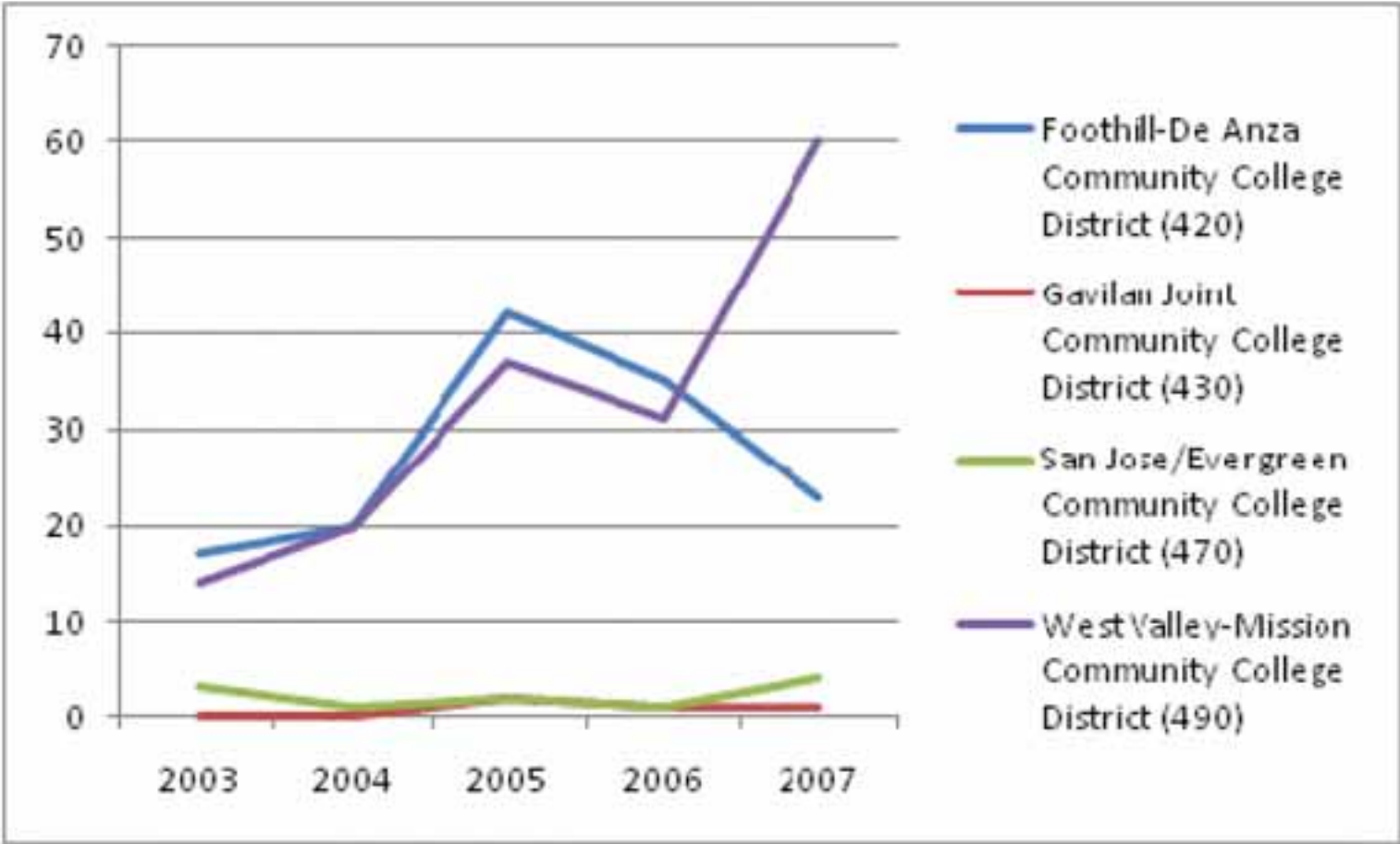
Santa Clara County Community Colleges

7 Community Colleges in Santa Clara County Associated with 4 Community College Districts

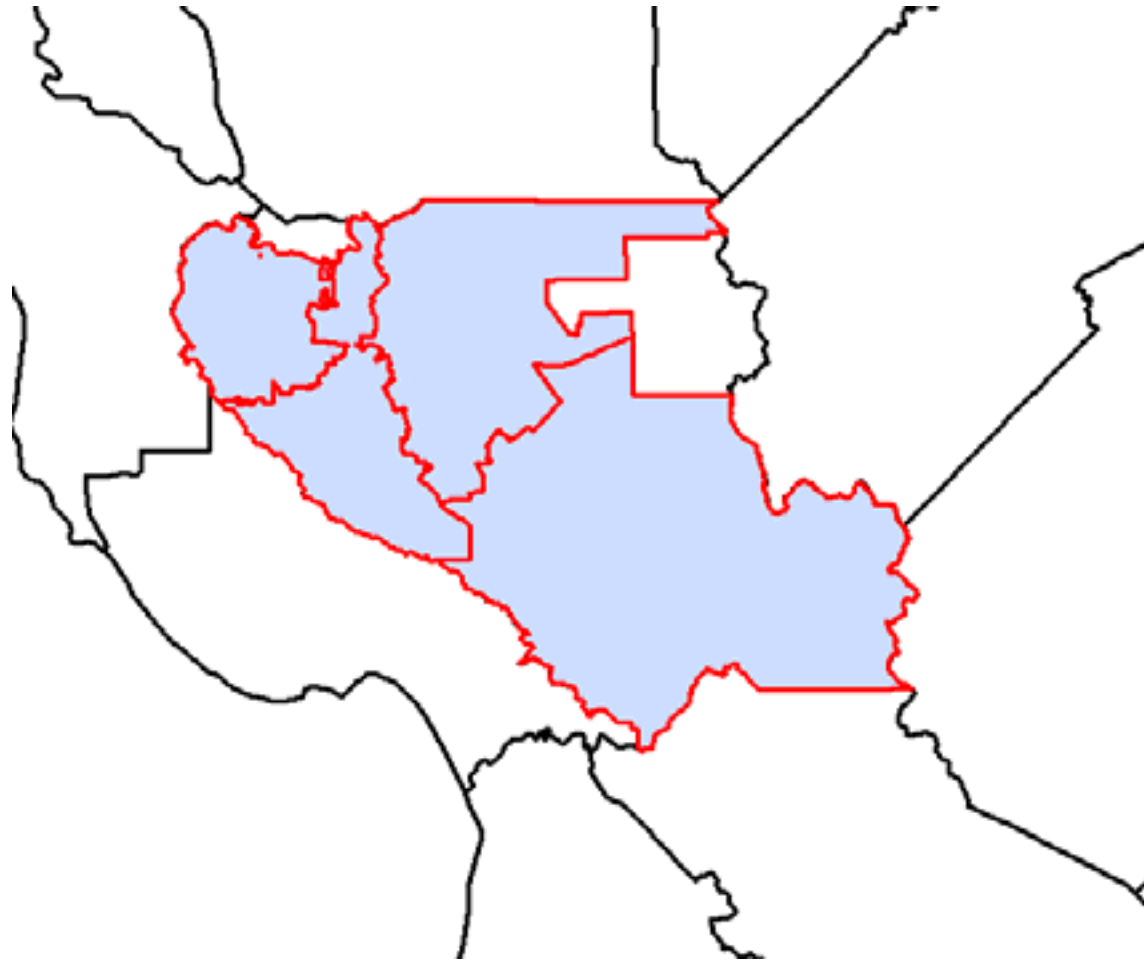
- Foothill-DeAnza (420)
- Gavilan (430)
- San Jose-Evergreen (470)
- West Valley-Mission (490)

These community college districts have enrollment greater than 10 from 75 of the approximately 1,700 Zip Codes in California.

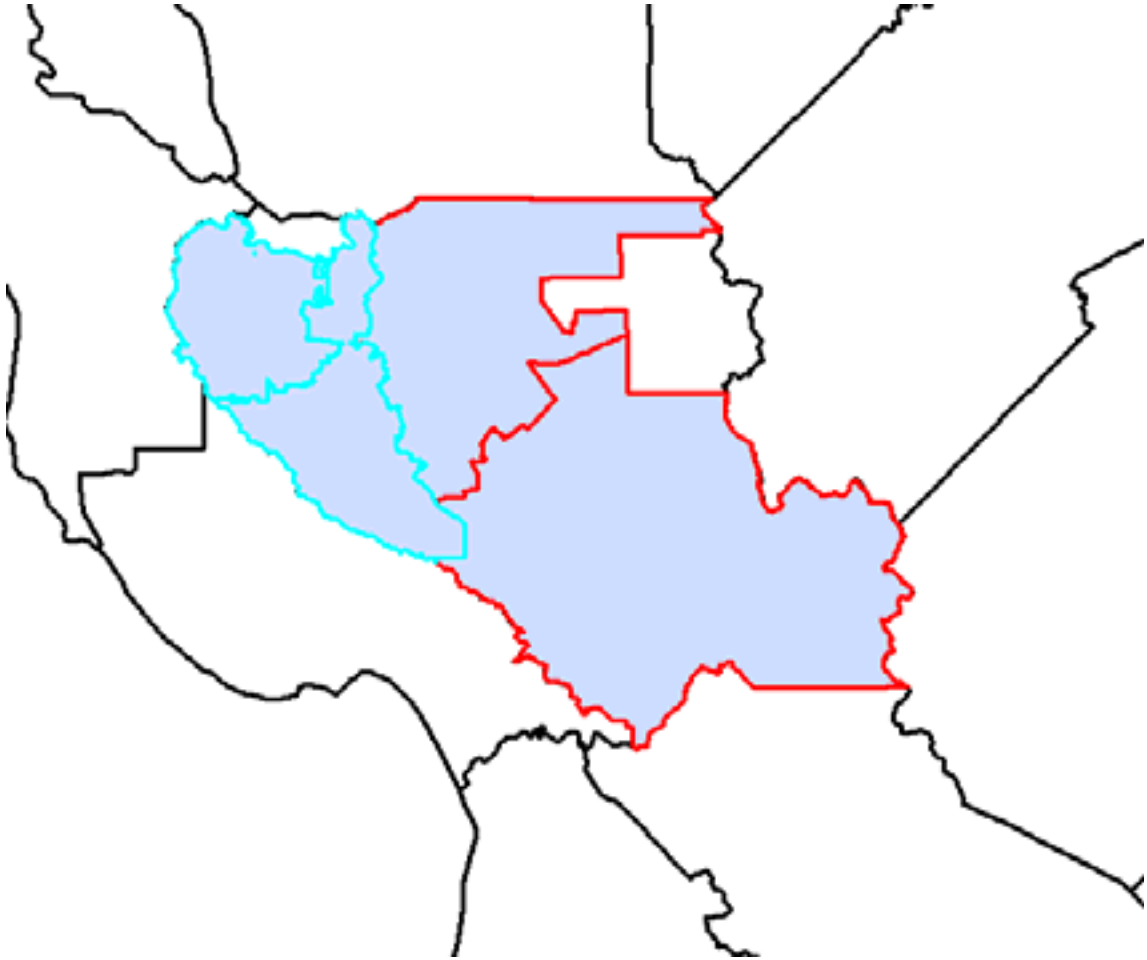
Associate Degrees Granted in Biology by Public Community Colleges Districts in Santa Clara County



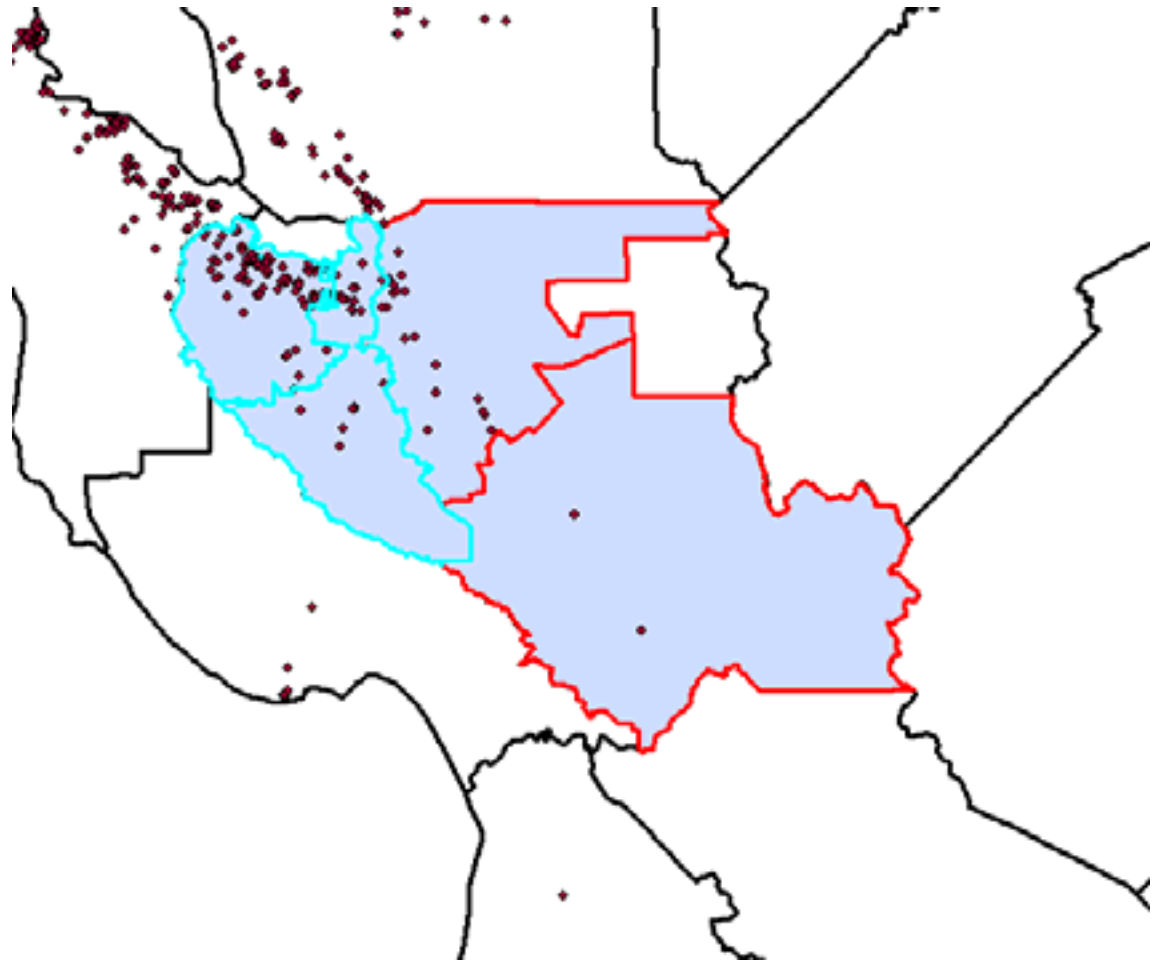
Santa Clara County CCDs



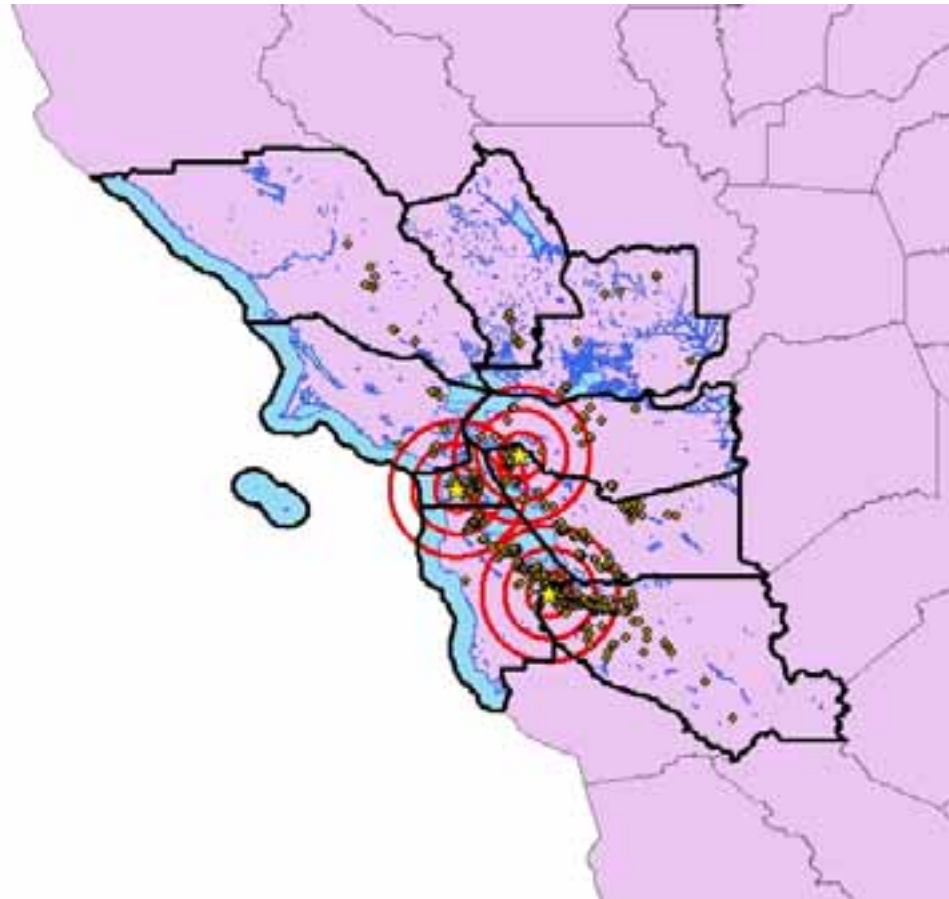
Santa Clara County CCDs - high biology capacity



Santa Clara County CCDs – biotech firm distrib



Biotech Firm Concentration Near Research Universities



From Pogodzinski and Kos, *GIS Tutorial in Economic Development*

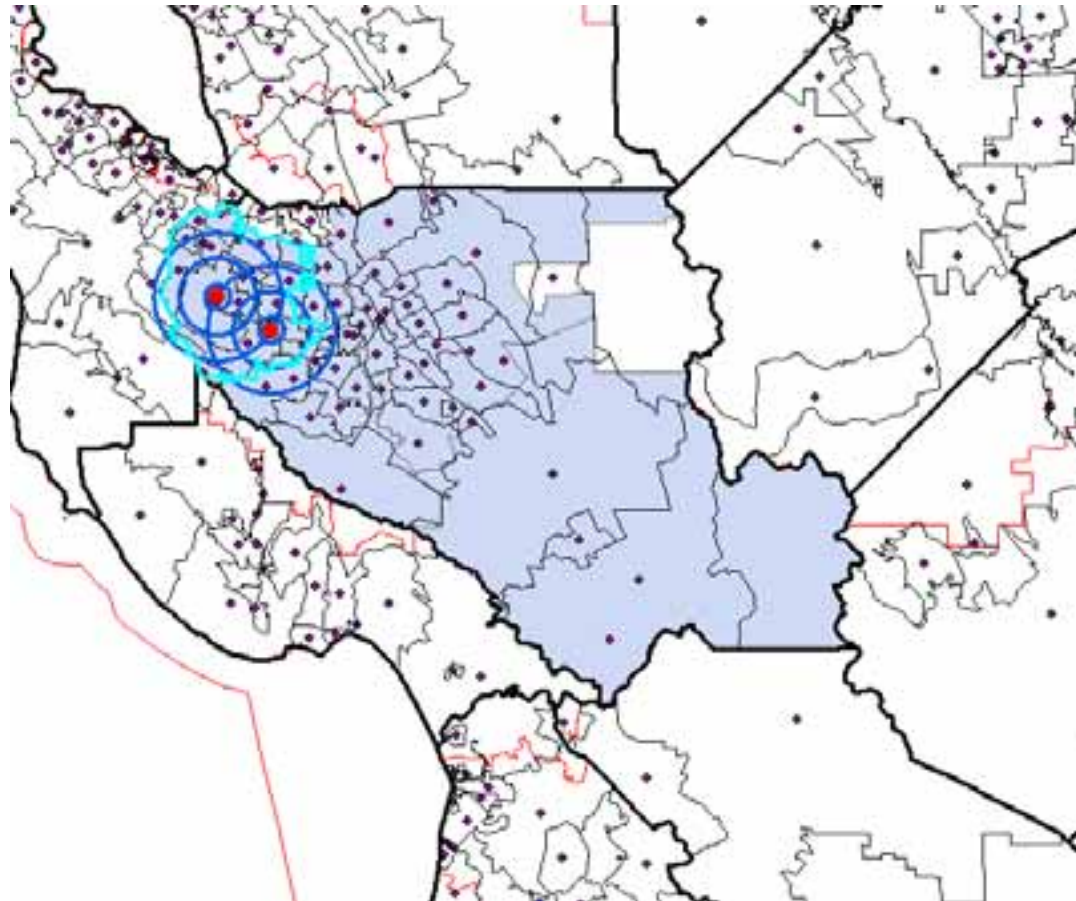
Biotech Firm Concentration Near Research Universities

Number of Biotech firms at each distance

University	5mi	10mi	15mi
Stanford	87	176	289
UC-Berkeley	34	43	85
UC-San Francisco	32	91	137

From Pogodzinski and Kos, *GIS Tutorial in Economic Development*

Santa Clara County Community Colleges Spatial Attendance Pattern (1, 3, and 5 mile buffers around campuses also showing zip code centroids)



Public Policy Implications

- Maintain broad distribution of campuses and resist the temptation to consolidate. Why? Mid-career job-changers not willing to travel as far as younger students.
- Concentrate programs in fields likely to attract younger students (biotech) onto fewer campuses since younger students are willing to travel farther.
- **Consolidate programs, not campuses!**

Clustering and Crude Proximity Measures

- Multi-ring buffers and
 - Counts of firms
 - Counts of enrollment (headcount or full time-equivalent students [FTES])
 - Counts of degrees generated
- Any measure of clustering of industry depends on the definition of *industry*

Industry Definitions

- NAICS codes
 - 2-digit level
 - 4-digit level
 - 6-digit level
- SIC codes

Industry Definitions – Example

(NAICS 2007 Code Numbers [541711](#) and [541712](#))*

- NAICS Code 54 (sector)
 - Professional, Scientific, and Technical Services
- NAICS Code 5417 (industry group)
 - Scientific Research and Development Services
- NAICS Codes 541711 & 541712 (US industry)
 - **541711 Research and Development in Biotechnology**
 - **541712 Research and Development in the Physical, Engineering, and Life Sciences**

(except Biotechnology)
*For 2007, countries were represented by a single number: 541710 Research and Development in the Physical, Engineering, and Life Sciences

Source: <http://www.census.gov/epcd/www/naics.html>

Economic Census 2002 and Economic Census 2007

- Zip code statistics for 2002 Economic Census are available down to US industry (6-digit) level
- Data at zip code level includes number of establishments:
 - Not operated for an entire year
 - Operated for an entire year
 - Operated for an entire year with sales/receipts/revenue of \$1,000,000 or more
- Industry group 5417 national aggregates not yet available for 2007 Economic Census
- Zip code statistics for 2007 Economic Census will not be available until June 2011

Questions or Comments (END)

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