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## The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 128, and Covenants Not to Compete

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**THE LEGAL INFRASTRUCTURE OF HIGH TECHNOLOGY INDUSTRIAL DISTRICTS: SILICON VALLEY, ROUTE 128, AND COVENANTS NOT TO COMPETE**

**Ronald J. Gilson \***

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Policy makers have rediscovered the concept of industrial districts, especially high technology industrial districts. It is easy to understand the attraction. The threat of continued loss of well paying manufacturing jobs to low wage countries has become a central political issue in the United States and other developed nations and a rallying cry for trade protectionists. The experience of regions like Silicon Valley, and what has come to be known as the “Third Italy,”<sup>1</sup> holds out the promise of the brass ring: new jobs with high wages.<sup>2</sup> Hoping that a similar name presages a similar outcome, regions christen themselves Silicon Mountain, Silicon Alley, Silicon Forest, or Silicon Glen.

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<sup>1</sup> The term “Third Italy” distinguishes a number of successful regions largely in north and central Italy from “the impoverished South and the old industrial triangle of Genoa, Turin, and Milan.” CHARLES F. SABEL, FLEXIBLE SPECIALIZATION AND THE RE-EMERGENCE OF REGIONAL ECONOMIES, IN REVERSING INDUSTRIAL DECLINE? INDUSTRIAL STRUCTURE AND POLICY IN BRITAIN AND HER COMPETITION 17, 22 (Paul Hirst & Jonathan Zeitlin eds., 1989). Joseph Bankman, Victor Goldberg, Jeffrey Gordon, Alan Hyde, and Lance Liebman provided helpful comments on an earlier draft.

<sup>2</sup> In 1996, Silicon Valley added some 50,000 jobs, while average wages grew at five times the national average. In the same year, the average wage in Silicon Valley totaled \$43,510, compared with \$28,040 nationally (in 1995 dollars). Jonathan Markoff, *A Gold Rush From Software Reinvigorated Silicon Valley*, N.Y. TIMES, Jan. 13, 1997, p.C1, col. 1. Wage rates in Italy’s Emilia-Romagna are twice the national average, and went from 17<sup>th</sup> out of Italy’s 21 regions in 1973 to 2<sup>nd</sup> in 1986. Bennett Harrison, *Industrial Districts: Old Wine in New Bottles?*, 26 REGIONAL STUDIES 469, 472 (1992).

The same phenomenon has also rekindled academic interest in the subject. The concept of an industrial district – the spatial concentration of firms in the same or a related industry – dates to Alfred Marshall writing in 1890.<sup>3</sup> Marshall developed the concept of (and, unfortunately, the phrase) agglomeration economies to describe the input scale economies external to the firm but internal to the region that are available to any firm as a result of the proximity of similar firms. The input is available more cheaply within the region because of the spatial concentration of users. Marshall used the labor market as an example of this increasing returns phenomenon. As more firms in an industry locate in a region, workers with the skills demanded by the industry follow. The process is self-reinforcing: as more skilled workers locate in a region, other firms in the industry follow. The geographic concentration of firms results in a lower cost of skilled labor.

Recent scholarship, styled the “new economic geography,”<sup>4</sup> continues Marshall’s stress on increasing returns in explaining industrial clustering, but with two important shifts in emphasis. First, reflecting the interest in high technology industrial districts evoked by their success, central attention is given to knowledge as an input subject to agglomeration economies. Second, more attention is paid to the dynamics that give rise to industrial districts, rather than to the equilibrium conditions that describe their existence. The result has been a recognition that industrial districts are path dependent – an industrial district’s location may result not from the invisible hand of efficiency, but

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<sup>3</sup> ALFRED MARSHALL, *PRINCIPLES OF ECONOMICS* 267-77 (8<sup>th</sup> ed. 1920, originally published in 1890).

<sup>4</sup> Paul Krugman, *Space: The Final Frontier*, 12 *J. ECON. PERSPEC.* 161 (1998). See Masahisa Fujita & Jacques-Francois Thisse, *Economics of Agglomeration*, 10 *JAP. & INTN’L ECON* 339, 341 (1996).

from “the details of the seemingly transient and adventitious circumstances”<sup>5</sup> associated with its origin. To understand the development and success of high technology industrial districts, “history matters.”<sup>6</sup>

In this article, I analyze a factor bearing on the location and development of high technology industrial districts that has not received attention in the economic geography literature: the legal infrastructure that supports the agglomeration economies said to give rise to and sustain regional concentrations of high technology firms.<sup>7</sup> The special importance of legal rules to high technology industrial districts results from the shift in emphasis on the input subject to increasing returns. The mechanisms and efficiency of knowledge transfer are shaped by the legal rules relating to intellectual property and, because at least tacit knowledge is most effectively transferred by the individuals in whom it is embedded, by the legal rules relating to employee mobility. Thus, I will argue, the legal infrastructure prominently influences the dynamics of high technology industrial districts.

I take as the context of my analysis the juxtaposition of two familiar U.S. high technology industrial districts: Silicon Valley on the San Francisco peninsula, and Route 128 outside of Boston. The comparison has two important advantages. First, it allows me the benefit of Annalee Saxenian’s deep description of the history and operation of

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<sup>5</sup> Paul A. David & Joshua Rosenbloom, *Marshallian Factor Market Externalities and the Dynamics of Industrial Location*, 28 J. URB. ECON. 349, 368 (1996).

<sup>6</sup> Fujita & Thisse, *supra* note 4, at 371.

<sup>7</sup> Alan Hyde, *Silicon Valley's Efficient Abolition of Trade Secrets*, in CORPORATE GOVERNANCE TODAY 103 (Conf. Vol., The Sloan Project on Corporate Governance at Columbia Law School, May, 1998), also addresses the relation between legal rules and the operation of the high tech industry. While our emphasis differs, I have greatly benefited from Professor Hyde’s interesting work.

these districts, as well as her assessment of the reason for Silicon Valley's continuing success and Route 128's ultimate decline.<sup>8</sup>

Second, the comparison provides a natural experiment bearing on competing explanations for the two districts' differential performance. Consistent with the new economic geography, Saxenian stresses the comparative efficiency of inter-firm knowledge transfer in Silicon Valley. In her account, knowledge is transferred between firms by the movement of employees between employers and to start-ups. She attributes Silicon Valley's efficiency advantage, and the resulting performance difference, to differences in the two regions' business cultures. Silicon Valley's culture of mobility – the constant penetration of local firms' open architecture by job-hopping engineers and the corresponding bias against vertical integration – is much more conducive to the regional dispersal of innovative knowledge than Route 128's culture of career long employment supported by more traditionally organized, vertically integrated firms.

I suggest here a different explanation for the two districts' differing efficiency at transferring knowledge between firms: differences in the district's legal infrastructure, that is, in the legal rules governing employee mobility and, in particular, the rules governing the enforceability of employee post-employment covenants not to compete. Such covenants are promises by employees not to compete with their employer, whether by working for a competitor or by starting a new business, for a period of time after employment terminates. In my account, the legal rules governing employee mobility are a causal antecedent of Saxenian's construction of a Silicon Valley business culture that

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<sup>8</sup> ANNALEE SAXENIAN, *REGIONAL ADVANTAGE: CULTURE AND COMPETITION IN SILICON VALLEY AND ROUTE 128* (1994).

supports job hopping and a Route 128 business culture that discourages it. The legal rules form one of the poles around which the shape of the business culture precipitates.

The natural experiment results from the fact that Silicon Valley and Route 128 have different legal rules governing employment mobility. Post-employment covenants not to compete have the potential to seriously restrict the movement of employees between existing firms and to start-ups and, hence, to seriously restrict employee transmitted knowledge spillovers. California prohibits covenants not to compete; Massachusetts enforces them.

My focus on the enforceability of post-employment covenants not to compete also responds to the concerns of the new economic geography. First, it ties the legal infrastructure directly to the mechanism that gives knowledge its characteristic of increasing returns within an industrial district. Knowledge, especially tacit knowledge, “spills over” between firms through the movement of employees between employers and to start-ups.

Second, this aspect of the legal infrastructure dramatically illustrates the importance of initial conditions. The different legal rules governing post-employment covenants not to compete in California and Massachusetts help explain the differences in employee job mobility and therefore the knowledge transfer that Saxenian identifies as a critical factor in explaining the differential performance of Silicon Valley and Route 128. However, the difference in legal infrastructure does not result from the California legislature’s efforts to provide the proper conditions for the development of high technology industrial districts. Rather, the California prohibition dates to the 1870s, a serendipitous result of the historical coincidence between the codification movement in

the United States and the problems confronting a new state in developing a coherent legal system out of its conflicting inheritance of Spanish, Mexican, and English law. The existence of this anachronistic legal rule at the time that Silicon Valley developed solved the collective action problem associated with encouraging employee mobility within the district.

Part I briefly develops the concept of agglomeration economies that give rise to industrial districts, and then sketches the emphasis of the new economic geography on knowledge spillovers and path dependency. Part II summarizes Saxenian's account of the comparative experiences of Silicon Valley and Route 128, which tracks the new economic geography in focusing on knowledge spillovers as giving rise to an agglomeration economy, and on employee mobility as the mechanism by which inter-firm knowledge transfers occur in Silicon Valley. Part III then offers an alternative explanation of the differences in employee mobility that Saxenian persuasively argues is at the center of the two district's differential performance. Saxenian emphasizes culture – laid back California versus button-down New England. In contrast, I stress differences in the two districts' legal infrastructures as an antecedent to business culture: the differential enforceability of covenants not to compete. Part III also demonstrates how the California legal infrastructure solves the collective action problem associated with encouraging knowledge spillover through employee mobility. Part IV then completes development of the initial conditions that ultimately supported the continued success of Silicon Valley by tracing the origins of this critical aspect of Silicon Valley's legal infrastructure to the peculiar circumstances immediately following California's statehood. Part V concludes by offering a cautionary note with respect to the implications of my analysis for three



related subjects: the standard law and economics prescription to fully protect property rights in intellectual property; a disturbing recent line of cases concerning claims of “inevitable disclosure” that threatens to turn trade secret law into the equivalent of a judicially imposed covenant not to compete; and the right strategy for policy analysts assessing reform of a region’s legal infrastructure to encourage new, or preserve a region’s existing, high technology industrial districts.

### **I. Economic Geography: Agglomeration Economies, High Technology, and Industrial Districts**

Economic geography seeks to explain “the location of factors of production in space.”<sup>9</sup> For our purposes, the object of the investigation is the presence of industrial districts: why firms in an industry locate in geographic proximity to each other. The policy motivation for the concern is readily apparent. If we can understand the conditions that give rise to high technology industrial districts, then we can provide regions seeking to preserve or increase the number and quality of available jobs a blueprint for what steps to take.

The inquiry took modern form with Alfred Marshall’s focus in 1890 on the potential for economies of scale *external* to the firm.<sup>10</sup> The familiar concept of economies of scale *internal* to the firm contemplates that production costs will fall as firm output increases. Marshall, in contrast, was concerned with the effects of an increase in scale at the regional level. Firms would cluster in an industrial district if increased regional output – the scale of production outside the firm – caused input costs to decline. Marshall offered the cost of skilled labor as an example. As the number of employers of skilled workers within a region increases, workers with those skills are

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<sup>9</sup> Paul Krugman, *Increasing Returns and Economic Geography*, 99 J. POL. ECON. 483 (1991).

drawn to the region. As the number of skilled workers within a region increases, employers in need of workers with those skills are drawn to the region.<sup>11</sup> The result, styled by Marshall an agglomeration economy and in later literature a *Marshallian factor market externality*,<sup>12</sup> reflects generally the propensity for an input's relative price to be lower when the number of firms in a region that call for that input is higher.<sup>13</sup>

At this point, it is important to keep in mind the limited power of agglomeration economies in explaining the existence of industrial districts. An industrial district has two geographic characteristics, one relative and one absolute. The relative characteristic is the geographic relation of firms to each other – their proximity in space. An industrial district represents a spatial clustering of firms somewhere. The absolute characteristic is the actual location of the industrial district: its physical location in space, in districts of concern to Marshall, their particular location in Sheffield or Lancashire. Agglomeration economies explain the relative characteristic of an industrial district – why firms are close together. The concept does not explain where in physical space the clustering occurs.

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<sup>10</sup> A. MARSHALL, *supra* note 3, at 266-77.

<sup>11</sup> When an industry has chosen a locality for itself, it is likely to stay there long: so great are the advantages which people following the same skilled trade get from near neighborhood to one another. . . . Employers are apt to resort to any place where they are likely to find a good choice of workers . . . ; while men seeking employment naturally go to places where there are many employers who need skills such as theirs . . . .

MARSHALL, *supra* note 3 at 271-72.

<sup>12</sup> See, e.g., Paul A. David, Dominique Foray & Jean-Michelle Dalle, *Marshallian Externalities and the Emergence and Spatial Stability of Technological Enclaves*, working paper (July 1996). The same phenomenon should occur with other mobile factors of production that have industry specific value.

<sup>13</sup> The analysis necessarily assumes that transportation costs for the input are positive. While the discussion in the text suggests that the input price decline results from a supply effect, input price is also affected by the risk sharing that can occur from the clustering of employers. Assume that having to move one's residence to secure another job is costly to an employee. If the risk of unemployment because of the failure of a particular employer is not perfectly correlated with the demand for workers at other firms in the region, then the clustering of firms reduces the expected cost of unemployment to the employee. That, in turn, reduces the portion of the wage paid to compensate for unemployment risk. David & Rosenbloom, *supra* note 5, at 351-53.

Spurred by the interest in high technology industrial districts, the new economic geography continued Marshall's emphasis on increasing returns, but with two important shifts in emphasis. First, reflecting the interest in high technology industrial districts, attention focused on knowledge as a critical input subject to agglomeration economies.<sup>14</sup> Second, reflecting the policy motivation for the inquiry, more attention was paid to understanding those elements of the phenomenon that traditional agglomeration economies may not explain: the dynamics of industrial districts – how they start, where they start, and once started, their pattern of development.

That knowledge as an input is subject to increasing returns as a result of geographic proximity initially presents something of a puzzle. Precisely because of high technology, information has lost its geographic anchor. For example, the physical location of a law library is unimportant when the case reports are available electronically through Lexis or Westlaw. Nor does physical location seem to matter very much when new scientific discoveries are immediately announced over the Internet. The reality of instantaneous communication through the World Wide Web has linked the world scientific community through electronic rather than physical proximity. From this perspective, the effect of technology should be to eliminate knowledge based agglomeration economies; the more important knowledge is as an input, the less likely we should be to observe industrial clustering.

The puzzle disappears when one distinguishes between information on the one hand, and knowledge or know-how on the other. For this purpose, the distinction is in the tacit character of knowledge, not the formal conception of an innovation, but the skill

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<sup>14</sup> Zvi Griliches, *The Search for R&D Spillovers*, 94 SCAND. J. ECON. 29 (supplement, 1992), reviews the literature in the area.

and experience associated with effectively implementing it.<sup>15</sup> Although advances in information technology may have caused the cost of transmitting the formal conception to become invariant to distance, effectively transmitting tacit knowledge requires proximity, and hence creates the potential for agglomeration economies.<sup>16</sup> The need for proximity for knowledge transmission creates the potential for two kinds of agglomeration economies. Where tacit knowledge is acquired through a market relationship, as through the transmission of technological know-how by contact with a supplier, the potential for a Marshallian factor market externality exists. In contrast, where tacit knowledge is transferred informally, the potential for *technological externalities* is created. In particular, the movement of workers between employers serves also to transfer tacit knowledge between firms.

Attention to the origins of agglomeration economies gives rise to the second characteristic of the new economic geography. The feedback process inherent in a Marshallian factor market externality – more firms [skilled workers] in a region leads to a migration of skilled workers [firms] to the region, which leads to a migration of more firms [skilled workers] – must start somewhere. However, nothing in the analysis thus far explains how or where the loop starts. Efforts to model the process suggest that the dynamics of district development are very sensitive to initial conditions; that is, the

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<sup>15</sup> See Maryann P. Feldman, *The Geography of Innovation* 14, 52 (1994); David B. Audretsch & Maryann P. Feldman, *R&D Spillovers and the Geography of Innovation and Production*, 86 AM. ECON. REV. 530 (1996); David B. Audretsch & Maryann P. Feldman, *Innovative Clusters and the Industry Life Cycle*, 11 REV. INDUS. ORG. 253, 256 (1996). Feldman, *supra*, states the distinction nicely: “some aspects of knowledge have a tacit nature that cannot be completely codified and transferred through blueprints and instructions.” *Id.* at 52.

<sup>16</sup> MICHAEL POLANYI, *PERSONAL KNOWLEDGE: TOWARDS A POST-CRITICAL PHILOSOPHY* 49-65 (1958) (describing one’s skills as “the observance of a set of rules which are not known as such to the person following them.”); *id.* at 69-77 (describing the processes of learning); RICHARD R. NELSON & SIDNEY G. WINTER, *AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE* 76-82, 115-16 (1982) (describing the tacit nature of skills).

course of subsequent growth may depend importantly on small differences between regions at the outset. As Brian Arthur has put it, an industrial district may develop “not necessarily because of any advantage of that particular location, but because ‘historical accident’ placed certain firms there initially and this concentration of firms in turn attracted [through the lure of agglomeration economies] a high proportion of subsequent entrants.”<sup>17</sup>

The combination of (i) knowledge as an input giving rise to a Marshallian factor market externality, (ii) technological agglomeration economies, and (iii) the dependence on history of the actual location of an industrial district, brings us to a final element of the economic structure of industrial districts: the life cycle of an industrial district. There is persuasive empirical evidence that the location of high technology industrial districts is associated with major university complexes.<sup>18</sup> To be sure, that association is insufficient to explain why Stanford gave rise to Silicon Valley and Harvard and MIT gave rise to Route 128, while similar phenomena were not associated with other major universities in the United States or elsewhere (an issue to which we will turn in Part II). However, my concern here is not with the formation of a high technology industrial district, but with its subsequent development.

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<sup>17</sup> W. Brian Arthur, ‘*Silicon Valley*’ *Locational Clusters: When Do Increasing Returns Imply Monopoly?*, 19 MATH. SOC. SCI. 235 (1990). See Krugman, *supra* note 9, at 487 (“[S]mall changes in the parameters of the economy may have large effects on its qualitative behavior. . . . The story also suggests that the details of the geography that emerges – which region ends up with the population – depends sensitively on initial conditions.”); David & Rosenbloom, *supra* note 5, at 368 (“[T]he sensitivity of the ultimate dynamic outcomes to small differences in initial conditions, or to relatively small shocks, allows realistic scope for historical events to play a role in the dynamics of spatial systems [which] allows the details of seemingly transient and adventitious circumstances to exert an enduring influence upon the spatial distribution of economic activity and population.”)

<sup>18</sup> See, e.g., Audretsch & Feldman, *R&D Spillovers*, *supra* note 15; Audretsch & Feldman, *Innovative Clusters*, *supra* note 15; Lynne G. Zucker, Michael R. Darby & Marilyn B. Brewer, *Intellectual Capital and the Birth of U.S. Biotechnology Enterprise*, NBER Working Paper #4653 (Feb. 1994).

Controlling for initial conditions, a combination of Marshallian factor market externalities and technological agglomeration economies can explain the initial development of a high technology industrial district. A scientific innovation, likely linked to university-originated research and development, has the potential for commercialization. A university community, in turn, provides an initial population of scientifically trained workers to begin the commercialization process, thereby triggering the skilled worker/ employer locational dynamic that creates an employee-related Marshallian factor market externality. At the same time, a technological agglomeration economy in the form of knowledge spillover from universities creates the opportunities for the new firm formations that demand skilled workers.<sup>19</sup> But what influences the subsequent pattern of the district's development?

From this perspective, knowledge spillovers play a critical role. Start first with an industrial district based on a particular set of products. Because tacit knowledge plays a critical role in taking an innovation from conception to commercialization, the agglomeration economy at the development/commercialization stage is likely to be large, supporting significant geographical clustering.<sup>20</sup> By contrast, tacit knowledge can be expected to play a lesser role during later stages in the industry's life cycle. "In the

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<sup>19</sup> For example, Zucker, Darby & Brewer provide empirical evidence that "the timing, and location of new biotech firms and new biotech units of existing firms are primarily explained by the presence at a particular time and place of scientists who are actively contributing to the basic science as represented by publications in major academic journals." Zucker, Darby & Brewer, *supra* note 18. See also Neil Bania, Randall W. Eberts, and Michael S. Fogarty, *Universities and the Startup of New Companies: Can We Generalize From Route 128 and Silicon Valley?*, 75 REV. ECON. & STAT. 761 (1993) (reporting positive relationship between local university research and firm births in the electrical and electronic equipment industries); Feldman, *supra* note 15, at 89 (noting the importance of university research and development to measures of regional innovation).

<sup>20</sup> "[T]he propensity for innovative activity to geographically cluster will tend to be shaped by the stage of the industry life cycle. . . . [T]he importance of tacit knowledge in generating innovative activity shapes the degree to which innovative activity will cluster. And the relative importance of tacit knowledge in generating innovative activity varies considerably across the various stages of an industry's life cycle." Audretsch & Feldman, *Innovative Clusters*, *supra* note 15, at 254.

mature stage [of the industry life cycle] most of the technical aspects of the product have become standardized, and the nature of demand is well known. At this point, the cost of transmitting information over geographic space becomes trivial.”<sup>21</sup> The industry’s focus becomes standardized production rather than innovation. Standardization, in turn, combines with the reduced influence of agglomeration economies of knowledge and the centrifugal force of congestion – the lower wage and land costs available outside the area because of the impact of clustering on the costs of fixed inputs – to cause the geographic dispersion of production. Commentators, for example, have described the dispersion of commodity-like semiconductor manufacturing from Silicon Valley to off shore sites as having followed this pattern.<sup>22</sup>

The story thus depicts a cyclical model of the development of a high technology industrial district. University related scientific discovery gives rise to the tacit knowledge that creates cluster inducing Marshallian and technological agglomeration economies, and initial conditions fix the cluster’s physical location. With the product’s maturity, the knowledge-based agglomeration economies dissipate, the value of physical proximity diminishes, and the industrial district diffuses. The question then is whether anything can interrupt this cycle of density giving way to dispersal.

At this point, the analysis shifts to the impact of knowledge spillovers not on the commercialization of a given product, but on the district’s capacity for continued innovation – the development of new products that will reset the industry life cycle. Here the literature stresses the importance of *inter-firm* knowledge spillovers. Suppose research and development in an industrial district takes place within a large number of

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<sup>21</sup> *Id.* at 259. See Robin Coran & Dominique Foray, *The Economics of Codification and the Diffusion of Knowledge*, 6 INDUS. & CORP. CHANGE 595 (1997) (discussing process of codification of tacit knowledge).

firms, the results of which are then shared among firms through both voluntary and involuntary knowledge spillovers. Voluntary spillovers occur through such mechanisms as joint ventures, and cooperative supply relationships in which the exchange of technology necessary to best serve the customer requires the customer to share its technology with the supplier and vice versa. The benefit of that knowledge spillover then also accrues to the suppliers' other customers. Involuntary spillovers occur through the movement of workers to new employers. Tacit information associated with an employer's technology is embedded in the human capital of its employees. When an employee changes jobs, that tacit information is available to the new employer. As one of the founders of Intel remarked about information sharing in Silicon Valley: "The other type of cooperation we might call involuntary. That is the mobility of our personnel which quickly diffuses knowledge of new techniques in design, production, and marketing throughout the industry . . . ." <sup>23</sup> These knowledge spillovers supercharge the innovative capacity of the district, facilitating the development of new technologies that create a new industrial life cycle, with renewed agglomeration economies.

Economic geography thus tells a coherent story about the pattern of industrial districts. Agglomeration economies – Marshallian and technological – fuel the growth of a district whose physical location is dictated by initial conditions. The spatial attraction among firms is intense in the early stages of an industry's life cycle when knowledge spillovers are critical, only to dissipate as successful commercialization shifts emphasis to production from innovation. But knowledge spillovers between firms through voluntary cooperation and involuntary employee movement also have the potential to sustain the

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<sup>22</sup> See SAXENIAN, *supra* note 8, at 93-95.



district's centripetal force by repeatedly restarting the industrial life cycle through new innovation – a form of “second-stage” agglomeration economy. And at this point our discussion of the two features of the new economic geography comes full circle: the importance of initial conditions as a determinant of the particular location of an industrial district reemerges. Just as initial conditions determine where among a range of alternative locations an industrial district actually arises, so too do they influence which among competing industrial districts will develop a second stage agglomeration economy and thereby reset its innovation cycle and overcome the locational entropy of product cycle maturity. As we will see, the institutional capacity of a high technology industrial district to support knowledge spillover at this critical second stage, exemplified by the differential experiences of Silicon Valley and Route 128, also appears to depend importantly on historical accident. In the case of Silicon Valley and Route 128, I will argue, the historical accident is the different character of the two districts' legal infrastructure.

## **II. Silicon Valley versus Route 128: Organizational and Performance Differences**

In this Part we set up a natural experiment concerning the importance of the legal infrastructure to the development of high technology industrial districts. The phenomenon that requires explanation is the differential performance of Silicon Valley and Route 128. Route 128 began the race well ahead. In 1965, total technology employment in the Route 128 area was roughly triple that of Silicon Valley. By 1975, Silicon Valley employment had increased five fold, but it had not quite doubled in Route 128, putting Silicon Valley about fifteen percent ahead in total technology employment.

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<sup>23</sup> Robert Noyce, *Competition and Cooperation: A Prescription for the 80s*, 25 RESEARCH MNGMNT. 13, 14

Between 1975 and 1990, the gap substantially widened. Over this period, Silicon Valley created three times the number of new technology-related jobs as Route 128.<sup>24</sup> By 1990, Silicon Valley exported twice the amount of electronic products than Route 128,<sup>25</sup> and this comparison excludes fields like software and multimedia, in which Silicon Valley growth has been strongest. In 1995, Silicon Valley reported the highest gains in export sales of any metropolitan area in the United States, an increase of 35 percent over 1994. The Boston area, which includes Route 128, was not in the top five.<sup>26</sup> What explains the improvement in Silicon Valley's performance, and the deterioration of that of Route 128?

Saxenian's provides a careful account of the causes of the performance differential that reflects the lessons of the new economic geography. Different initial conditions, reflecting the two areas different histories, account for the agglomeration and technological economies that gave rise in the first instance to the two high technology industrial districts. However, differing patterns of industrial organization resulted in differing levels of inter-firm knowledge spillovers and, in turn, differing capacities to create the second stage agglomeration economy that can reset the district's product life cycle. In this Part, we trace Saxenian's perceptive analysis of the different industrial

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(March 1982).

<sup>24</sup> SAXENIAN, *supra* note 8, at 2-3 (Figure 1). The same pattern appears if only semiconductor jobs are considered. In 1959, Route 128 semiconductor companies employed approximately 27,500 workers, while Silicon Valley companies employed only 10,000. By 1970, the balance had reversed, Silicon Valley semiconductor companies employing 32,500 workers, while Route 128 employment had shrunk to 19,000. By 1980, the difference was even more pronounced, with Silicon Valley employment rising to 64,000, while Route 128 employment remained flat at 19,000. *Id.* at 79 (Figure 2).

<sup>25</sup> *Id.* at 2.

<sup>26</sup> In 1996, San Jose exported \$29.3 billion, New York exported \$28 billion, and Detroit exported \$27.5 billion. The Boston area came in eleventh with \$8.7 billion of exports. See International Trade Administration, U.S. Dep't of Commerce, *Top Metro Area Exporters, 1996* (visited July 10, 1998) <<http://www.ita.doc.gov/industry/otea/metro/top2596.html>>. Measuring success along a different dimension, it has been reported that the market capitalization of technology companies in and around Silicon Valley approximately equals that of the entire French Stock Market. *Silicon Valley: Introduction*, BUS. WK, Aug. 25, 1997. In 1996, Silicon Valley's unemployment was 3.1% and its exports were rising at about 30% per year. Louise Kehoc, *The Valley's Magic Formula*, FIN. TIMES, Aug. 25, 1997, at 13.

organization of Silicon Valley and Route 128 and how that difference influenced the existence of knowledge spillovers. In the next Part, we take up the issue that Saxenian's account does not explain: why Silicon Valley developed the knowledge based second stage agglomeration economy that allowed the district to transcend its original product life cycle. Put differently, what initial conditions caused the second round agglomeration economy to develop in Silicon Valley and not in Route 128?

#### **A. District Origins**

Both Route 128 and Silicon Valley had their origins in local universities. But while the Harvard/MIT complex for Route 128, and Stanford University for Silicon Valley, provided the core around which each district grew, different events triggered the emergence of the industrial districts in these particular localities around these particular universities.

For Route 128, the critical event was the increase in defense spending on technology during World War II and the Cold War. MIT received more military funding during the World War II than any other university, in no small measure due to the presence of an MIT professor, Vannevar Bush, as head of the government funding agency.<sup>27</sup> This funding led to MIT's creation of the Radiation Laboratory. Similarly, Air Force funding during the early Cold War period led to the formation of Lincoln Lab at MIT in 1951. By the mid-1960s, Boston area university-related research labs employed some 5,000 scientists and engineers.<sup>28</sup> Consistent with the existence of agglomeration economies resulting from the concentration of skilled engineers, the area proved a fertile ground for commercial technology development. Lincoln Lab scientists founded more

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<sup>27</sup> SAXENIAN, *supra* note 8, at 13.

<sup>28</sup> *Id.* at 16.

than fifty companies, including DEC, and another fifty-five were founded by scientists from the MIT Instrumentation Lab.<sup>29</sup>

Like Route 128, Silicon Valley's modern form also took shape after World War II.<sup>30</sup> While Hewlett-Packard and Litton Engineering Laboratories had been formed in the 1930s, the initial conditions associated with Silicon Valley's emergence are found in the efforts of Frederick Terman, an MIT Ph.D. who became Stanford's dean of engineering following World War II. Having been both a student of Vannevar Bush at MIT and director of Harvard's Radio Research Lab during World War II, Terman saw first hand the potential benefits from university/industry collaboration. He returned to Stanford after World War II and pioneered Stanford's efforts to develop the agglomeration economies necessary to establishing a high technology industrial district. He increased the size of the Stanford engineering program so that by 1950 its award of doctoral degrees in electrical engineering equaled that of MIT. This was followed during the 1950s by efforts to expand the range of university-industry knowledge spillovers. Stanford founded the Stanford Research Institute explicitly as a bridge between university research and commercial application. Stanford also initiated its Honors Cooperative Program, which encouraged engineers at local companies to enroll in graduate programs at the university, thereby formalizing university-company interaction. Finally, Stanford turned some of its own land adjacent to the campus into the Stanford Industrial Park, which assured that physical proximity would reinforce ties between the university and the electronics community. By 1961, the industrial park housed 25 companies over 652 acres.

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<sup>29</sup> SUSAN ROSENGRANT & DAVID LAMPE, ROUTE 128: LESSONS FROM BOSTON'S HIGH-TECH COMMUNITY 93, 99 (1992)

Thus, Marshallian factor market externalities and technological economies combined to support the growth of Route 128 and Silicon Valley as high technology industrial districts. The initial conditions that favored those universities and localities were different, World War II Federal research funds providing the trigger for Harvard/MIT and Route 128, and the efforts of Frederick Terman, in part shaped by his own experience in Boston, acting as the spur to Stanford and Silicon Valley.

### **B. Subsequent Development**

Saxenian's account of the differential performance of Silicon Valley and 128 centers on the strikingly different forms of industrial organization that came to characterize the two regions. From the outset, Silicon Valley developed a business structure that reflected non-linear career patterns and a special status for entrepreneurs. The career paths of Silicon Valley engineers and managers resembled Brownian motion. They moved between companies, founded start-ups, supplied former employers, purchased from former employees, and in the course of a career developed personal and professional relationships that cut across companies and competition. During the 1970s, employee turnover averaged 35 percent a year at the region's electronics firms;<sup>31</sup> even in the severe recession in the semiconductor industry in 1984, 12 percent of a sample of Silicon Valley electronics production engineers quit their existing jobs for different employers.<sup>32</sup> As Saxenian characterized the environment in Silicon Valley, "engineers

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<sup>30</sup> This account draws on SAXENIAN, *supra* note 8, at 21-24.

<sup>31</sup> *Id.* at 34.

<sup>32</sup> David Angel, *The Labor Market for Engineers in the U.S. Semiconductor Industry*, 65 ECON. GEOG. 99, 103 (1989) ("These results indicate substantial labor mobility among semiconductor performance engineers and confirm the expectation of frequent job changes by these highly skilled workers.")

shifted between firms so frequently that mobility not only was socially acceptable, it became the norm.”<sup>33</sup>

Entrepreneurs occupy a special place in the Silicon Valley hierarchy.<sup>34</sup> As Joseph Bankman and I have written elsewhere, “in Silicon Valley the defining myth takes as its stage David Packard’s or Steve Job’s garage. Palo Alto’s Roland is the engineer who, with nothing but an idea and strength of character, leaves his job with an established company and starts a firm that becomes an industry leader, in the process becoming fabulously wealthy.”<sup>35</sup> Literally scores of companies, including most prominently Intel, trace their origins to a founder’s prior employment at Fairchild Semiconductor, which itself had been formed by engineers leaving Shockley Transistor Corporation. As Saxenian notes, Hewlett-Packard executives alone founded eighteen start-ups between 1974 and 1984.<sup>36</sup>

The result of what Alan Hyde calls “high velocity employment”<sup>37</sup> – rapid employee movement both between employers and in connection with founding start-ups – is a pattern of industrial organization in which firms are remarkably porous to outside influence. Firms have not vertically integrated, because smaller start-ups could provide parts cheaper and more effectively. In turn, the availability of a full range of suppliers

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<sup>33</sup> SAXENIAN, *supra* note 8, at 34. As one engineer told Saxenian; “Two or three years is about max (at a job) for the Valley because there is always something more interesting across the street. You don’t see someone staying twenty years at a job here.” *Id.* at 35. The comments of another engineer captures the absence of friction in moving between jobs associated with a Marshallian factor market externality: “[in Silicon Valley] it wasn’t that big a catastrophe to quit your job on Friday and have another on Monday and this was just as true for company executives. You didn’t necessarily even have to tell your wife. You just drive off in another direction on Monday morning. You didn’t have to sell your house, and your kids didn’t have to change schools.” *Id.*

<sup>34</sup> Saxenian reports that “[t]he culture of the Valley accorded the highest regard to those that started firms. . . .” *Id.* at 38.

<sup>35</sup> Joseph Bankman & Ronald J. Gilson, *Why Start-ups?* 1 (forthcoming, STAN.L.REV. 1999).

<sup>36</sup> SAXENIAN, *supra* note 8, at 116. Silicon Valley’s fascination with start-ups also has efficiency advantages. A large literature suggests that the small companies are more likely sources of innovation. See Bankman & Gilson, *supra* note 35 (surveying the literature).

reduced the capital necessary to found a start-up; virtually everything but the idea could be subcontracted out.<sup>38</sup> Moreover, vertical integration could not even effectively protect a company's trade secrets; too many employees would move to competitors carrying their employer's know how with them (who in turn would benefit from an inflow of employees from other employers).

Thus, Silicon Valley's form of industrial organization institutionalized the knowledge spillovers that constitute the second stage agglomeration economy critical to an industrial district's resetting its production lifecycle. With this local industry structure, a single company need not be a technological leader in every stage of a product's manufacturing process. Instead it can specialize in one stage, whether research and design or fabrication, and rely on suppliers or customers to provide cutting edge technology at other stages. In Saxenian's account, knowledge spillovers facilitated by the mobility of employees and the resulting bias against vertical integration, turns the entire industrial district into an engine of continuous innovation, thereby transcending the lifecycle of any single product.

Route 128 firms, in contrast, developed in more traditional fashion, imitating the vertically integrated structures of the large mass production company.<sup>39</sup> In contrast to the Brownian motion of Silicon Valley's high velocity employment, career patterns of employers and managers in Route 128 companies were much more linear. Knowledge workers anticipated long-term employment with a single employer, and career development that contemplated rising vertically within an organization, rather than succeeding through lateral movement, as in Silicon Valley. As Saxenian emphasizes,

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<sup>37</sup> Hyde, *supra* note 7.

<sup>38</sup> SAXENIAN, *supra* note 8, at 38-40, 72-73.

“[t]he practice of leaving a large company to join a small firm or a promising start up was virtually unheard of.”<sup>40</sup> Consistent with this pattern, Route 128 gave rise to traditionally vertically integrated companies; in this locality, knowledge transfer took place within, rather than across firms.<sup>41</sup> As a result, learning and innovation were company specific exercises. Missing was the knowledge spillover and the corresponding second stage agglomeration economy that resulted from the distribution of innovation across the district associated with employee mobility and the absence of vertical integration. To be sure, particular companies in Route 128 created innovative products, but the performance of the district as a whole deteriorated. The district was unable to consistently reset the product life cycle, with a resulting secular decline across the region.

### C. Explanations for the Organizational and Performance Differentials

Saxenian’s account provides three-quarters of the elements necessary to explain the origins and different trajectories of the Silicon Valley and Route 128 high technology districts. Consistent with the new economic geography, a complete story must account for four elements: (i) the initial conditions and (ii) associated agglomeration economies that explain both the location and *original* success of the two districts, and (iii) the initial conditions and (iv) associated *second-stage* agglomeration economy whose presence has allowed Silicon Valley to reset its product life cycle and whose absence has contributed to Route 128’s decline. The story so far explains the initial conditions and agglomeration economies that gave rise to Silicon Valley and Route 128, and the agglomeration

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<sup>39</sup> *Id.* at 70.

<sup>40</sup> *Id.* at 63. The differential in the founding of start-ups is startling. According to Saxenian, the largest wave of start-ups in Silicon Valley history began in the late 1970s and continued during the 1980s. *Id.* at 117. During the same period, the rate of start-ups in Route 128 declined. *Id.* at 125. For example, in 1981 venture capitalists funded only 17 start-ups in Massachusetts, while funding 37 in Silicon Valley. *Id.* at 64.

<sup>41</sup> *Id.* at 69-70.



economy present in Silicon Valley and absent in Route 128 that allowed Silicon Valley to continually recreate the district. What is missing is item (iv): an account of the initial conditions whose presence facilitated the second stage agglomeration economy in Silicon Valley and whose absence prevented its development in Route 128.

Saxenian's tale of two districts does reveal the basic mechanism whose differential availability must be explained. The second stage agglomeration economy results from inter-company, intra-district knowledge spillovers that cause the entire district to function as an innovation laboratory. These spillovers result from the pattern of extreme employee mobility characteristic of Silicon Valley and absent in Route 128. The web of knowledge spillovers, personal relations, start-up businesses, and absence of vertical integration all owe their existence to the ease with which employees move from employer to employer, from established company to start-up, taking their employer's tacit knowledge with them, and applying it in their new situation. Lacking the ability to prevent knowledge spillovers, Silicon Valley companies adapted to their environment, and the characteristic Silicon Valley industrial organization evolved.<sup>42</sup>

But that leaves us with the missing item: why did high velocity employment evolve in Silicon Valley and not in Route 128? What were the initial conditions associated with the second round agglomeration economy?

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<sup>42</sup> The story is one in which initial conditions lead to the adoption of complementary institutions – those that make existing institutions more productive. Development of the system thus moves in a domino like fashion as existing institutions give rise to associated institutions that provide this fit. See Paul Migrom & John Roberts, *Complementarities and Fit: Strategy, Structure, and Organizational Change*, 19 J. ACCTNG. & ECON. 179 (1995); Paul Migrom & John Roberts, *Complementarities and Systems: Understanding Japanese Economic Organization*, 9 ESTUDIOS ECONOMICOS 3 (1994); Paul Migrom & John Roberts, *The Economics of Modern Manufacturing: Technology, Strategy and Organization*, 80 AM. ECON. REV. 511 (1990).

Saxenian offers a partial but, in the end, unsatisfying answer: culture or “social structure.”<sup>43</sup> In Silicon Valley the absence of a prior culture allowed the development of a new one – one which reinforced open social and professional relations. These open relations also “functioned as efficient job search networks,”<sup>44</sup> critically important in a culture in which “the preferred career option . . . was to join a small company or a start-up, rather than an established company. The superiority of small, innovation firms over large corporations became an article of faith among many of the region’s engineers.”<sup>45</sup> The culture in Route 128 differed. “The conservative social traditions and attitudes of New England also shaped the organization of local labor markets and patterns of entrepreneurship. Stability and company loyalty were valued over experimentation and risk taking in the Route 128 region.”<sup>46</sup> Thus, in Saxenian’s account, cultural differences in the two regions provide the crucial initial conditions that led to different employment patterns and, ultimately, to different patterns of industrial organization only one of which – Silicon Valley’s – would give rise to a second stage agglomeration economy.

But *why* did Silicon Valley culture develop differently from Route 128? Accepting Saxenian’s description of the two districts, her proffer of culture as the causative agent of the critical differences in employee career patterns is ultimately unpersuasive. Standing alone, cultural explanations are incomplete accounts of the characteristics of economic institutions. It is hardly surprising that culture and economically successful institutions are mutually supportive; the intriguing result would be if the two conflicted. But the correspondence between culture and economics leaves

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<sup>43</sup> *Id.* at 29.

<sup>44</sup> *Id.* at 34.

<sup>45</sup> *Id.*

<sup>46</sup> *Id.* at 62.

open the question of causation,<sup>47</sup> a matter of great importance if part of the goal is to understand the structure necessary to support a high technology district.

The new economic geography and Saxenian's deep description of the Silicon Valley and Route 128 thus combine to leave us with a critical question: What initial conditions gave rise to the regions' centrally different employment patterns? As Paul Krugman put it, "given a slightly different sequence of events, Silicon Valley might have been in Los Angeles, Massachusetts, or even Oxfordshire."<sup>48</sup> And that brings us to the influence of the legal infrastructure.

## II. **The Legal Infrastructure of High Technology Industrial Districts**

In Part II's account of the second stage agglomeration economy whose presence explains Silicon Valley's capacity to reset the district's product cycle, employee mobility plays the central role. Much of a high technology firm's intellectual property is informal in character. As Robert Merges has explained, "[a] great deal of the relevant information is in the form of trade secrets or 'tacit' knowledge and know-how. . . . Accounts of industrial R&D and invention almost universally mention the importance of hands-on experience, much of it gained over time and in the course of interactions with other researchers, manufacturing personnel, and marketing experts in the firm."<sup>49</sup> This element of the employer's intellectual property is imbedded in the employee's human capital, and can be most effectively transferred through proximity and, in particular, by an employee changing jobs. Thus, employee mobility is the mechanism by which the requisite knowledge spillover occurs. But an individual employer has an obvious competitive

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<sup>47</sup> See Ronald J. Gilson & Mark J. Roe, *Lifetime Employment: Labor Peace and the Evolution of Japanese Corporate Governance*, working paper (Sept. 1997).

<sup>48</sup> Paul Krugman, *Complex Landscapes in Economic Geography*, 84 AM. ECON. REV. 412, 415 (1994).

interest in protecting its intellectual capital which, in the case of trade secrets and tacit knowledge, is accomplished by restricting employee mobility. Individually rational employer efforts to protect intellectual property ultimately conflict with the collectively rational conditions necessary to the knowledge spillovers that support the critical second stage agglomeration economy.

The legal infrastructure of a high technology industrial district mediates this tension between intellectual property protection on the one hand, and employee mobility on the other. In this Part, our concern will be with the complementary legal rules that both determine the character of intellectual property rights, and shape the terms of the employment relation. Demonstrating the differences between the California and Massachusetts rules in these two critical respects is the first step in identifying differences in the two districts' legal infrastructure as an important initial condition that ultimately helped shape their different experiences.

I should take up at the outset a straightforward response to the importance this account accords the aspects of the legal infrastructure bearing on employee mobility. If encouraging inter-employer spillovers of trade secrets and tacit knowledge through employee mobility results in a second-stage agglomeration economy, and if the average per firm value of that economy exceeds the corresponding average per firm cost of weakened intellectual property protection, then the legal infrastructure will be irrelevant. Individual firms acting in their own self interest will elect not to interfere with employee mobility, resulting in a self-enforcing equilibrium of high velocity employment.<sup>50</sup>

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<sup>49</sup> Robert Merges, *Property Rights Theory and Employee Inventions* in CORPORATE GOVERNANCE TODAY 61, 79 (Conf. Vol., The Sloan Project on Corporate Governance at Columbia Law School, May 1998).

<sup>50</sup> I have in mind here Robert Ellickson's study of the difference between the rules actually applied by the community and the law on the books, in resolving cattle disputes in Shasta County. Residents developed

The difficulty with this account of self-organization is the familiar coordination barrier to collective action. While it would be in the interest of the region's firms collectively to facilitate employee mobility even at the expense of diluting the intellectual property of individual firms, it will be in the interest of any individual firm to impede the mobility of its own employees. Such a firm gets the benefit of the region wide spillover of other firms' intellectual property without incurring the cost of diluting its own. Some coordinating mechanism is necessary to achieve (and perhaps maintain) the equilibrium, which brings us back to the role of the legal infrastructure.<sup>51</sup> Whether because Silicon Valley firms did not realize the regional advantages from employee mobility, or because of the difficulty of coordination, local firms' initial response to employee mobility reflected an individually rational strategy. As Saxenian describes, early in the district's development employers responded to departing employees by taking legal action. Even in her account, it was only the failure of these efforts that led to employer acceptance of high velocity employment.<sup>52</sup>

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and applied their own rules independent of the formal legal infrastructure. *See* ROBERT C. ELLICKSON, *ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES* (1991).

<sup>51</sup> Gilson & Roe, *supra* note 47, consider a similar claim with respect to the absence of an external labor market associated with Japanese lifetime employment. That analysis suggests, consistent with the text, that individual firm self-interest will prevent the evolution of a self-enforcing equilibrium. They conclude that establishing the equilibrium observed over most of the post-World War II period in Japan required government coordination.

<sup>52</sup> SAXENIAN, *supra* note 8, at 35. Indeed, occasional outbursts of employer hostility to employee mobility continue to occur. According to accounts in advertisements taken out by Oracle Corporation in the San Francisco Chronicle and on billboards along U.S. 101 (which runs by Oracle headquarters), eleven computer programmers at Informix, an Oracle competitor, left Informix and joined Oracle in January, 1997. According to the Oracle advertisement, the day the employees quit, the CEO of Informix confronted the CEO of Oracle at his home, asking Oracle "to return the eleven 'runaway' employees." The next day, Informix sued each of the departing employees. Oracle appeared to be taking some pleasure in the event, the advertisement offering the following advice to various interested parties: "**Advice to Informix:** Hire programmers, not lawyers. . . . **Advice to Informix programmers:** Negotiate your legal fees upfront. **Advice to Informix customers:** Call Oracle." Advertisement, *SAN FRANCISCO CHRON.*, March 9, 1997, p. B-7, col. 3 (emphasis in the original).

Our inquiry thus starts with the ability of Silicon Valley firms to prevent knowledge spillovers through employee mobility. As we will see, the regime of high velocity employment appears to have resulted from the legal infrastructure's inspired failure to provide complete protection for an important category of intellectual property. The inability to prevent knowledge spillover through employee mobility then proved to be one pole around which the character of Silicon Valley's business culture and industrial organization precipitated.

**A. Protecting Tacit Knowledge and Inventions through Trade Secret and Invention Law**

**1. Tacit Knowledge.** Trade secret law provides the most straightforward source of protection for an employer's tacit knowledge that has become embedded in an employee's human capital. Stated generally, employees retain the right to use their general and industry specific human capital when they move to a new position. However, they cannot make use of an employer's trade secrets; conceptually, at least, employers have the right to prevent employees from "spilling over" tacit knowledge that constitutes a trade secret. If the employer can prove that the new employer of a former employee has used its trade secrets, a variety of remedies are available, including injunctive relief and damages. The problem, however, is that trade secret law provides less effective protection than may at first appear.

The line between the employee's general and industry specific knowledge on the one hand, and the employer's trade secrets on the other, is drawn by the Uniform Trade Secrets Act ("UTA"), which has been adopted in one form or another by 41 states

(including California) and the District of Columbia.<sup>53</sup> The UTA defines a trade secret as “information, including a formula, pattern, compilation, program, device, method, technique, or process, that (i) derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure, and (ii) is the subject of efforts that are reasonable under the circumstances to maintain secrecy.”<sup>54</sup> While Massachusetts has not adopted the UTA, its common law definition of a trade secret is for practical purposes identical.<sup>55</sup>

The definition establishes the elements of the cause of action for misappropriation of a trade secret – the mechanism by which an employer would protect its tacit knowledge from spilling over to a competitor by means of an employee’s departure. The original employer would have to show that the former employee’s new employer “misappropriated”<sup>56</sup> information of the original employer, that the information was not

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<sup>53</sup> See RESTATEMENT (THIRD) OF UNFAIR COMPETITION § 39, at 437-38 (listing adopting states). The Uniform Trade Secrets Act has been adopted by 41 states and the District of Columbia. These states are Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Utah, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

<sup>54</sup> UNIF. TRADE SECRETS ACT § 1(4) (definitions) (amended 1985). The California version appears as CAL. CIV. CODE § 3426.1 (West 1997). The California statute differs from the UTA in that it omits the phrase “and not being readily ascertainable by proper means.” This omission has the effect of providing broader protection than the UTA, a point we will consider TAN \_\_ infra.

<sup>55</sup> See, e.g., *CVD, Inc. v. Raytheon Co.*, 769 F.2d 842, 850 (1<sup>st</sup> Cir. 1985) (“Any formula, pattern, device or compilation of information which is used in one’s business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it,” quoting *Eastern Marble Prods. Corp. v. Roman Marble, Inc.*, 372 Mass. 835, 838, 364 N.E. 2d 799, 801 (1977), quoting RESTATEMENT (FIRST) OF TORTS § 757 cmt. b (1939). The RESTATEMENT (THIRD) OF UNFAIR COMPETITION § 39 defines a trade secret as “any information that can be used in the operation of a business or other enterprise and that is sufficiently valuable and secret to afford an actual or potential economic advantage over others.” The reporters state with respect to § 39 that “[t]he concept of a trade secret as defined in this Section is intended to be consistent with the definition of “trade secret” in § 1(4) of the [UTA].”

<sup>56</sup> The UTA § 1 defines “misappropriation” as:

- (1) Acquisition of a trade secret of another by a person who knows or has reason to know that the trade secret was acquired by improper means; or

generally known, and that the original employer had made reasonable efforts to protect the information's secrecy. From the perspective of an original employer seeking to protect competitively sensitive tacit knowledge, two problems are readily apparent. The first is substantive, the second procedural.

The substantive problem relates to the imprecision of the lines that the UTA requires a litigant to establish. The distinction between tacit knowledge imbedded in the employee's human capital that "derives independent economic value, actual or potential, from not being generally known," and an employee's general or industry specific human capital is blurred at very best. Similarly uncertain are what efforts to maintain secrecy are "reasonable under the circumstances," and therefore required by the UTA as a condition to trade secret protection. Articles by California practitioners provide a lengthy litany of protective activities that would help establish the requisite effort to maintain secrecy,<sup>57</sup> but all are expensive and some are likely to interfere with the actual conduct of the business. This point is especially important. When lawyers design procedures that are inconvenient for those that actually must implement them, the procedures have a

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- (2) Disclosure or use of a trade secret of another without express or implied consent by a person who
    - (A) Used improper means to acquire knowledge of the trade secret; or
    - (B) At the time of the disclosure or use, knew or had reason to know that his knowledge of the trade secret was
      - (i) derived from or through a person who had utilized improper means to acquire it;
      - (ii) acquired under circumstances giving rise to a duty to maintain its secrecy or limit use; or
      - (iii) derived from or thorough a person who owed a duty to the person seeking relief to maintain its secrecy or limit its use; or
    - (C) Before a material change of his position, knew or had reason to know that it was a trade secret, and that knowledge of it had been acquired by accident or mistake.

See CAL. CIV. CODE § 3426.1 (West 1997).

<sup>57</sup> See, e.g., VICTORIA CUNDIFF, *Protecting Computer Software as a Trade Secret*, in 18<sup>TH</sup> ANNUAL INSTITUTE ON COMPUTER LAW (PLI, 1998); GARY WEISS, SEAN LINCOLN & ERIN FARRELL, *Protecting Trade Secrets: A Primer for California Start-ups*, in LEGAL DOCUMENTATION FOR START-UP AND EMERGING COMPANIES (Education Committee of the Business Law Section of the State Bar of California, 1997); MARINA TSATALIS & TIMOTHY KLIMA, *Protecting Trade Secrets from Malicious Employees*, in



tendency to be ignored. From an evidentiary standpoint, adopting a procedure that is then ignored is more damaging than never having adopted it in the first place. The initial adoption cuts off the argument that the procedure was unnecessary in the first place. Finally, the matter remains a judgment call for the trier of fact.

The procedural problem derives from the substantive problem. Precisely because the distinctions the UTA requires a plaintiff to establish are imprecise, trade secret litigation is likely to be expensive and slow. The frequency with which phrases like “knows [knew] or has [had] reason to know” or “reasonable under the circumstances” appear in the statute is a fair metric for the breadth of discovery by the defendant. Moreover, it is quite unlikely that such issues will be resolvable by summary judgment. As Judge Posner said with respect to the original employer’s obligation to maintain secrecy, “[b]ut only in an extreme case can what is a ‘reasonable’ precaution be determined on a motion for summary judgment, because the answer depends on a balancing of costs and benefits that will vary from case to case and so require estimation and measurement by persons knowledgeable in the particular field of endeavor involved. . . . There are contested issues of fact here, bearing in mind that what is reasonable is itself a fact for purposes of Rule 56 of the civil rules.”<sup>58</sup> In every case, the plaintiff will have to take seriously the threat that the matter will actually have to be tried, with the resulting uncertainty associated with a jury trial of technical issues.

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LEGAL DOCUMENTATION FOR START-UP AND EMERGING COMPANIES (Education Committee of the Business Law Section of the State Bar of California, 1997).

<sup>58</sup> *Rockwell Graphics Systems, Inc. v. DEV Industries, Inc.*, 925 F.2d 174, 179-80 (7<sup>th</sup> Cir. 1991). Note also that Judge Posner’s reference to “estimations and measurements by persons knowledgeable in the particular field” can be fairly read to invite a contest of expensive experts and a parallel round of expert discovery.

In short, litigation seeking to protect an employer's trade secrets from spilling over by a former employee's taking with her the employer's tacit knowledge has two important characteristics that are amusingly (albeit distressingly) highlighted in tongue-in-cheek quips that I have heard from commercial litigators. The first has counsel for a potential trade secret plaintiff advising her client that "no price is too high for justice." In contrast, the second has counsel for the potential defendant advising her client that "justice delayed is justice." On balance, trade secret law does not seem to provide a significant barrier to high velocity employment and, at least in California, it apparently has not.<sup>59</sup>

Care must be taken not to overstate the argument. Trade secret law does have some force. Actions in response to theft and industrial espionage, because they are unlikely to involve tacit knowledge, are not subject to the same level of ambiguity associated with efforts to restrict employee mobility. And significant protection is provided even against departing employees in circumstances where the misappropriation is clear (as when the former employee has removed or copied documents), the technology obviously secret, and the damage to the business substantial. But it remains the case that protection is limited with respect to the kind of knowledge spillovers that give rise to a second stage agglomeration economy. In this regard, one should keep in mind that the practical considerations weighing against employee litigation will grow with the

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<sup>59</sup> A third concern involves the danger that the litigation process itself will result in the disclosure of the trade secret to third parties whose subsequent use of the trade secret will not violate the Uniform Trade Secrets Act because the third party will not have "misappropriated" the information. In California, for example, Code of Civil Procedure § 2019 requires that "the party alleging the misappropriation shall identify the trade secret with reasonable particularity..." Cal. Code Civ. Pro. § 2019(d) (West, 1997). To be sure, in any action under the Uniform Trade Secrets Act the court is directed to "preserve the secrecy of an alleged trade secret by reasonable means ... ." Cal. Civ. Code § 3426.5 (West, 1997). However, the practical difficulty of adequately policing the large number of third parties who will come to know the trade

development of the industrial district, thus continually raising the value threshold that must be crossed before it will be worthwhile to initiate trade secret litigation against a former employee. In my analysis, the absence of legal barriers to high velocity employment provides the pole around which a complementary business culture precipitates. Once a business culture supportive of high velocity employment is established, trade secret litigation against former employees is not only expensive and uncertain, but also risks the imposition of labor market imposed reputation penalties against the unusual employer who sues a departing employee. Hyde provides examples of this phenomenon; the recent Oracle-Infomix controversy provides yet another.<sup>60</sup> Thus, as the high technology industrial district takes form, the costs of a former employer pursuing trade secret litigation against departing employees rise. Given the initial condition, local employment practices evolve toward a self-enforcing equilibrium

**2. Inventions.** Legal rules appear to provide the employer

little more comfort when an employee leaves with a new invention to form a start-up, than they do when an employee leaves with tacit knowledge to work for a competitor. The standards governing who owns an invention discovered by an employee depends on the stage of the inventive process at which the question is asked. The critical point in the process is “conception,” defined as “the first occurrence of the complete invention in the mind of the inventor – *as corroborated by objective evidence.*”<sup>61</sup> Under the law of inventions, ideas remain the employee’s property until conception. And because for conception to occur the employee must take the affirmative step of creating written

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secret as a result of contested litigation, even with the assistance of various protective orders, represents a major deterrent to commencing the litigation in the first place.

<sup>60</sup> Hyde, *supra* note 7. The Oracle-Infomix incident is recounted in note 52, *supra*, and the accompanying text.

corroboration, an employee can choose to delay this event until after he leaves the company.<sup>62</sup>

To be sure, the earlier in the invention process an employee must make the decision to undertake a start-up, the riskier is the employee's human capital investment in the venture.<sup>63</sup> However, it is important to stress that the litigation burden of proving conception rests with the former employer who is claiming ownership. Thus, in the case of a legally sophisticated Silicon Valley employee who can be expected to know the rules, the former employer will have to acquire through discovery precisely the documents that the former employee knows would be damaging. This knowledge allows the former employee to behave strategically with respect to such documents, whether by not retaining them, or by not creating them in the first place.

That leaves the application of trade secret law to pre-conception inventions. Here too, however, protection fails. Merges states with respect to this concern that "while trade secret law protects pure information in theory, in practice trade secret law actions by ex-employers are rarely successful when the former employee(s) take nothing tangible with them."<sup>64</sup>

## **B. Protecting Tacit Knowledge and Inventions through a Covenant Not to Compete**

Were trade secret law the only way to protect employers against spillovers of proprietary knowledge through employee mobility, the legal infrastructure would be an

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<sup>61</sup> Merges, *supra* note 49, at 37 (emphasis in the original).

<sup>62</sup> *Id.* at 38. For present purposes, we can ignore statutory and common law differences in the default rules regarding invention ownership depending on whether the employee was hired to do research, whether the inventing employee used employer resources in the invention process, and whether the invention related to the employer's existing or contemplated business. As long as the employee leaves before the invention's formal conception, the ownership rules influenced by these considerations do not apply.

<sup>63</sup> See Bankman & Gilson, *supra* note 35.

<sup>64</sup> Merges, *supra* note 49, at 38.

unlikely candidate to explain the initial conditions that led to the different experiences of Silicon Valley and Route 128. Simply put, the legal infrastructures of the two districts do not differ in material respects along this dimension: the scope of protection provided by trade secret law in California and Massachusetts appears to be roughly the same.

Employers, however, have recourse to another, more effective way to prevent employee disseminated spillovers of employer proprietary knowledge. If the critical mechanism by which spillovers occurs is through employee mobility, then an employer can secure protection by causing existing employees to sign a post-employment covenant not to compete. In contrast to trade secret law, the legal infrastructures of Silicon Valley and Route 128 differ dramatically along this dimension.

**1. The Operation of Covenants Not to Compete.** A post-employment covenant not to compete prevents knowledge spillover of an employer's proprietary knowledge not, as does trade secret law, by prohibiting its disclosure or use, but by blocking the mechanism by which the spillover occurs: employees leaving to take up employment with a competitor or to form a competing start-up. Such a covenant provides that, after the termination of employment for any reason, the employee will not compete with the employer in the employer's existing or contemplated businesses for a designated period of time – typically one to two years – in a specified geographical region that corresponds to the market in which the employer participates.

The logic of the provision reflects the limited useful life of knowledge in high technology industries. Given the speed of innovation and the corresponding telescoping of product life cycles, knowledge more than a year or two old likely no longer has significant competitive value. The hiatus imposed by a covenant not to compete thus

assures that a departing employee will bring to a new employer only her general and industry specific human capital. The value of proprietary tacit knowledge embedded in the employee's human capital, or the value of inchoate inventions the employee has strategically chosen not to bring to conception during her employment, will have dissipated over the covenant's term. Nothing of value is left to spill over to a new employer or start-up venture.

The availability of such a covenant has an obvious impact on the potential for an industrial district to develop the second stage agglomeration economy that allowed Silicon Valley to reset its product cycle. The covenant operates to put a sharp brake on employee mobility, the mechanism by which knowledge spillovers give rise to the critical second stage agglomeration economy. The widespread use and enforcement of covenants not to compete slows down high velocity employment to the point where the level of knowledge spillovers is too low to support a district wide innovation cycle.

It is with respect to the availability of covenants not to compete that the character of the legal infrastructure helps explain the initial conditions that gave rise to the different experiences of Silicon Valley and Route 128. Under Massachusetts law, post-employment covenants not to compete generally are enforceable. Under California law, they are not. As we will see, this difference in starting point helps explain the different capacities of the two industrial districts to generate the second stage agglomeration economy necessary to reset a district's product cycle.

## **2. The Enforceability of Covenants Not to Compete under Massachusetts Law.**

Massachusetts law is generally representative of the approach taken toward post-employment covenants not to compete by the great majority of states. United States law

in this area largely derives from English law that developed the basic pattern of blanket enforcement of covenants not to compete given by the seller in connection with the sale of a business, and the application of a rule of reason to covenants associated with employment. Covenants not to compete would be enforced against a departing employee if the covenant's duration and geographic coverage were no greater than necessary to protect an employer's legitimate business interest, and not otherwise contrary to the public interest.<sup>65</sup> This formulation is commonplace in Massachusetts' covenant cases, and dates to the late 19<sup>th</sup> century.<sup>66</sup>

Massachusetts law case developing the circumstances when a covenant not to compete will be enforceable is large, somewhat inconsistent, and uses the language of

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<sup>65</sup> See generally ANTHONY C. VALIULIS, COVENANTS NOT TO COMPETE 166 (1985); Harlan M. Blake, *Employee Agreements Not to Compete*, 73 HARV. L. REV. 625 (1960). As related by Valulis, the development of English law regarding enforceability of post-employment covenants not to compete tells an interesting tale of economic history. The earliest statutes and case law, quite hostile to employment restrictions, are said to have grown out of the extreme labor shortage following the Black Death in 1348. In 1349, for example, the Ordinance of Labourers was enacted which, in effect, made voluntary unemployment a crime. *Dyers' Case*, Y.B. Mich. 2 Hen. 5, f.f., pl. 26 (C.P. 1414), is said to have denied enforcement of a bond against competition by a former employee, with the comment by one of the judges that "[b]y God, if the plaintiff were here he should go to prison until he paid a fine to the King." Valulis, *supra*, at 156-57. Changing economic circumstances, including the rise and decline of the guilds, led to the development of a rule of reason.

The general approach in the United States is set out in RESTATEMENT OF CONTRACTS 2D § 188 (1981):

- (1) A promise to refrain from competition that imposes a restraint that is ancillary to an otherwise valid transaction or relationship is unreasonably in restraint of trade if
  - (a) the restraint is greater than is needed to protect the promisee's legitimate interest, or
  - (b) the promisee's need is outweighed by the hardship to the promisor and the likely injury to the public.
- (2) Promise imposing restraints that are ancillary . . . include . . . :
  - ...
  - (b) a promise by an employee or other agent not to compete with his employer or other principal; . . .

<sup>66</sup> See, e.g., *Ferrofluidics Corp. v. Advanced Vacuum Components*, 968 F.2d 1463, 1468 (1st Cir. 1992) (applying Massachusetts law under New Hampshire choice-of-law principles); *Allied Adjustment Service v. Heney*, 125 N.H. 698, 700-02, 484 A.2d 1189 (applying Massachusetts law. Blake, *supra* note 65, dates the rule of reason formulation in Massachusetts to *Morse v. Twist Drill & Mach. Co. v. Moore*, 103 Mass. 73 (1869). Massachusetts law is flexible in that a court will trim down an otherwise valid covenant whose duration or geographic coverage is too great to the point that it is enforceable. See *All Stainless, Inc. v. Colby*, 364 Mass. 773, 777-79, 308 N.E.2d 481 (1974) (upholding two-year covenant not to compete for a salesman but restricting the geographical area to the sales territory serviced prior to termination).

trade secret law quite loosely. In particular, judicial discussion of the interests of an employer sufficient to support enforcement typically refers to a litany of acceptable concerns: the protection of trade secrets, confidential information, and good will.<sup>67</sup> This formulation raises the specter that a covenant not to compete adds nothing to the trade secret protection available without a separate covenant (and in California). For present purposes, my goal is neither to survey, nor to reconcile judicial precedent in Massachusetts, but rather to focus on outcomes. In this respect, Massachusetts law accords significant impact to the presence of a post-employment covenant not to compete. A recent discussion by a Massachusetts practitioner captures the additional protection provided by a covenant:

It is often a practical impossibility for a former employee to work in the same industry for a competitor without employing or disclosing, even unconsciously, the intellectual property of the former employer. Indeed, that intellectual property constitutes only one end of the spectrum of the information, knowledge and expertise that an employee develops in the course of working for an employer. The demarcation line between such information, knowledge and expertise and truly proprietary information may not be ascertainable. Even if it were, it is difficult or impossible for a company to determine whether a former employee is honoring the obligation to refrain from using information that is clearly over the line and into the category of trade secret. In these circumstances, a covenant

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<sup>67</sup> See, e.g., *New England Canteen Service, Inc. v. Asley*, 372 Mass. 671, 673-75, 363 N.E.2d 526 (1977) (refusing to enforce non-competition covenant absent a showing of good will or similar interest damaged by former employee's competition); *Marine Contractors Co. v. Hurley*, 365 Mass. 280, 286-87 (1974) (upholding covenant not to compete where consideration was paid); *All Stainless*, 364 Mass. at 778 (1974) (upholding two-year covenant not to compete for a salesman but restricting the geographical area to the sales territory serviced prior to termination); *Richmond Bros., Inc. v. Westinghouse Bdcst. Co.*, 357 Mass. 106, 111, 256 N.E.2d 304 (1970) (refusing to enforce a covenant not to compete against a former employee where it would be mere ordinary competition and former employee knew no trade secrets); *Wells v. Wells*, 9 Mass. App. Ct. 321, 323, 400 N.E.2d 1317 (1980) (holding that "[E]mployee covenants not to compete are enforceable only to the extent they are necessary to protect the legitimate interests of the employer."); *National Hearing Aid Centers, Inc. v. Avers*, 2 Mass. App 285, 288-91, 311 N.E.2d 573 (1974) (refusing to enforce covenant against employee who did not appropriate any confidential customer information belonging to employer).



not to compete can provide an added measure of protection.<sup>68</sup>

And the outcomes of litigated cases reflect the likelihood of enforcement. Of the ten decisions on preliminary injunctions to enforce a covenant not to compete between February, 1994 and July, 1996, injunctions were granted in eight.<sup>69</sup> Of special importance, the availability of preliminary injunctive relief with respect to covenants not to compete contrasts sharply with the unavailability of summary judgment in the case of misappropriation of trade secrets.<sup>70</sup>

In all events, my purpose is not to show that covenants not to compete are uniformly enforceable under Massachusetts law. Rather, all I seek to establish is that Massachusetts law represents an initial condition which could give rise to the Route 128 form of employment pattern, industrial organization, and business culture that Saxenian describes. If, as clearly seems to be the case under Massachusetts law, the probability that a post-employment covenant not to compete will be enforced is sufficiently high, a different career strategy would be dictated. The risk to employees from changing employers (and the risk to employers of hiring the former employees of competitors) or organizing a start-up would encourage an employee to stay in her current job. The

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<sup>68</sup> J. Charles Mokriski, *Trade Secrets: Protect your Competitive Edge – or Perish*, MASS. LAWYERS WEEKLY, May 30, 1994, at 33.

<sup>69</sup> Edmund C. Case, *Recent Developments in ‘Non-Compete’ Litigation*, MASS. LAWYERS WEEKLY, July 15, 1996, at 11. *Comprehensive Technologies Intl v. Software Artisans, Inc.*, 3 F.3d 730, 739 (4<sup>th</sup> Cir. 1993), makes the same point: “When an employee has access to confidential and trade secret information crucial to the success of the employer’s business, the employer has a strong interest in enforcing a covenant not to compete because other legal remedies will often prove inadequate. It will often be difficult, if not impossible, to prove that a competing employee has misappropriated trade secrets belonging to his former employer.” See ROBERT P. MEGES, PETER S. MENELL, MARK A. LEMLEY & THOMAS M. JORDE, *INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE* 89 (1997) (“In a competitive industry, preventing the disclosure of trade secrets is far preferable to suing for misappropriation after they have already been disclosed. A noncompetition agreement may be a reasonable way for an employer to prevent a problem – and a lawsuit – before it starts.”)

<sup>70</sup> See text accompanying note 58, *supra*.

resulting dynamic would favor long-term career patterns, vertical integration and, ultimately, internal rather than district wide innovation. The initial condition – a legal infrastructure that impedes employee mobility – gives rise to a complementary business culture and institutions that, once established, supports a self-enforcing equilibrium.

Importantly, this aspect of Route 128’s legal infrastructure would not interfere with the industrial district’s original development. Route 128 grew out of university-related agglomeration economies, a plentiful supply of skilled labor due to the presence of Harvard and MIT, and the knowledge spillovers resulting from the University-run World War II and Cold War research labs. Because those laboratories were non-profit organizations, it is highly unlikely that they secured covenants not to compete from their employees. Consistent with this analysis, a large number of Route 128 start-ups, including DEC, were founded by scientists leaving these labs.<sup>71</sup> However, the legal infrastructure would present a barrier to the second stage agglomeration economy that sustains a high technology district by allowing it to reset its product lifestyle, an economy that did not develop in Route 128 but did in Silicon Valley.

### **3. California Law Governing Covenants Not to Compete.**

California law governing covenants not to compete is both unusual, and radically different than that of Massachusetts. California Business and Professions Code § 16600 provides that “every contract by which anyone is restrained from engaging in a lawful profession, trade or business of any kind is to that extent void.”<sup>72</sup> The courts have interpreted Section 16600 “as broadly as it reads.”<sup>73</sup> Other than two statutory exceptions

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<sup>71</sup> See text accompanying note 16, *supra* (fifty companies founded by scientists from MIT’s Lincoln Lab; fifty five founded by scientists at the MIT Instrumentation Lab).

<sup>72</sup> CAL. BUS. & PROF. CODE § 16600 (West 1997).

<sup>73</sup> *Scott v. Snelling and Snelling, Inc.*, 732 F. Supp. 1034, 1042 (N.D. Cal. 1990).

that track the general rule outside of California which allow enforcement of covenants not to compete associated with the sale of a business,<sup>74</sup> the statute's prohibition is essentially unqualified. For example, covenants that do not prohibit post-employment competition, but merely to penalize it, are also prohibited.<sup>75</sup> While there are decisions suggesting in dicta that California courts may enforce a covenant not to compete when it is necessary to protect trade secrets,<sup>76</sup> I have uncovered no case in which a California court actually enforced a covenant not to compete on that basis.<sup>77</sup> Indeed, California courts' application of choice of law rules underscores the seriousness with which they view Section 16600. Even if the employment agreement which contains a post-employment covenant not to compete explicitly designates the law of another state, under which the covenant would be enforceable, as controlling, and even if that state has

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<sup>74</sup> The statutory exceptions cover sales of a business whether effected through the sale of the business' assets, the sale of shares in a corporation, or the sale of a partnership interest. Cal. Bus. & Prof. Code 16601 (sale of goodwill or corporation shares; agreement not to compete), 16602 (partners; dissolution; agreement not to compete) (West 1997).

<sup>75</sup> See, e.g., *Beneficial Life Insurance Co. v. Knoblauch*, 653 F.2d 393 (9<sup>th</sup> Cir. 1991) (invalidating under 16600 an employment contract term that required a departing employee to repay advances if the employee competed); *Fowler v. Varian Associates, Inc.*, 196 Cal. App. 3d 34, 43-44, 241 Cal. Rptr. 539 (1987) (holding that discharging an employee for good cause for assisting employer's competitors did not violate the free competition policy behind Section 16600, as "agreements designed to protect an employer's proprietary information do not violate section 16600."); *Ware v. Merrill Lynch, Pierce, Fenner & Smith, Inc.*, 24 CAL. APP. 3D 35, 100 CAL. RPTR. 791 (1972), *aff'd*, 414 U.S. 117 (1973) (invalidating under 16600 a profit-sharing plan term that caused a former employee to forfeit benefits if the employee engaged in a competing business); *Muggill v. Rueben H. Donnelly Corp.*, 62 CAL. 2D 239, 42 CAL. RPTR. 107 (1965) (invalidating a retirement plan term that caused a former employee to forfeit annuity payments if the employee engaged in a competing business).

<sup>76</sup> *TransAmerican Collections, Inc. v. Continental Account Servicing House, Inc.* 342 F. SUPP. 1303, 1305 (D. Utah 1972) (covenant not to compete may be enforceable where necessary to protect trade secrets); *Muggill v. Reuben H. Donnelley Corp.*, 62 CAL. 2D at 242 (covenants not to compete are unenforceable "unless they are necessary to protect the employer's trade secrets"); *Scott v. Snelling & Snelling, Inc.*, 732 F. SUPP. at 1043 ("California courts recognize a judicially created exception to Section 16600 and will enforce a covenant not to compete" to protect an employer's trade secrets). *Fowler v. Varian Associates, Inc.*, 196 Cal. App. 3d 34, 43-44, 241 Cal. Rptr. 539 (1987) (holding that discharging an employee for good cause for assisting employer's competitors did not violate the free competition policy behind Section 16600, as "agreements designed to protect an employer's proprietary information do not violate section 16600).

<sup>77</sup> *TransAmerican Collections* upheld a covenant not to compete under Utah law; its statement of California law was dicta. *Muggill* neither involved trade secrets, nor upheld anything. Instead the case voided under

contacts with the contract, California courts nonetheless will apply 16600 on behalf of California residents to invalidate the covenant.<sup>78</sup>

Perhaps there is a California case that I have missed which enforces a covenant not to compete. But just as I did not attempt in the previous section to establish that Massachusetts courts *always* enforced covenants not to compete, I do not seek here to demonstrate that California courts *never* enforce a covenant not to compete (although I would not be surprised by that outcome). Rather my point is the more limited one that California's legal infrastructure made it extremely unlikely that post-employment covenants not to compete would be enforced. Coupled with the limited usefulness of trade secret law in California as elsewhere, Silicon Valley employers' early efforts to prevent employees leaving to compete with employers' proprietary tacit knowledge failed. Employees learned that they could leave; employers learned that they could not prevent high velocity employment and the resulting knowledge spillover. And that legal infrastructure caused employers, however reluctantly, to adopt a different strategy, one of cooperation and competition, that generated a dynamic process leading to Silicon Valley's characteristic employee career pattern, lack of vertical integration, knowledge spillovers and business culture. Thus, the initial condition supplied by Silicon Valley's legal infrastructure ultimately gave rise to the conditions necessary to support a second stage agglomeration economy, which allowed it to reset its product cycle, and to thrive while Route 128 rode its product cycle down the curve.

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16600 a provision of an employment agreement that terminated pension benefits if a former employee competed. *Scott* declined to enforce a covenant not to compete because it found no trade secrets to protect.<sup>78</sup> See *Frame v. Merrill Lynch*, 20 Cal. App. 3d 668, 673 (1971) (applying California law to invalidate profit-sharing plan benefit termination on competition despite its validity under New York law, and a contractual designation of New York law as controlling); *Scott v. Snelling and Snelling, Inc.*, 732 F. Supp. 1034, 1039-40 (N.D. Cal. 1990) ("Section 16600 has been held by the California courts to represent a strong public policy which would override the choice of law provision in the contract . . .").

**4. Solving the Collective Action Problem.** The analysis in the previous section sets out the role played by Business and Professions Code § 16600 as an initial condition of the strategic dynamic set in place by the growth of Silicon Valley. As I argued in Part II, establishing a second stage agglomeration economy in the absence of a supporting legal infrastructure poses a collective action problem for an industrial district. The collectively rational strategy is to allow high velocity employment, because the per firm benefit of the economy exceeds the per firm cost of the intellectual property dilution that results from the knowledge spillovers necessary to support the economy. However, the individually rational strategy is for a single firm, and therefore every firm, to take advantage of spillovers from the other firms but to restrict the mobility of its own employees. An inability to solve the coordination problem would then lock the district into the suboptimal strategy (and resulting career patterns, industrial organization, and business culture) dictated by the prisoners' dilemma confronting the district.

The existence of Business and Professions Code § 16600 provided the coordination mechanism necessary to overcome this prisoners' dilemma barrier to development of a second stage agglomeration economy. By prohibiting covenants not to compete, Section 16600 eliminated the only effective strategy for pursuing the individually rational, but collectively suboptimal strategy. No communication between firms was necessary to this cooperative outcome. Each firm could discover independently (or from observing the experience of their competitors) that trying to restrict employee mobility was ineffective. At that point, the optimal individual strategy and the optimal collective strategy converged: Silicon Valley's legal infrastructure, in the form of Business and Profession Code § 16600's prohibition of covenants not to

compete, provided a pole around which Silicon Valley's characteristic business culture and structure precipitated.

**5. An Alternative Explanation.** Allan Hyde has told a different story about the source of high velocity employment in Silicon Valley. While his account shares my emphasis on the importance of the legal infrastructure, he finds the critical element not the prohibition of covenants not to compete, but California's effective elimination of trade secret protection.<sup>79</sup> While I agree with much of Professor Hyde's insightful analysis of the phenomenon that has claimed both of our attentions, on the question of identifying the operative element of Silicon Valley's legal infrastructure, I am afraid he has the wrong culprit.

Hyde rejects the influence of covenants not to compete, based largely on the dicta in a number of cases that Section 16600 does not prohibit covenants not to compete in support of trade secrets. Because misappropriation of trade secrets is independently prohibited, and if covenants not to compete are enforceable if a trade secret is established, then in his analysis covenants not to compete add nothing to whatever protection is already provided by trade secret law. The operative element therefore must be the extent of trade secret protection. And the difference between Silicon Valley and Route 128's legal infrastructure then must be a difference in the rigor of trade secret law in California and Massachusetts.

My initial problem with the analysis is that Professor Hyde provides neither case law nor commentary supporting the proposition that California trade secret law is less favorable to employers than that of Massachusetts. Indeed, the formal evidence cuts the other way. When California adopted the Uniform Trade Secrets Act in 1985, it made a

significant change in the National Conference of Commissioners on Uniform State Laws' model statute. The model statute defines the confidentiality element of the definition of a trade secret as information that derives value "from not being generally know to, *and not being readily ascertainable to*, other persons. . . ."<sup>80</sup> Under this provision, all trade secret protection is lost if a trade secret is available through public sources, regardless of whether a defendant actually obtained the trade secret in so innocent a manner.<sup>81</sup> The California legislature deleted the italicized phrase, thereby providing broader trade secret protection than the model act.<sup>82</sup> So if there was a narrowing of trade secret protection in California, the culprit was not the legislature.

Perhaps the culprit was the courts, although Hyde does not offer case support for the proposition that California judges uniquely weakened trade secret protection. Nor does Hyde offer an explanation of the dynamic by which judicial respect for trade secret protection deteriorated. While courts had to confront Section 16600 at the time the conflict over employee mobility began in the early years of Silicon Valley, what moved them to dilute trade secret protection over the vigorous objections of this new business community? And why was the outcome different than in Massachusetts? One might echo Saxanian's proffer of culture, but as we have seen that still leaves us in search of an explanation for the culture.<sup>83</sup>

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<sup>79</sup> Hyde, *supra* note 7.

<sup>80</sup> UNIFORM TRADE SECRETS ACT § 1(4) (amended 1985) (emphasis added).

<sup>81</sup> Merges et al., *supra* note 69, at 44-45.

<sup>82</sup> CAL. CIV. CODE § 3246.1(d)(1). See ABBA Rubber Co. v. Seaquist, 286 Cal. Rptr. 518 (Ct. App. 1991) (customer list can be a trade secret even if the information it contains was available from a trade directory).

<sup>83</sup> There is evidence, of the variety captured by the comment that a lawyer's definition of data is the plural of anecdote, that real actors think the difference between California and Massachusetts law governing covenants not to compete makes a difference. In Ferrofluidics Corp. v. Advanced Vacuum Components, 968 F.2d 1463 (1<sup>st</sup> Cir. 1992), Ferrofluidics Corp., a producer of magnetic rotary seal used in the manufacture of semiconductor chips, hired Sickles as a product manager of its Seals Division in 1985, and thereafter promoted him to general manager of the division. In 1990, when "Ferro was suffering, along

In the end, Hyde's perfunctory concern with the California courts and legislature is best explained by his interesting identification of a different suspect. He argues that Silicon Valley lawyers subverted trade secret protection. Here Hyde draws on a literature that assigns these lawyers the special "West coast" transactional role of facilitator rather than the East coast role of problem raiser.<sup>84</sup> Hyde reports that Silicon Valley lawyers who, in connection with the closing of a venture capital financing, provide investors with the required legal opinion that the start-up company has the right to use its technology, employ a narrower definition of trade secret than the courts and the California statute. The explanation for this practice is that the lawyers know that the former employer of the start-up's founders will not sue anyway. In Hyde's view this protection comes not necessarily because trade secret law is unfavorable, but because the reputational consequences to the former employer in the labor market will outweigh the gains from enforcing its intellectual property rights.<sup>85</sup> Anticipating this analysis, lawyers are more aggressive in their opinions than the law on the books alone would warrant, because a claim will never be made challenging their opinion.

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with much of the New England high-technology industry, from a downturn in the economy," Sickles accepted an offer from the Nippon Ferrofluidics Corporation (which has been Ferro's Japanese investor) to start a competing magnetic seal rotary fluid business in the United States. *Id.* at 1466.

Sickles moved to California to start the new venture, Advanced Vacuum Components (AVC), in the hope that he could evade his noncompete covenant by subjecting the new business to California law. Sickles had "received advice from lawyers on several occasions, some of which he in turn related to NFC, including the nugget that '[l]egal complications will be greatly reduced by incorporating [the new venture] in California since this state strongly protects the entrepreneur and, in general, does not recognize non-compete agreements.'" *Id.* In 1991, AVC and Ferro "raced to the courthouse": AVC requested a judicial declaration invalidating his restrictive covenant under California law; Ferro initiated a lawsuit to enforce the covenant in New Hampshire Federal District Court (which applied Massachusetts law under the terms of the covenant itself). Ferro won the race and was able to enforce the covenant for three years through a permanent injunction. *Id.*

<sup>84</sup> See Mark C. Suchman & Mia L. Cahill, *The Hired Gun as Facilitator: Lawyers and the Suppression of Business Disputes in Silicon Valley*, 21 LAW & SOC. INQ. 679 (1996).

<sup>85</sup> Hyde, *supra* note 7.



Reliance on reputational effects is not helpful here, because the reputation argument presumes a business culture that supports a self-enforcing equilibrium. Yet, explaining the existence of that business culture is, in the end, the point of trying to establish the initial conditions giving rise to the second stage agglomeration economy in the first place. Moreover, we still have no explanation for the origins of the differences between the two districts' legal infrastructure. Finally, there is also a more straightforward explanation for the Silicon Valley lawyers' conduct. As I argued in Part III.A., enforcement of trade secret claims in Massachusetts confronts significant procedural and substantive barriers. The opinions said to be given by Silicon Valley lawyers are also consistent with what appears to be the "law in action" in Massachusetts, for precisely the reasons covenants not to compete are said to provide employers critical additional protection in that jurisdiction.

In the end, the difference in their treatments of post-employment covenants not to compete remains the most likely difference in the legal infrastructures of Silicon Valley and Route 128 that led the two districts down their ultimately quite different paths. But although the analysis thus far explains the importance of the legal infrastructure to high technology industrial districts, it still is one step short of explaining the source of the initial conditions in Silicon Valley.

#### **IV. Serendipity**

Identifying Business and Professions Code § 16600 as the pole around which Route 128's distinct business culture precipitated still leaves one critical question unanswered. To specify fully the initial conditions that led to the second stage agglomeration economy which provided Silicon Valley's salvation we need to know

from where this unusual statute came. And here the special role of serendipity, of the importance of historical accident stressed by Arthur and Krugman, takes center stage. Section 16600 was not the result not of the prescience of the California legislature. Rather, it grew out of the nineteenth century coincidence of the codification movement in American law, personified by the efforts of David Dudley Field in New York, and the need for a new state to bring some order to the chaotic condition of its laws following its admission to the union.

The history of California Business and Professions Code § 16600 begins in New York in 1847. In that year, Field was appointed as one of three commissioners charged by the recently adopted New York state constitution “to revise, reform, simplify, and abridge the rules and practice, pleadings, forms and proceedings of the courts of record of this state.”<sup>86</sup> Field dominated the process, which resulted in a revolutionary civil procedure code that the New York legislature promptly enacted.<sup>87</sup> Field’s codification efforts continued in 1857, when the New York legislature appointed him to a Code Commission charged with codifying substantive law. Despite the controversy associated with his efforts,<sup>88</sup> Field produced a Civil Code in 1865.<sup>89</sup> Because of the controversy associated with his efforts, the Civil Code was never enacted in New York.<sup>90</sup> Instead, it found its only home in the West. The needs of newly admitted states, including

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<sup>86</sup> NEW YORK STATE CONSTITUTION, art. VI, 24 (1846).

<sup>87</sup> LAWRENCE M. FRIEDMAN, A HISTORY OF AMERICAN LAW 340 (2d ed. 1985).

<sup>88</sup> Friedman notes: “the codification movement is one of the great set pieces of American legal history. It has its hero, Field; its villain in James C. Carter of New York who fought the idea of codification with as much vigor as Field fought for it.” *Id.* at 351.

<sup>89</sup> DAVID VAN EE, DAVID DUDLEY FIELD AND THE RECONSTRUCTION OF THE LAW 51 (1986).

<sup>90</sup> The Civil Code was passed by both houses of the New York legislature between 1879 and 1882, but was vetoed by the Governor both times. *Id.* at 101. It was never adopted in New York. Reisman places the Civil Code at the very center of the conflict over codification: “The bone of contention . . . was the Civil Code – for Field the centerpiece of his whole agenda, for Carter its truly pernicious part.” Mathias Reisman, *The Historical School Against Codification: Savigny, Carter and the Defeat of the New York*

especially California, to impose some order on jurisdictions with conflicting legal traditions and no single body of law coincided with the peak of Field's codification crusade.<sup>91</sup> Field found a special ally in California, his brother Stephen J. Field, a member of the California legislature at the time the state adopted Field's Civil Procedure Code in 1851, and later Chief Justice of the California Supreme Court and an Associate Justice of the United States Supreme Court.<sup>92</sup>

In 1850 California had officially adopted the "common law of England"<sup>93</sup> to supplant pre-statehood Spanish and Mexican law. However, the extensive reach of the old Mexican land grant system, together with the overriding Federal exceptions carved out by the Treaty of Guadalupe Hidalgo which ended the Mexican-American War in 1848, diminished the effect of legislation attempting to abolish and repeal all prior law in California.<sup>94</sup> Consequently, throughout the 1860s, a series of governors, including Leland Stanford, urged a codification of California's laws.<sup>95</sup> After a false start in 1868,

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*Civil Code*, 37 AM. J. COMP. L. 95, 100 (1989). Field's Code Commission also produced a Political Code in 1860, and a Penal Code in 1864. The Penal Code was ultimately adopted in 1882. *Id.* at 50, 99.

<sup>91</sup> ARVO VAN ALSTYNE, *THE CALIFORNIA CIVIL CODE*, WEST'S ANNOTATED CALIFORNIA CODES, CIVIL CODE 1 (1954) ("From the raising of the American flag by Commodore Sloat at Monterey on July 7, 1846, to the organization of constitutional state government in 1849, the legal history of California is one of disorder and confusion."); Rosamond Parma, *The History of the Adoption of the Codes of California*, 22 L. LIBR. J. 8 (1929) (outlining the disarray of California law at the time it entered the Union in 1850).

<sup>92</sup> VAN ALSTYNE, *supra* note 91, at 6.

<sup>93</sup> "[S]o far as it is not repugnant to or inconsistent with the Constitution of the United States or the laws of the State of California." CAL. STATS. 1850, ch. 95.

<sup>94</sup> "[A]ll laws now in force in this state, except such as have been passed or adopted by the legislature, are hereby repealed, provided, however, that no rights accrues, contracts made or suits shall be effected thereby, and providing that the law relating to 'Jueces del Campo' or Judges of the Plains shall be excepted, until provision is made for that office by law; and provided, also that such repeal shall not affect any constitutional laws or acts of Congress, or any of the stipulations contained in the Treaty of Peace between the United States and Mexico, ratified at Queretaro, the 30<sup>th</sup> day of May, 1848." CAL. STATS. 1850, ch. 125.

<sup>95</sup> Parma, *supra* note 91, at 13.

the legislature in 1870 appointed a Commission to revise and compile the laws of the State of California.<sup>96</sup>

The Commission moved promptly the next year to adopt Field's proposed New York Civil Code in total.<sup>97</sup> Indeed, the Commission's original version of the California Civil Code contained most of the New York Commission's annotations, although as adopted by the legislature in 1872 the Code replaced the direct citations to the New York Civil Code with references to California cases. It was in Section 833 of Field's proposed New York Code, adopted verbatim by the California legislature in 1872,<sup>98</sup> that we find the precursor of Business and Professions Code § 16600.

Section 833 of the proposed New York Civil Code and the § 1872 California Civil Code provided the general rule:

Section 833. Every Contract by which anyone is restrained from exercising a lawful trade or business of any kind, otherwise than as provided by the next two sections, is to that extent void.

The following two sections contained exceptions for covenants not to compete in connection with the sale of a business or the dissolution of a partnership:

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<sup>96</sup> A Commission was appointed in May, 1868, but committed political suicide by announcing its intention to repeal the grand jury system. The legislature disbanded the original Commission and empowered its replacement to disregard the work of its predecessors. *Id.* at 14-15.

<sup>97</sup> In their preface to the draft of the Civil Code, the Commission states: "The citizen and lawyer alike complain over the want of a condensed methodical expression of the law. The Civil Code of New York – a monument of legal wisdom and patient industry – is a collection of Common Law rules and principles, combined with a consolidation of statutes like our own, all concisely stated, logically and harmoniously arranged, in order of subjects corresponding to Blackstone's Commentaries." CODE COMMISSIONERS, REVISED LAWS OF THE STATE OF CALIFORNIA iv (1871).

<sup>98</sup> Following California's lead, the Dakota Territory adopted a similar Civil code in 1877, which also acknowledged the influence of the New York Civil Code and the more recent California Civil Code. DAKOTA CIV. CODE (1895). When the territory became two separate states, each retained the Code. Montana followed in 1895 with a similar civil code, also acknowledging New York and California. MONTANA CIV. CODE (1895). See Andrew P. Morriss, *This State will Soon Have Plenty of Laws, Lessons from One Hundred years of Codification in Montana*, 56 MONT. L. REV. 359 (1995). Lawrence Friedman provides an interesting explanation of the Field Civil Code's success in the West: "The success of the codes in the West was due to reasons that by now are familiar. These were sparsely settled states in a hurry to ingest a legal system. A few had something of a civil law tradition. In none of the Western states did the bar have a strong vested interest in the continuance of the old rules, especially of pleading." FRIEDMAN, *supra* note 87, at 353-53.

Section 834. One who sells the good will of a business may agree with the buyer to refrain from carrying on a similar business within a specified county, so long as the buyer, or any person deriving title to the good will through him, carries on a like business.

Section 835. Partners may, upon or in anticipation of a dissolution of a partnership, agree that none of them will carry on a similar business within the same city or town where the partnership business has been transacted, or within a specified part thereof.

Parts of Field’s formulation reflected the state of the law on restraints at that time in New York and elsewhere. By this point, courts in England applied a rule of reason to evaluating contractual restrictions on the conduct of a trade or business. From the time of *Mitchel v. Reynolds* in 1711,<sup>99</sup> English law distinguished between post-employment contractual restraints on employees, and restraints arising out of the sale of a business. The latter were generally upheld, but the former were held to more rigorous scrutiny and unreasonable restraints – in duration or coverage – were struck down. This approach ultimately grew into a “rule of reason” that required judicial balancing of interests, including those of the public, in determining a restriction’s validity. American law generally followed the English pattern, albeit with special concern for the interests of employees. But except for a period in which general restrictions – those whose application was not limited geographically – were routinely invalidated, American courts did not apply a per se rule of invalidity with respect to either post-employment restraints or those associated with the sale of a business.<sup>100</sup>

For our purposes, the sequence of Sections 833 through 835 differs from the existing body of law in one critical respect. While sections 834 and 835 carry forward the existing law’s sanction of covenants not to compete associated with the sale of a

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<sup>99</sup> 1 P. Will. 181 (1711).

business, Section 833 voids all other restraints, including especially post-employment covenants not to compete.

It is impossible to know exactly what Field had in mind in this sequence. These sections were added late in the development of the Code, and had not been part of the preliminary draft circulated to judges and lawyers in 1862.<sup>101</sup> The comment to section 833 expresses a concern that “contracts in restraint of trade have been allowed, by modern decisions, to a very dangerous extent,” and refers to two cases: *Dunlop v. Gregory*,<sup>102</sup> and *Whittaker v. Howe*.<sup>103</sup> Both cases involve non-competition covenants associated with the sale of a business. In *Dunlop v. Gregory*, the Hudson River Steamboat Association, which operated a passenger service on the Hudson River between New York, Albany and Troy, owned five boats outright, and two-thirds of a sixth. A covenant not to operate a passenger boat north of Saugerties on the Hudson was attached to the Association’s purchase of the remaining one-third interest in the jointly owned boat. In *Whittaker v. Howe*, a covenant not to compete anywhere in Great Britain was attached to the sale of a law practice. The comment to section 833 makes no reference to post-employment covenants not to compete.<sup>104</sup>

The comments to the California Civil Code provide no more guidance. Sections 833 through 835 of the proposed New York Code became sections 1673 through 1675 of the California Civil Code. The California Code Commissioners’ 1871 draft contains only a citation to the New York section, and the text of the New York comment.<sup>105</sup> The 1872

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<sup>100</sup> Blake, *supra* note 65, at 629-44, develops this history.

<sup>101</sup> Compare N.Y. CIV. CODE § 833 (1865) with N.Y. CIV. CODE (draft 1862).

<sup>102</sup> 10 N.Y. 241 (1851).

<sup>103</sup> 3 Beav. 383 (Chancery 1841).

<sup>104</sup> The comments to Sections 834 and 835 add nothing to the analysis. Both refer only to the need to accurately specify the breadth of an allowable covenant not to compete, and neither contains case citations.

<sup>105</sup> REVISED LAWS OF STATE OF CALIFORNIA, § 1673 (1871).

official version expands the original New York comment to include references to California cases.<sup>106</sup> However, these cases, like those discussed by the New York annotation, do not deal with post-employment covenants not to compete.

Thus, beginning with the enactment of the Civil Code in 1872, California law on post-employment covenants not to compete diverged from that of Massachusetts and the rest of the large industrial states. The rule of reason, clearly in place in Massachusetts by 1869<sup>107</sup> and adopted in New York by 1887,<sup>108</sup> came to cover post-employment covenants. Subsequent revision of the California codes made minor changes in the language of §§ 1673 through 1675, and moved the sections from the Civil Code to their present place as Sections 16600 through 16602 of the Business and Professions Code. However, the substantive peculiarity of California law remained intact until the 1960s.<sup>109</sup> At that point the development of a high technology industrial district in Silicon Valley brought this serendipitous element of California's legal infrastructure to center stage. Field's accident of history then served as the coordinating mechanism which supported a second stage agglomeration economy – the pole around which Silicon Valley's unusual business culture and industrial organization precipitated. The rest, as they say, is history.

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<sup>106</sup> See *More v. Bonnet*, 40 Cal. 251, 254-55 (1870) (involving a contract not to practice asphalt roofing or pavement laying if the purchaser of tools for such business became delinquent in his payments); *Wright v. Ryder*, 36 Cal. 342, 361 (1868) (involving a contract upon sale of a boat not to allow that boat to run on any rivers, bays, or waters of the State of California); *California Steamboat Navigation Co. v. Wright*, 6 Cal. 258, 262 (1856) (involving a contract not to allow a boat to navigate certain waters of California for three years where consideration was paid).

<sup>107</sup> See *Morse Twist Drill & Mach. Co. v. Moore*, 103 Mass. 73 (1869).

<sup>108</sup> See *Diamond Match Co. v. Roeber*, 106 N.Y. 473, 13 N.E. 419 (1887).

<sup>109</sup> The growth in the size of the Civil Code resulted in the biggest change: its dismemberment. The 1930 Code Commission suggested that portions of the Civil Code be broken off into separate codes. VAN ALSTYNE, *supra* note 91, at 24. The Probate Code was the first spinoff in 1931, CAL. STATS. 1931, ch. 281, p. 587, repealing CIVIL CODE §§ 236-257, 1270-1409. The Business and Professions Code was created in 1937. CAL. STATS. 1937, p. 1229. Sections 16600 through 16602 were added to the Business and Professions Code, and Sections 1673 through 1675 were deleted from the Civil Code in 1941. CAL. STATS. 1941, ch. 526, § 1 (noting derivation from Civil Code §§ 1673-75). The new section 16601 was

## V. Implications: Three Cautionary Notes

My account of the role of the legal infrastructure of high technology industrial districts is now complete. The new economic geography stresses the importance of initial conditions in shaping an industrial district's business culture and industrial organization. The presence in Silicon Valley of a second stage agglomeration economy based on inter-company knowledge spillovers has allowed that district to repeatedly reset its product cycle. The absence of such spillovers in Route 128 has left that district to ride down the product cycle associated with the minicomputer. The difference in initial conditions that helps account for the incidence of this economy and the resulting difference in the two districts' long-term success is found in a critical difference in the two districts' legal infrastructures. The rules governing the effectiveness of employer imposed restraints on employee mobility, the mechanism by which inter-company knowledge spillover takes place, differ sharply in the two districts. Massachusetts law generally enforces such restraints, thereby effectively blocking the critical knowledge spillovers; California law voids them, thereby encouraging knowledge spillovers.

Each legal infrastructure gave rise to a dynamic that helped shape each district's characteristic business culture and industrial organization, one compatible with development of a second stage agglomeration economy and one not. Consistent with the new economic geography's emphasis on the importance of historical accident, the explanation for the two districts' different legal infrastructure lies in the temporal coincidence of California's need for a coherent body of law following statehood, and David Dudley Field's proposed New York Civil Code. In 1872, California adopted

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expanded to include sales of corporate shares as well as sales of good will, but the broad prohibition of employee post-employment covenants remained undisturbed.



without explanation Field's proposed prohibition of post-employment covenants not to compete; Massachusetts, like most other industrial states, instead followed a rule of reason that sanctioned such covenants subject to judicial review of their duration and coverage.

Like any good story, my chronicle of the importance of the legal infrastructure of high technology industrial districts has a number of possible morals, of potentially instructive implications for related debates. In closing I want to take up briefly three such implications. The first concerns the story's implications for the standard law and economics account of the importance of completely protecting property rights in intellectual property. The second deals with a recent line of cases involving claims of "inevitable disclosure" by departing employees that threatens to turn trade secret law into a judicially imposed de facto covenant not to compete. The third considers the story's lesson for regional planners seeking to establish or preserve industrial districts. While each of these implications warrants far more attention than is possible here, I want to add a cautionary note that counsels in favor of a more textured, less categorical analysis in each case.

#### **A. The Conflict Between Protecting Property Rights in Intellectual Capital and Second Stage Agglomeration Economies**

The standard law and economics prescription stresses the importance of fully protecting the property rights of the producers of intellectual property. In the absence of complete protection, producers will not capture all of the gains resulting from their efforts, and too little intellectual property will be produced.<sup>110</sup> The importance of inter-

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<sup>110</sup> MICHAEL TREBILCOCK, *THE COMMON LAW OF RESTRAINT OF TRADE: A LEGAL AND ECONOMICS ANALYSIS* 152-53 (1986), makes the standard argument with respect to giving California employers more tools to protect their intellectual property against departing employees. Edmund W. Kitch, *The Law and*

employer knowledge spillovers to the second stage agglomeration economy that has preserved Silicon Valley sounds a note of caution with respect to an unqualified application of the standard analysis. We may need a more textured approach that takes into account the benefit of an industrial district preserving agglomeration economy.<sup>111</sup> As I suggested earlier,<sup>112</sup> the comparison is between the average per firm cost of diluted intellectual property protection and the average per firm benefit associated with the preservation of the high technology industrial district.

Of course, which direction the comparison favors is an empirical question, and one that should not be resolved with, as Professor Trebilcock puts it, “casual empiricism that proves nothing.”<sup>113</sup> But the difference in performance of Silicon Valley and Route 128 is a little more than casual and, in all events, the absence of empirical evidence hardly resolves the matter in favor of either side of the argument.

We can perhaps advance the issue by using Silicon Valley to frame a kind of sensitivity analysis. The fact is that firms in Silicon Valley have always been free to opt out of California’s legal infrastructure. A firm need only move its intellectual property producing activities out of California to avoid the property rights diluting effect of Business and Professions Code § 16600.<sup>114</sup> If in the calculus of a particular firm the cost of diluted property rights protection outweighs the benefit of the agglomeration economy by more than the firm’s and its employees’ relocation costs, the firm can simply move to,

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*Economics of Rights in Valuable Information*, 9 J. LEG. STUD. 683 (1980), also develops this analysis, although he recognizes the anomaly presented by Silicon Valley. *Id.* at 710.

<sup>111</sup> Alan Hyde, *supra* note 7, also develops this point, although our emphasis differs.

<sup>112</sup> See the text following note 78, *supra*.

<sup>113</sup> TREBILCOCK, *supra* note 110, at 153.

<sup>114</sup> Indeed, that strategy would have reduced the role of Section 16600 as a coordinating mechanism because an alternative strategy to acceptance of high velocity employment would thereby be available. A firm could exit.

<sup>115</sup> See SAXENIAN, *supra* note 8, at 93-94.

say, Massachusetts. And if the matter were as simple as an unqualified property rights analysis would have it, one would have expected waves of defections. To be sure, some companies have moved operations out of Silicon Valley. However, the migration appears to be of manufacturing and assembly operations, presumably motivated by the increased factor prices resulting from congestion, rather than the innovative activities whose location would be influenced by the level of intellectual property protection.<sup>115</sup> Empirical evidence concerning this sort of balance of trade may be available to help resolve the dispute, or at least move the analysis forward.

One piece of casual empiricism, however, should be noted, if only to highlight the kind of phenomenon an unqualified property rights analysis will have to explain. Recently, the large Swiss pharmaceutical company Novartis AG announced that it would invest \$250 million in a proprietary research institute in genomics, an aspect of biotechnology with respect to which the large pharmaceuticals have typically bought expertise, rather than develop it themselves.<sup>116</sup> This investment has as its sole purpose the creation of intellectual property. Where, then, does Novartis site its new intellectual property factory: where the legal infrastructure fully protects intellectual property rights, or where the company will have the benefit of an industrial district? The new facility will be located in La Jolla, California, a burgeoning biotech industrial district<sup>117</sup> that is, of course, subject to California Business and Professions Code § 16600.<sup>118</sup>

## **B. Resisting Inevitable Disclosure Analysis in California**

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<sup>116</sup> See *Novartis Plans to Build Genetic-Research Center*, WALL ST. J., Apr. 9, 1998, at A4.

<sup>117</sup> See David Audretsch & Paula Stephan, *Company-Scientist Locational Links: The Case of Biotechnology*, 86 AM. ECON. REV. 641 (1996)(concentration of biotech firms in San Diego area).

<sup>118</sup> To be sure, Novartis had a more focused reason for locating the facility in La Jolla. It will be build adjacent to the Scripps Research Institute, “with which Novartis already has a 10 year, \$200 million agreement giving Novartis first rights of refusal to discoveries.” *Id.* But this kind of clustering is precisely what is said to result from agglomeration economies.

The “inevitable disclosure” line of cases in trade secret law represents the doctrinal analogue to the classic law and economics emphasis on fully protecting property rights in intellectual property. Under this doctrine, some courts have constructed a non-contractual covenant not to compete by enjoining a departing employee from beginning a new job with a competitor of the former employer. The injunction is based on a finding that because of the nature of the trade secrets involved, the employee must inevitably use or disclose them in working for a competitor, regardless of the employee’s good faith. California courts have not yet considered the inevitable disclosure doctrine, but California practitioners have begun to raise it as an alternative to contractual post-employment restrictions.<sup>119</sup> The importance of a knowledge spillover-based second stage agglomeration economy to Silicon Valley’s repeated renewal strongly suggests that California courts should be quite cautious in allowing the use of an inevitable disclosure claim to evade Business and Professions Code § 16600. The straightforward application of the doctrine should not seriously test a California court’s resolve. A more oblique application of the doctrine, which better fits dicta in existing California case law, is a more serious threat.

*Pepsico, Inc. v. Redmond*<sup>120</sup> illustrates the potential reach of the inevitable disclosure doctrine. The litigation was triggered when Quaker Oats hired Redmond, then Pepsico’s manager of California sports drink operations, as vice president-field operations for Quaker Oat’s Gatorade brand. At the time Redmond was hired, Pepsico had begun a new marketing and promotion campaign for its “All Sports” beverage, which directly competed with Gatorade. Although Redmond had not signed a post-employment

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<sup>119</sup> See Weiss, Lincoln & Farrell, *supra* note 57, at 7-8.

covenant not to compete, Pepsico sought an injunction barring Redmond from working for Quaker Oats based on the theory that Redmond would inevitably disclose Pepsico's trade secrets.<sup>121</sup> Relying on the Illinois version of the UTA, the court concluded that Redmond could not help but make use of his knowledge of Pepsico's proprietary pricing, marketing, and promotion strategies for its sports drink when undertaking precisely the same responsibilities for Quaker Oats' competing brand. How could Redmond plan a strategy for Quaker Oats without relying on what he knew would be Pepsico's reaction? As the district court concluded, "unless Redmond possessed an uncanny ability to compartmentalize information, he would necessarily be making decisions about Gatorade and Snapple by relying on his knowledge of [Pepsico's] trade secrets."<sup>122</sup> On that basis, the Court of Appeals affirmed the District Court's order prohibiting Redmond from beginning work at Quaker Oats for six months.

*Pepsico* illustrates the problem the inevitable disclosure doctrine presents for California courts. Suppose Redmond's new job been in California, rather than his old one. California law then would have governed the issue. The statutory conflict for a California court is straightforward. On the one hand, Business and Professions Code 16600 prohibits post-employment covenants not to compete. On the other hand, California's version of the UTA authorizes injunctive relief against misappropriation of trade secrets.<sup>123</sup> Preventing misappropriation by enjoining employment creates the statutory friction.

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<sup>120</sup> 54 F.3d 1262 (7<sup>th</sup> Cir. 1995).

<sup>121</sup> Presumably the absence of a contractual covenant not to compete reflected the California situs of Redmond's Pepsico employment and the existence of Business and Professions Code 16600. The case was decided under Illinois law.

<sup>122</sup> 54 F. 3d at 1269.

<sup>123</sup> CAL. CIV. CODE § 3426.2(a) (West 1997).

More specifically, the inevitable disclosure doctrine threatens just the type of knowledge whose spillover has been so critical to Silicon Valley. It is the very character of tacit knowledge that an employee cannot avoid its use. To take an obvious example, a high technology employee frequently learns not only how to make a product, but how not to make it as well – that is, what manufacturing techniques do not work. Knowledge that particular approaches are ineffectual is very valuable in a fast moving high technology industry; the time saved not going down dead ends means getting a product to market sooner. How does an employee not use his former employer’s proprietary knowledge that an approach will not work if he is working in the same area for a competitor?

The inevitable disclosure doctrine remains controversial outside of California. Although one court has followed *Pepsico* in enjoining competing employment in the absence of a post-employment covenant not to compete,<sup>124</sup> others have rejected requests for injunctive relief in the absence of a covenant,<sup>125</sup> sometimes stating explicitly that this area is for contract.<sup>126</sup> Moreover, the cases lend themselves to resolution based on a close parsing of the facts. Consistent with the judicial balancing associated with rule of reason review of contractual post-employment restrictions (and the standard balancing of the equities required for injunctive relief), courts relying on the inevitable disclosure doctrine have stressed employee misbehavior in justifying an injunction.

The inevitable disclosure doctrine can be presented to California courts in two ways: directly in support of injunctive relief despite the absence of a post-employment

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<sup>124</sup> *Merck & Co., Inc. v. Lyon*, 941 F. Supp. 1443 (M.D.N.C. 1996).

<sup>125</sup> *See, e.g., Campbell Soup Co. v. Giles*, 47 F.3d 467 (1<sup>st</sup> Cir. 1996); *Cudhay v. American Laboratories, Inc.*, 315 F. Supp. 1339 (D. Neb. 1970).

<sup>126</sup> The district court in *Campbell Soup Co. v. Giles*, *supra*, stated that “if Campbell had wanted to protect itself against the competition of former employees, it should have done so by contract. This court will not afford such protection after the fact.” *Campbell Soup Co. v. Giles*, Slip Op. 94-40177-NMG (D. Mass.

not to compete; and indirectly in support of enforcement of an existing contractual restriction. California courts are likely to confront the issue first in its direct form.<sup>127</sup> Given the state's long history of prohibiting covenants not to compete, few firms will have required their employees to sign contracts widely understood in the legal and business communities to be unenforceable. In this guise, a California court should have little difficulty concluding that Business and Professions Code § 16600 forecloses the use of the inevitable disclosure doctrine to create a de facto covenant not to compete. California courts routinely have seen through other efforts to accomplish indirectly what Section 16600 prohibits directly.<sup>128</sup> The UTA's general authorization of injunctive relief hardly trumps such a long-standing and specific statutory prohibition.<sup>129</sup>

When presented in its indirect form, the inevitable disclosure doctrine is more troublesome. While Section 16600 and the UTA plainly face in different directions, California case law does suggest an accommodation of the two statutes that would leave room at least doctrinally for enforcing trade secret based post-employment restrictions. Although in dicta, the California Supreme Court has stated that covenants not to compete are unenforceable "unless necessary to protect the employer's trade secrets,"<sup>130</sup> a phrase that has been repeated, equally hypothetically, by other courts. Now suppose that a well

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Dec. 12, 1994) (quoted in Anthony A. Bongiorno & James J. Marcellino, *Noncompetes: Worth Their Weight in Paper?*, MASS. LAWYERS WKLY., Oct. 28, 1996, p.11.

<sup>127</sup> The inevitable disclosure doctrine is said to be before the California Superior Court for Santa Clara County in *Advanced Micro Devices, Inc. v. Hyundai Electronics America*, No. CV752679, Santa Clara Superior Court. Weiss, Lincoln & Farrell, *supra* note 57, describe an unpublished order in that case granting a preliminary injunction enjoining five former Advanced Micro Devices employees from working on a specific technology at a new employer. See Hanna Bui-Eve, *To Hire or Not to Hire: What Silicon Valley Companies Should Know About Hiring Competitor's Employees*, 48 HASTINGS L.J. 981, 998 (1997).

<sup>128</sup> See note 75, *supra*.

<sup>129</sup> Post-*Pepsico* case law is consistent with this distinction. In most cases, inevitable disclosure analysis is invoked by litigants to justify enforcing a contractual post-employment not to compete under the rule of reason. See *Lumex, Inc. v. Highsmith*, 991 F. Supp 624 (E.D.N.Y. 1996); *Uncle B's Bakery, Inc. v. O'Rourke*, 920 F. Supp. 1405 (N.D. Iowa 1996); *La Calhene, Inc. v. Spoylar*, 938 F. Supp 523 (W.D. Wis. 1996); *APAC Teleservices, Inc. v. McRae*, 985 F. Supp 852 (N.D. Iowa 1997).

counseled employer requires a recent employee to sign a post-employment covenant not to compete whose recitations explicitly invoke the involuntary disclosure doctrine as a justification: that the employee must receive the employer's trade secrets in order to do her work, that the trade secrets are of a character that inevitably would be disclosed if the employer worked for a competitor, and that the covenant not to compete is necessary to protect them. Later, when the employer seeks to enforce the covenant not to compete against the departing employee, the inevitable disclosure doctrine can be rationalized as simply giving substance to an exception to Business and Professions Code § 16600 the potential for which has long been recognized in California law. Of course, such a rationalization would find theoretical support in the law and economics emphasis on protecting property rights to assure the proper incentives to produce intellectual property.

The doctrinal sleight of hand necessary for the inevitable disclosure doctrine's indirect application in California thus does not require a significant judicial stretch. But the analysis here of the initial conditions giving rise to Silicon Valley's second stage agglomeration economy admonishes California courts to exercise great caution before pursuing such an accommodation. Inevitable disclosure doctrine poses a serious threat to the inter-employer spillover of proprietary tacit knowledge that allows Silicon Valley to repeatedly reset its product cycle. Given the uncertainty of the theoretical tradeoff between fully protecting property rights and protecting the agglomeration economy that supports the industrial district, courts should be reluctant to alter the legal infrastructure that preserves the existing, and successful, balance.<sup>131</sup>

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<sup>130</sup> Muggill v. Reuben H. Donnelly Corp., 62 Cal. 2d at 242. See text accompanying note 76, *infra*.

<sup>131</sup> The doctrinal response to the indirect invocation of the inevitable disclosure doctrine is also not difficult to construct. The cases in which courts have floated the possibility that a covenant not to compete could be used to protect a trade secret, have involved a tangible trade secret, like customer lists. As a result, a court



### C. Emulating Silicon Valley's Success by Prohibiting Covenants not to Compete

My account of the legal infrastructure's role in Silicon Valley's continued success has an obvious implication for regional planners seeking to create or preserve local industrial districts: Simply replicate that aspect of the legal infrastructure that provided the critical initial condition. On this analysis, the planner should persuade her state's legislature to emulate California by enacting the equivalent of Business and Professions Code § 16600's prohibition of post-employment covenants not to compete. Again, however, I think caution is in order in assessing the policy implications of Silicon Valley's history.

Evaluating the prohibition of covenants not to compete reflects a trade off between the district wide benefits of knowledge spillovers through employee mobility, and the costs of the parallel reduction in the incentive to invest in intellectual property that results from the dilution of employers' property rights. With respect to Silicon Valley and Route 128, the balance seems to have favored agglomeration economies over property rights protection. However, this balance may well be quite local, depending on the characteristics of particular industries. And because industries are not randomly distributed across jurisdictions, each state's particular industrial population may dictate a different balance. Rather than emulating California's blanket prohibition (which after all exists by historical accident not design), it may be that the rule of reason currently

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is in a position to enforce a very narrow definition of competition – one limited to the trade secret's particular tangible manifestation. In effect, the covenant would provide somewhat broader protection than a no solicitation agreement, which the California courts have interpreted as barring direct solicitation of business, but not indirect solicitation by means of the announcement of the employee's new position. It would also parallel the distinction drawn by invention law based on whether written corroboration has triggered conception. *See* text accompanying notes 61-64, *supra*. Such a narrow scope for the trade secret exception would leave outside the doctrinal accommodation trade secrets involving tacit knowledge and the like which are at the heart of Silicon Valley's knowledge spillover based agglomeration economy.

applied to post-employment covenants not to compete by other industrial states may be flexible enough to allow for this kind of industry by industry approach. In assessing the validity of a particular covenant under this legal regime, a court balances against the employer's interest in enforcing the covenant not only the employee's interest in mobility, but also the public interest.<sup>132</sup> At least at the doctrinal level, this formulation invites the court to take into account the public interest in a potential agglomeration economy associated with knowledge spillovers in a particular industry, and invites the parties to present expert testimony concerning the knowledge structure of the industry involved.

Robert Merges and Richard Nelson provide some guidance about how such an inquiry might proceed.<sup>133</sup> Patent law in general, and the appropriate scope of a patent in particular, present an issue roughly analogous to that presented by the scope of protection provided by the law governing trade secrets and covenants not to compete. In patent law, encouraging innovation by protecting property rights in an invention through a broad patent scope inevitably conflicts with an alternative means to encourage innovation. A narrow patent scope encourages innovation by making it easier for subsequent investors to improve existing patented technology. In trade secret law, encouraging innovation through a broad scope for trade secret protection -- that is, by augmenting trade secret law through enforcing covenants not to compete and thereby protecting tacit knowledge and pre-conception inventions -- also conflicts with an alternative means to encourage innovation. A narrow scope for trade secret protection, as with California's prohibition of

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<sup>132</sup> See text accompanying notes 65-70, *supra*.

<sup>133</sup> Robert Merges & Richard Nelson, *On the Complex Economics of Patent Scope*, 90 COLUMBIA L.REV. 839 (1990).

post-employment covenants not to compete, facilitates second stage agglomeration economies by leaving tacit knowledge and pre-conception inventions unprotected.

Merges and Nelson argue that the proper patent scope depends on the nature of innovation in particular industries. Two of their categories of innovation are instructive for our purpose. The first is "discrete innovation," in which the invention's boundaries are clear and, although subject to improvement, the invention is clearly not the first step in a series of important technical advances. The ballpoint pen is offered as an example of this type of invention. The second is "cumulative technologies," in which innovation is additive in the sense that it can be anticipated that fundamental technological advances are both possible and will build on existing technology. "Over time dramatic advance occurs in these technologies from improvements to one aspect or another, adding this new feature or that."<sup>134</sup> Computers are an example of this type of technology.

Building on this typology, Merges and Nelson argue that a broad patent scope is appropriate in industries characterized by discrete innovation; encouraging initial discovery by expansive property rights incurs little offsetting cost by discouraging follow-on innovation. In contrast, a narrow patent scope is appropriate in industries characterized by cumulative technologies; the gains from encouraging follow-on innovation exceed the costs of reduced incentives for initial invention. The same analysis may be appropriate with respect to trade secret protection. Because Silicon Valley appears to be characterized by cumulative technologies, California's narrow scope of trade secret protection, effected by prohibiting covenants not to compete, would be just about right.

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<sup>134</sup> *Id.* at 881.

Thus, it may well be that a state concerned with regional development today should not blindly seek to replicate the historical source of Silicon Valley's success. Given the opportunity to act by design rather than by historical accident, the better approach may be to craft a legal infrastructure that has the flexibility to accommodate the different balance between external economies and intellectual property rights protection that may be optimal in different industries. In contrast, for California, where the industrial distribution already reflects the long-term presence of Business and Professions Code § 16600, the best course may simply be staying the course.