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Revisiting Labor Mobility in Innovation Markets

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1. Introduction

Both intellectual capital—such as inventive designs and know-how—and human capital—such as the skills of scientists, engineers, and other talented personnel—are necessary for firms to innovate (Becker 1962; Zucker, Darby, and Brewer 1998).[1] Just as firms protect intellectual capital through intellectual property rights and other mechanisms that deter usage by competitors, firms protect human capital through contractual and other mechanisms that limit employees' ability to work at competitors. The most common mechanism is the post-employment covenant not to compete (typically known as the "noncompete"), which precludes an employee from working at a competitor, usually for a limited time period and within a limited geographic region.

Noncompetes have recently attracted significant interest from researchers, policymakers, and the media in the broader debate over the public policies that best support innovation.[2] California's long-standing resistance to noncompetes, coupled

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[1] Indeed, these categories are not exclusive: a firm's intellectual capital may be embedded in its human capital (Zucker et al., 1988).

[2] Reflecting unusual interest in the intricacies of employment contracts, *The New York Times*, *The Wall Street Journal*, *Forbes*, *Fortune*, *The Boston Globe*, and many other mass media outlets have recently run stories and op-eds on the use of noncompete clauses and legislative proposals to

with the state's technology firms' exceptional performance, has supported calls to restrict noncompetes in other states. Those calls have relied on several prominent academic studies purporting to show that noncompetes limit mobility and impede innovation. In response, several state legislatures have enacted laws or are considering enacting laws to prohibit or restrict noncompetes. The time is therefore ripe to assess carefully whether our existing understanding of innovation markets supports restricting noncompetes and other limitations on employee mobility.

The conventional view of noncompetes rests on the efficiency rationale that drives all IP rights: without some period of exclusivity, a firm has difficulty earning returns on the investment in its human capital assets. Otherwise, third parties could appropriate those investments by hiring the firm's employees and accessing their knowledge at a much lower cost than it took the firm to develop that knowledge, thereby diminishing the firm's incentive to make the investment in the first place. Just like IP rights, however, there is a tradeoff. Noncompetes may also preclude otherwise efficient employment relationships and, over time, diminish innovation by impeding the circulation of intellectual capital (as well as raise personal autonomy concerns). As with IP rights, some limitations on noncompetes are essential to balance the benefits and costs. Historically, the common law of almost all states (subject to the long-standing California exception) has adopted the same balancing-test approach—known as the "reasonableness" standard—toward noncompetes.

Legal scholars and economists traditionally agreed with this approach, observing that noncompetes and other limitations play two socially valuable functions. First, noncompetes induce a firm to finance training that the employee cannot self-finance in the form of reduced wages (Kitch 1980; Rubin and Shedd 1981). Second, noncompetes prevent the leakage of trade secrets to competitors, which could otherwise free-ride off the employer's intellectual capital (Blake 1960; Kitch 1980; Rubin and Shedd 1981). These scholars argue that the predominant reasonableness standard has sufficiently taken into account the efficiency gains attributable to noncompetes while enabling courts to develop standards that constrain employer over-reaching (especially in concentrated markets), protect uninformed employees, and incorporate personal autonomy concerns, including the ability for individuals to

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ban these clauses. *See, e.g.,* Steven Greenhouse, *Noncompete Clauses Increasingly Pop Up in Array of Jobs,* N.Y. Times, June 8, 2014; Neil Irwin, *When the Guy Making Your Sandwich Has a Noncompete Clause*, New York Times, Oct. 14, 2014; Ruth Simon and Angus Loten, *Litigation Over Noncompete Clauses is Rising,* Wall St. J., Aug. 14, 2013; Joann S. Lublin, *Companies Loosen the Handcuffs on Non-Competes,* Wall St. J., Aug. 12, 2013; Eric Goldman, *Why Congress Should Restrict Employee Non-Compete Clauses*, Forbes, June 30, 2015; Claire Zillman, *Are Noncompete Agreements Hurting Tech Innovation?*, Fortune, July 1, 2015; John McEleney, *Noncompetes Hurt Workers and their Employers*, The Boston Globe, June 28, 2015. Overall, according to a Lexis-Nexis search, newspaper and magazine stories on noncompetes have sharply risen since 2015.

freely select among available jobs.[3]

A growing number of scholars in law, business, and economics argue that the conventional view, and its reasonableness standard, are wrong (Hyde 2003; Moffat 2010; Samila and Sorenson 2011; Fisk and Barry 2012; Lobel 2013, 2015). These scholars generally assert that banning noncompetes (and, by implication, other contractual restrictions on employee mobility) promotes employee turnover, which promotes innovation. Policymakers, concerned with cultivating robust technology economies, have begun to act on this advice. Hawaii recently enacted legislation restricting the enforcement of noncompetes in "technology businesses"[4] and Massachusetts, Michigan, Maryland, Missouri, Washington, and Wisconsin are considering similar action.[5] If the "new wisdom" on noncompetes is correct, it would overturn several centuries of common-law jurisprudence as currently reflected in the law of effectively 46 states, and rebut conventional wisdom among an earlier generation of law-and-economics scholars.

The new wisdom on noncompetes is ostensibly supported by two principal bodies of evidence. First, commentators and policymakers point to the apparent connection between California's refusal to enforce noncompetes and the success of Silicon Valley (Gilson 1999; Lobel 2013). By contrast, the Route 128 area near Boston apparently lost its innovative edge because Massachusetts insisted on enforcing noncompetes. The result in the former case is a virtuous circle of accelerated innovation that led to the rise of Silicon Valley; the result in the latter case is a sad story of a Silicon Valley that could have been but wasn't. Second, the new wisdom relies on recent empirical studies purporting to find adverse effects of noncompetes on employees' human capital development, employee mobility, and regional innovation measures (Stuart and Sorenson 2003; Fallick, Fleischman, and Rebitzer 2006; Marx, Strumsky, and Fleming 2009; Garmaise 2011; Samila and Sorenson 2011; Amir and Lobel 2013; Marx, Singh, and Fleming 2015).

In this article, we thoroughly examine the theoretical and empirical underpinnings behind the recent enthusiasm for restricting noncompetes (and, by implication, other limitations on employee mobility). This includes analysis of the legal sources and analytical methods used in the leading empirical studies, which have been conducted largely by economists and is now being consumed by legal scholars, policymakers, and the media. While the details are complex, our ultimate

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[3] The reasonableness standard for noncompetes traces its origins to the landmark, early eighteenth century English decision in *Mitchel v. Reynolds*, (1711) 24 Eng. Rep. 347 (K.B.).

[4] Hawaii H.B. No. 1090 (2015). In passing its bill, the Hawaii legislature stated: "Hawaii has a strong public policy to promote the growth of new businesses in the economy, and academic studies have concluded that embracing employee mobility is a superior strategy for nurturing an innovation-based economy" (Milligan 2015).

[5] Lori Ehrlich, a Massachusetts' representative who introduced a bill to preclude most noncompete enforcement, believes noncompetes have an "overall impact of stifling innovation" and cites studies by Marx et al. (2009) and Garmaise (2011) on her website. See http://www.loriehrlich.com/non-compete-agreements-40.html.

conclusion is straightforward. There is little to no persuasive support for any causal relationship between banning noncompetes, on the one hand, and increasing employee turnover and innovation, on the other hand. Although restrictive policies may further normative aims such as personal autonomy and distibutive fairness, there is currently no compelling reason from an efficiency perspective—the perspective primarily adopted by proponents of noncompete bans—to impose a flat ban on noncompetes and other contractual limitations on employee mobility.

To assess the new wisdom, we distinguish between two versions of this school of thought. In its weak version, this thesis asserts that limiting the enforcement of noncompetes increases the circulation of R&D personnel (Fallick, Fleischman, and Rebitzer 2006; Marx, Strumsky, and Fleming 2009; Garmaise 2011; Marx, Singh, and Fleming 2015). In its strong version, it asserts that increased employee circulation results in more innovation (Gilson 1999; Hyde 2003; Stuart and Sorenson 2003; Samila and Sorenson 2011). Some scholars also posit that noncompetes reduce employee investments in their own human capital (Garmaise 2011; Amir and Lobel 2013). In general, on the strong version, restraints on employee mobility reduce knowledge spillovers and employee-specific human capital, thereby stunting innovation (Garmaise 2011; Lobel 2013).

We accept the weak version in principle. However, we observe that the "real" difference between jurisdictions that "nominally" strongly or weakly enforce noncompetes may often be insignificant. Our doubts are reinforced when we review several prominent studies that purport to show a strong relationship between the enforceability of noncompetes and employee circulation and innovation. Upon close examination, these studies suffer from serious infirmities or substantial limitations. Most importantly, nearly all of the major studies do not accurately characterize variations in and other key aspects of state noncompete law, which results in fundamental measurement errors. Other studies track labor mobility using indicators such as the patent record that likely confound their results. Some studies focus on specific types of personnel, such as top executives, or types of firms, such as very large companies, that limit their applicability. As such, these studies do not provide support for the new wisdom.

Our doubts are further reinforced when we review the standard narrative of the rise of Silicon Valley and the decline of Route 128. A closer look shows that there is little ground on which to attribute Silicon Valley's rise over Route 128 to historical differences in the enforcement of noncompetes. First, during Silicon Valley's ascendance, California's policy against noncompetes was clouded by several important exceptions not generally recognized in the literature. Second, California firms could significantly mimic the effect of noncompetes through alternative instruments, including trade secret litigation and deferred compensation and other financial mechanisms. Third, it is not clear that Massachusetts law substantially restrained employee turnover in its computer industry. Last, Silicon Valley's dramatic rise over Route 128 most likely stems far more from technological and economic fundamentals, rather than fine distinctions in noncompete enforcement

and other means of restricting employee mobility. In this regard, the Route 128 area has remained a significant innovation center, especially in the life sciences and certain information technology segments.

The article proceeds as follows. Section 2 contrasts the strong and weak versions of the "new wisdom" with the "old wisdom" concerning noncompetes. Section 3 revisits the weak thesis that noncompetes depress employee mobility and critiques several well-known empirical studies. Section 4 revisits the strong thesis that labor mobility increases innovation and impugns the validity of additional empirical studies. Section 5 critiques the standard narrative of the rise of Silicon Valley and the decline of Route 128. We briefly conclude.

2.   The Old and New Wisdom

2.1 The Old Wisdom: Restricting Labor Mobility Is Good and Bad for Innovation

Conventional analysis of noncompetes and related restraints on employee mobility tracks conventional analysis of intellectual property rights. That analysis identifies social costs and gains attributable to limitations on labor mobility in innovation markets. Without empirical evidence in any particular case, this analysis is agnostic in general with respect to the efficiency of enforcing those restraints. On the gains side of the social welfare equation, noncompetes and related restraints enable employees to commit to employers who are reluctant to invest in cultivating the human capital of employees who can move to another employer at will (Blake 1960; Kitch 1980; Rubin and Shedd 1981). When an employee leaves, the employer potentially suffers three costs: (i) it loses its training investment; (ii) the employee may transmit proprietary information to a competitor; and (iii) the firm must incur costs to recruit and train a substitute employee. Without the ability to obligate employees to continue employment, and without a sufficient up-front payment from employee to employer to cover the expected costs in event of the employee's departure, an employer subject to these potential costs faces two choices. The employer can either decline to hire the employee or hire the employee but underinvest in training and the development and transmission of proprietary information (Friedman, Landes, and Posner 1991). These concerns underlie age-old apprenticeship systems: limiting the apprentice's ability to switch employers enables the master to internalize the gains from the intellectual capital transferred to the apprentice (Rubin and Shedd 1981). From an efficiency perspective, although noncompetes may sometimes foreclose post-employment opportunities, they may sometimes result in joint efficiency gains *ex ante* by enabling employment transactions that otherwise would not be economically rational.

On the costs side of the social welfare equation, a jurisdiction that bars noncompetes and other restraints on employee mobility may induce a distorted allocation of human and non-human resources across activities both within and across firms. Within firms, the inability to enforce noncompetes may induce an

employer to modify the internal allocation of team personnel so as to mitigate informational leakage from employee departures.[6] Or the firm may underinvest in R&D by re-allocating resources to activities in which it is not generating informational assets that an employee can transmit to another employer. Following this rationale, noncompetes facilitate the efficient allocation of talent and other inputs to innovation activities within firms.

These social gains must be offset against the social costs of enforcing noncompetes. First, some commentators argue that noncompetes may discourage employees from cultivating their human capital due to the limited ability to access post-employment opportunities (Garmaise 2011; Lobel 2013). It is not clear that this is the case since any employer has an incentive to reward employees who enhance their skills and can therefore make a greater contribution to the firm. Second, and more obviously, enforcing noncompetes limits the mobility of R&D personnel, which may hinder the efficient allocation of talent across firms (Bishara et al. 2015). To be clear, a noncompete does not bind an employee to a firm; rather, like any long-term employment contract, it requires that a third party pay a fee to hire away an employee. Any resulting payment between employers to lift a noncompete is a transfer without static efficiency consequences (Posner, Triantis, and Triantis 2004). However, the costs of negotiating and executing those transactions—which may in some instances preclude transactions altogether—may have dynamic efficiency effects to the extent that slowing down employee turnover impedes the transmission of intellectual capital that would be beneficial to the industry as a whole as a form of knowledge spillover (Gilson 1999; Lobel 2013). These inefficiencies, according to some commentators, are exacerbated when employees lack bargaining power or are uninformed regarding the scope and enforceability of noncompetes (Moffat 2010).

Given these offsetting effects, the conventional analysis of noncompetes and other restraints on employee mobility cannot support a definitive position against or in favor of enforcing these agreements. If noncompetes enable firms to secure the gains from training and R&D so as to efficiently allocate personnel, then barring noncompetes would ultimately reduce the common pool of technological knowledge, including knowledge available for circulation through employee movement. A ban on noncompetes would only yield a net social gain if the costs associated with the free-rider and other problems were exceeded by the benefits associated with the unimpeded circulation of human capital. That tradeoff cannot be resolved *a priori*.

2.2 The New Wisdom: Restricting Labor Mobility is Bad for Innovation

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[6] For instance, Apple is famous for its secrecy practices and separate teams that work on different projects so as to minimize information transfer between them (Lashinsky 2012).

The conventional wisdom is intellectually modest in taking the view that enforcing noncompetes *may* have a net social beneficial effect on innovation. By contrast, the new wisdom tends to take the bolder view that enforcing noncompetes usually, if not always, discourages innovation by slowing down the flow of intellectual capital (e.g., Hyde 2003; Moffat 2010; Garmaise 2011; Samila and Sorenson 2011; Lobel 2013, 2015). Especially given the autonomy, distributive, and other concerns raised by noncompetes—without any strong innovation-based justification—this school of thought usually endorses outright or near-outright bans on noncompetes and other restraints on employee mobility.

The new wisdom appears in two versions, which we will call "weak" and "strong." The weak version is a descriptive proposition that barring noncompetes accelerates employee movement. The strong version goes a step further and asserts that increased movement of R&D personnel promotes innovation by more efficiently allocating talent and by facilitating knowledge spillovers. This view derives from the concept of "agglomeration economies" attributed to Marshall (1890)—namely, the proposition that certain industries benefit collectively by a free-flowing exchange of ideas, even if an individual firm may periodically suffer the loss of some portion of its R&D investment. Building on that concept, Saxenian (1994) and Gilson (1999) contrast Silicon Valley with Route 128 to argue that institutional mechanisms—cultural norms and organizational forms in Saxenian's case and a legal ban on noncompetes in Gilson's case—that promote employee mobility can promote innovation by facilitating the flow of intellectual capital. A large body of commentary by legal scholars and economists has endorsed this proposition in stronger formulations, contending that enforcing noncompetes and other restraints on employee mobility depress innovation (e.g., Hyde 2003; Stuart and Sorenson 2003; Moffat 2010; Garmaise 2011; Samila and Sorenson 2011; Moffat 2012; Amir and Lobel 2013; Lobel 2013, 2015).

A priori there is no reason to weigh the social costs attributable to noncompetes more heavily than the social gains. Hence, the strong version of the new wisdom reduces to an empirical assertion premised upon a single historical example and a limited body of empirical evidence. Saxenian (1994), with adaptation by Gilson (1999), provides the historical example; however, their observations can do nothing more than establish a correlation between legal regime and innovation outcomes (assuming an accurate description of the legal regime, which we refine in Section 5). While Gilson (1999) emphasized the limited policy implications that can be drawn from his observations, a follow-on literature has relied heavily on his account as well as recent empirical studies to drop those qualifications, interpreted those observations in causal terms, and advocated for outright bans on enforcing noncompetes (Hyde 2003; Moffat 2010; Moffat 2012; Lobel 2013, 2015). As we will now argue, this normative position cannot be justified on either theoretical or empirical grounds.

3. Revisiting the Weak Thesis

The weak version of the new wisdom may seem virtually tautological. It would appear to be obvious that a market without noncompetes would operate under reduced transactional frictions, and therefore increased labor mobility, relative to a market with noncompetes. We recognize that declining to enforce noncompetes must have *some* positive effect on increasing employee movement in equilibrium. Yet, there are countervailing factors that potentially diminish the *size* of these effects. First, even without noncompetes, employers have other means by which to restrain employee mobility. Second, contrary to much of the literature, no jurisdiction declines to enforce noncompetes in all circumstances. Rather, a broader or narrower range of noncompete covenants are enforceable, depending on the jurisdiction. Hence, the *incremental* effect on employee mobility of restricting noncompetes may be more limited than might otherwise be expected. As we show, our doubts as a matter of theory are confirmed through a close review of relevant empirical studies.

3.1 Does Banning Noncompetes Necessarily Increase Employee Mobility?

Employers have access to two principal alternative means by which to restrain employee mobility. To the extent that those alternatives can mimic noncompetes, there must be some doubt about the causal connection between banning noncompetes and increasing employee circulation.

3.1.1. Patents as Dampeners on Labor Mobility

A firm may use patents to protect against knowledge leakage through employee movement (Risch 2007). Although a patent may not cover tacit knowledge per se, it may cover a product or method incorporating that tacit knowledge. Assuming the firm can bear (or credibly threaten to bear) enforcement costs, the expropriation risk posed by a departing employee would be limited to informational assets that fall outside its patent portfolio. A patenting strategy converts any departing employee into an encumbered asset that is less attractive to competitors, will receive lower offers from competitors, and can therefore be retained at a lower cost. Hence, even in a jurisdiction that is hostile to noncompetes, there may be significant patent-based obstacles that discourage employee movement. Consistent with our expectations, Agarwal, Ganco, and Ziedonis (2009) find a notable deterrent effect on labor mobility in the U.S. semiconductor industry proportional to a firm's propensity to bring patent infringement suits.

3.1.2 Other Legal Mechanisms to Prevent Mobility

Assume a senior engineer departs Google for Facebook. The employee has been

involved in developing some of Google's most cutting-edge search technologies. As an employer based in California, Google would appear to be powerless to prevent the employee from working for Facebook. Even assuming Google cannot wield a noncompete covenant, Google has other credible legal threats at its disposal.

First, if the employee had signed a non-disclosure agreement and threatens to use confidential information, Google could bring a breach of contract claim.[7] Alternatively, Google could bring a breach of contract claim if it had entered into a long-term employment contract or a shorter-term employment contract with periodic renewal at the employer's option. The latter structure (known as the "option clause") is widely used in the Hollywood television and film industry and effectively locks performers into up to seven-year commitments with a network or studio.[8]

Second, if the employee had signed an invention assignment agreement,[9] Google could bring a claim against the employee if it could credibly argue that the employee is using an "invention" that the employee made while employed by Google. As long as Google's claim could at least survive summary judgment, it could credibly threaten to impose significant discovery and other litigation costs.

Third, Google could bring a trade secret misappropriation claim against the employee and potentially the future employer, alleging that the employee or the future employer had used or disclosed trade secrets belonging to Google. Even if use cannot be shown, Google could seek an injunction to prevent its former employee from joining Facebook if the court finds that the employee threatens disclosure, or in some states (but not California today) would "inevitably disclose" the employer's trade secrets in her new position.[10] Trade secret litigation is a relatively familiar occurrence in Silicon Valley. Intel, Cisco, Apple and other well-known Silicon Valley companies have been involved in prominent, recent trade secret disputes.[11] Depending on the credibility of any such legal threat, and the

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[7] Hyde (2003) states that these agreements have no incremental legal effect because no employment agreement could extend to information that would not otherwise be construed to be a trade secret. This is not correct in California. In 1977, a California state court held that a breach of contract claim could extend to information that would not qualify for trade secret protection. *See* Cybertek Computer Products, Inc. v. Whitfield, 1977 Cal. App. LEXIS 2140, 11-12 (Cal. Super. Ct. 1977). Starting in 1984, this principle was codified in the California Uniform Trade Secrets Act, which specifically states that the statute does not preempt "contractual remedies, whether or not based upon misappropriation of trade secrets" (Civil Code § 3426.7(b)(1)).

[8] California law enforces personal services contracts for a term up to seven years. Cal. Civ. Code §2855.

[9] An invention assignment agreement is an agreement whereby an employee preemptively assigns all rights to the employer in any of the employee's inventions during the term of employment. See Fisk (2009) for a detailed history.

[10] Based on Wiesner (2012)'s survey of 24 states (current as of 2012), courts in only a handful of states explicitly reject the doctrine while the remainder either explicitly recognize the doctrine or, more commonly, apply it occasionally.

[11] Notable disputes include: Cisco's lawsuit in 2014 against Arista, a company founded by departing Cisco employees; Intel's suit in 2000 against Broadcom, which had hired some of Intel's

potential injunction, damages, and litigation costs to which the employee and future employer could be exposed,[12] Google may be able to dissuade Facebook from hiring its employee.[13]

Fourth, Google and Facebook might be parties to a mutual "no-hire" (also known as "anti-poaching") agreements. Beginning in 2005, Apple, Google and other Silicon Valley-based companies reportedly entered into unwritten "no-hire" agreements to protect their trade secrets and to suppress wage competition among one another (Elder 2014; Lobel 2015). Although these arrangements were ultimately dissolved following a settlement with the Department of Justice for alleged antitrust violations (*id.*), they illustrate how firms that are precluded from using noncompetes may have strong incentives to use other mechanisms to protect their human capital investments.

3.1.3 Economic Equivalents

Even in the absence of *any* legal instrument, employers have another potent mechanism by which to discourage employee movement: they can use deferred compensation mechanisms to encourage employees to remain with the firm (Booth 2006). There are multiple methods. Employers can set the vesting schedules of deferred equity compensation so that departing employees suffer an implicit financial penalty. Cisco, a Silicon Valley incumbent and repeat acquirer of startups, typically requires that a target's employees waive "trigger vesting" rights that accelerate upon an acquisition and adopt a new graduated vesting schedule, precisely in order to deter departures by the target's key employees following the acquisition (Mayer and Kenney 2004). Similarly, empirical evidence shows that California biotechnology firms issue stock options with long vesting periods and employees of those firms hold large percentages of firm equity, suggesting that firms are using this approach to constrain the outflow of human capital (Liebeskind 2000).[14]

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most valuable employees; Intel's suit in 1991 against ULSI Technology; and Apple's suit in 1985 against Steve Jobs and Next. Rogers and Larsen (1984, p. 91) discuss two cases in which Silicon Valley firms filed trade secret claims against startups founded by ex-employees, resulting in closure of the startups.

[12]Although trade secrecy claims are certainly not as strong as an absolute bar on post-employment opportunities at competitors, we tend to disagree with Gilson's (1999) implicit assertion that they generally are not reasonably effective substitutes for noncompetes (Hyde 2003), especially taking into account that California law enables courts to award relief in trade secret cases even in cases of merely "threatened" (rather than actual) misappropriation. *See infra* § 5.2.2.2. Although we agree that trade secret suits are "costly" and "uncertain," so are noncompete suits—thus, in those regions such as California with weak noncompete enforcement, one would expect compensating actions by firm-level actors (or even the judiciary) to bolster trade secrecy enforcement. *See id.*

[13] State common law would typically provide Google in this hypothetical with a menu of additional tort claims that do not fall under the trade secret rubric, including breach of fiduciary duty, unjust enrichment, conversion, unfair competition and unfair business practices.

[14] From an efficiency perspective, deferred compensation may be less preferable to a

Alternatively, an acquisition agreement can skew the division of deal consideration such that a small portion is allocated to the up-front purchase price and the remainder is allocated to a future post-acquisition date, contingent on selected employees remaining with the acquiror post-closing for a certain period of time (Makinen, Haber, and Raymundo 2012).

3.2 Empirical Evidence for the Weak Version

Given the availability of alternative mechanisms by which to discourage employee mobility, there is reason to doubt that banning noncompetes would have significant incremental effects on employee mobility (and vice-versa). This assertion runs counter to prominent empirical studies that purport to demonstrate that banning noncompetes substantially increases employee circulation (Fallick, Fleischman, and Rebitzer 2006; Marx, Strumsky, and Fleming 2009; Garmaise 2011; Marx, Singh, and Fleming, 2015). Closer examination of the four major studies on the issue shows that they are either limited in scope or methodologically flawed, and hence do not legitimately establish any broad causal relationship between the enforcement of noncompetes and labor mobility.[15]

Specifically, Fallick et al. (2006) find that California workers in the computer industry show mobility rates that are 56% higher than workers in other states in the same industry; however, there is no such effect in other industries. Fallick et al. (2006) assert more generally: "These results are consistent with Gilson's hypothesis regarding California law. The Silicon Valley effect on mobility appears to run throughout the state's computer clusters." Marx et al. (2009) find that a change in Michigan's law in 1985 that transformed it from essentially a non-enforcing to an enforcing state resulted in a reduction of 8.1% in the in-state mobility rates of inventors when compared to non-enforcing states. Garmaise (2011) examined employment agreements among U.S. executives and found that states that adopted stronger enforcement policies reduced labor mobility. Specifically, Garmaise (2011) reports that "[a] shift to a tougher enforcement regime reduces the arrival intensity of within-industry transfers by 47%. A change in state law to greater enforceability leads to a reduction in within-industry transfers that is both economically and statistically significant." Finally, Marx et al. (2015) conclude that Michigan's shift to an enforcing state led to a "brain drain" of skilled workers—namely, inventors—out of Michigan to non-enforcing states. One regression model shows a 4.4-times greater risk for Michigan inventors leaving the state for a non-enforcing state following the change in legal regime. However, all of these studies exhibit one or more of at least seven substantial limitations that cast significant doubt on—and, in the very least, limit the applicability of—their findings. As we explain,

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noncompete, because there is generally no reasonableness standard to police compensation contracts from imposing external costs on potential future employers (Posner, Triantis, and Triantis 2004).

[15] We briefly address weaknesses in other empirical studies focused on labor mobility in the footnotes.

these limitations could very well change the outcomes of these studies.

3.2.1 *Improper Characterization of How Strongly States Enforce Noncompetes*

First, three of the four studies we examine in detail in this section, as well as many other studies, oversimplify—and largely misjudge—the variation in the strength of state-by-state enforcement of noncompetes. Specifically, these studies classify strength of enforcement either (1) in a binary fashion as "enforcing" or "non-enforcing" states, developed from Stuart and Sorenson (2003); or (2) according to a 12-factor scale developed by Garmaise (2011). We examine each scale in turn.

3.2.1.1 *Inaccuracies in Binary Scales*

Stuart and Sorenson (2003) classify states as "non-enforcing" or "enforcing." Specifically, they identify six states that, during the period 1985-1996, purportedly "preclude[d] the enforcement of *all* noncompete agreements" (p. 190, emphasis added) and five states that "only enforce[d] non-compete covenants under very specific circumstances" (*id.*). These eleven states are considered "non-enforcing." In contrast, they identify twenty-six "enforcing" states that purportedly placed "*no* restrictions" on the enforcement of noncompetes (*id.*, emphasis added), as well as thirteen other "non-enforcing" states that followed a "reasonableness" approach or enforced noncompetes limited in time or space (*id.*).

This binary approach is inherently inaccurate—all states enforce some noncompete provisions and no states enforce all noncompete provisions. Other than California, North Dakota, and Oklahoma (until 1989), all states during that time period essentially adopted a "reasonableness" approach to the enforcement of noncompetes, subject to variation in application (Malsberger 1996; Malsberger 2004; Bishara 2011). Even in the case of California, as we discuss in detail in Section 5.2, the apparent statutory ban on noncompetes is qualified by (i) a statutory exception for sales of businesses, (ii) judicial exceptions for so-called "narrow restraints" (until 2008), trade secrets, and other circumstances, and (iii) the potential enforcement of judgments of out-of-state courts that are more receptive to noncompetes.

Even if one were to draw an arbitrary line between states, it would result during this time period in at most two "non-enforcing" states. Consistent with both Bishara's (2011) comprehensive state-by-state review and our own independent review, we find that during the relevant time periods, other than California and North Dakota, none of the purported "non-enforcing" states in Stuart and Sorenson (2003)—namely, Alaska, Connecticut, Michigan, Minnesota, Montana, Nevada, Oklahoma, Washington, and West Virginia—can plausibly be classified in this

manner.[16]

It appears that Stuart and Sorenson (2003) primarily examined the language of specific state statutes as reproduced in the Malsberger (1996) treatise on state enforcement of covenants not to compete, without carefully reviewing the descriptions of actual case law in the same treatise. Critically, any state's effective noncompete regime cannot be accurately described without taking into account *both* applicable statutes and judicial interpretation of those statutes. Montana is a case in point. Apparently on the basis of the Montana statute voiding "contracts in restraint of trade" (Mont. Code Ann. §§ 28-2-703 & 704), which has common origins with California's statute, Stuart and Sorenson (2003) classify it as a state that "precludes the enforcement of *all* noncompete agreements." Yet, Malsberger (1996, pp. 674-75) expressly states that "[d]espite subsection 703, Montana courts have upheld restrictive covenants in employment contracts" under a general reasonableness standard.[17]

For states without statutes, Stuart and Sorenson's (2003) summary of the Malsberger (1996) treatise is also inaccurate. Our detailed review of the treatise, including cases cited therein, shows that all of the supposed non-enforcing states lacking statutes—Alaska, Connecticut, Minnesota, and Washington—are misclassified (Malsberger 1996, pp. 98-99, 192-94, 604-05, 1136). Again, like the states classified as "permissive" regimes by Stuart and Sorenson (2003), these states essentially enforce noncompetes under a reasonableness standard. Indeed, Bishara (2011)—who undertook a close analysis of an earlier version of the same treatise, Richey and Malsberger (1991)—classifies Connecticut and Washington as the fourth and eighth *strongest* enforcing states, respectively.

3.2.1.2 *Inaccuracies in Graduated Scales*

Garmaise (2011) replaces the over-simplified binary approach with a graduated 12-point scale that assigns equal weight (1 or 0) to the answers (yes/no) to twelve questions based on those in the Malsberger (2004) treatise regarding the strength and scope of noncompete law in various states. While this is an improvement, this scale is still problematic because there is no legitimate legal or other basis to *equally* weight each of the twelve factors. Comparing two of the factors as an example, it is arguably much more important how a plaintiff must prove the existence of an enforceable covenant not to compete than what counts as sufficient post-employment consideration in considering the strength of a state's noncompete regime.

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[16] Nevada's relevant statute was amended in 1995 in order to allow noncompetes not only for employees seeking employment with third parties, but also employees "intending self-employment." (Malsberger 1996). Although this was a major expansion in Nevada law, the previous regime still followed a reasonableness standard (*id.*).

[17] See Dobbins, DeGuire & Tucker, P.C. v. Rutherford, 218 Mont. 392 (1985) (adopting a three-part reasonableness test to determine whether to enforce a noncompete).

There are other problems with the Garmaise (2011) scale. Garmaise's (2011) initial factor—whether the state has a statute bearing on the enforceability of noncompetes (as opposed to mere common law)—does not strike us as indicative one way or the other as to whether the state more strongly enforces noncompete law. Although some very strict states (e.g., California and North Dakota) have adopted statutes, so have some states following the flexible, common law reasonableness standard (e.g., North Carolina and Ohio).[18]

Next, arbitrary thresholds—such as whether a state has upheld a statewide three-year restriction versus only a two-year one—are not particularly meaningful in the overall scheme of noncompete enforcement. Malsberger (2004) does not of course catalog all the noncompete opinions in a given state—thus, Garmaise (2011) could not even answer correctly whether "3-year statewide restrictions have [ever] been upheld" in a particular state. For instance, Malsberger (2004, pp. 3332-37) lists no cases in Wisconsin in which a three-year statewide noncompete was upheld; rather, Malsberger (2004, p. 3336) only cites a case in Wisconsin for which a three-year noncompete was found unreasonable.[19] But Wisconsin courts in fact had upheld a six-year noncompete and suggested that a three-year noncompete would be reasonable.[20]

Last, for perhaps the most important question—"What is an employer's protectable interest and how is it defined?"—instead of examining the full range of protectable interests, Garmaise (2011, p. 421) curiously focuses on whether an "employer can prevent the employee from future independent dealings with all of the firm's customers, not merely customers with whom the employee had direct contact." Besides omitting important protectable interests—such as trade secrets, training and development, and ordinary competition—customer relationships are not the type of interest that would typically be of great concern to the top executives at the large, publicly traded firms examined in Garmaise's (2011) study. Rather, customer relationships and list restrictions—at least at a large public firm—are more likely to apply to sales personnel, who have direct relationships with the firm's customers. Variation among states in a factor not relevant to the examined class of employees may—like the Stuart and Sorenson (2003) scale—produce spurious results.

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[18] Garmaise's (2011, p. 421) threshold for this factor is whether "[s]tates . . . enforce noncompetition agreements outside a sale of-business context." Even limiting the statutory inquiry to this narrow issue still does not rectify the problem, because some states without statutes enforce noncompetition agreements outside of a sale-of-business context.

[19] Mutual Serv. Cas. Ins. Co. v. Brass, 242 Wis.2d 733 (2001).

[20] See Reiman Assocs., Inc. v. R/A Advertising, Inc., 102 Wis.2d 305 (Wis. Ct. App. 1981) (upholding six-year noncompete as reasonable); Fullerton Lumber Co. v. Torborg, 70 N.W.2d 585, 589-92 (Wis. 1955) (remanded for determination of the extent of time as to which noncompete covenant is reasonable and suggesting that a minimum period of three years would be supported by the evidence).

3.2.1.3 *Evaluating the Enforcement Scales*

Ultimately, the ideal metric for evaluating a state's noncompete regime is the probability that a typical employee move that would be allowed in a hypothetical non-enforcing state would *not* be allowed in any given state. Although it is clearly impossible to achieve such accuracy, neither Stuart and Sorenson (2003) nor Garmaise (2011) provide sufficient verification for the legitimacy of their indices, such as an empirical analysis of actual cases. Such untested and rough assessments do not make for valid studies.[21]

This concern is confirmed by examining the correlations between the available enforcement scales. The correlation between the Stuart and Sorenson (2003) binary scale and the Garmaise (2011) 12-point scale is only 0.43. Bishara (2011) constructs an alternate scale[22]—using seven of the twelve questions in the Richey and Malsberger (1991) and Malsberger (2009) treatises—which, although it raises similar issues as the Garmaise (2011) scale, in our opinion is somewhat more likely to be accurate because it uses a graduated scale (unlike Stuart and Sorenson (2003)) and differentially weights different factors in the scale (unlike Garmaise (2011)).[23] The correlation between the Bishara (2011) and Garmaise (2011) scales is 0.66 and the Bishara (2011) and Stuart and Sorenson (2003) scale is 0.42.[24]

Moreover, even if one assumed that Stuart and Sorenson (2003) and Garmaise (2011) properly classified all states, some states with purportedly weak, legislatively driven enforcement of noncompetes may have compensated via stronger judicial enforcement of legal substitutes for noncompetes, such as trade secret law. In Part 3.1, we described in detail a larger menu of potentially offsetting mechanisms. Failure to take account of these compensating mechanisms may lead to a misidentification of the effective enforcement strength of the legal instruments available in a given state to restrict employee mobility.[25]

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[21] Garmaise (2011) additionally examines individual changes in law in three states by using time series estimations, which we address below in Section 3.2.7.

[22] Starr et al. (2014) constructs an alternate scale modeled closely on that of Bishara (2011), which are correlated at 0.94; hence, we ignore the Starr et al. (2014) scale.

[23] In this regard, all three scales rely on a single legal reference (the Malsberger treatise) to make their classifications. This treatise is drafted by many different attorneys—each handling a small number of states—which introduces the possibility that varying approaches are employed in different states to answer the various questions underlying the weighting scheme in Garmaise (2011) and Bishara (2011).

[24] We thank Norman Bishara for providing the data underlying his scale.

[25] In a differences-in-differences analysis, like that in Marx et al. (2009, 2015), arguably these effects would effectively cancel out before and after the exogenous shock. However, this would likely be so only over short time periods. The estimation period in Marx et al. (2009, 2015) is 25 or more years—thus, to the extent there were unmeasured long-term trends in these noncompete substitutes, they could confound the results.

We recognize that some type of quantitative ranking is a necessary precondition to undertake systematic analysis of the economic effects of noncompete laws. However, given the clear errors in categorization, relatively low correlations among different scales, and failure to take account of compensating legal mechanisms, we are doubtful that the results of studies using the Stuart and Sorenson (2003)[26] or Garmaise (2011)[27] scales to measure the effects of noncompetes on labor mobility can be properly relied upon for empirical study.

A better approach to construct an enforcement scale in our view would be to undertake a comprehensive assessment of the actual extent and conditions in which courts enforce (or not) noncompetes. A large number of actual cases should be randomly selected in each state across a time period of interest. The assessment would identify the outcome in the case along with key factors in each case, including occupation, at-will vs. contract employee, employer- vs. employee-driven termination, industry, term of the noncompete, geographic scope of the noncompete, and other key circumstances, such as whether trade secrets, sale of a business, dissolution of a partnership, choice of law/forum, and substantial employee training were present. Multivariate, logistic regressions could then be constructed to compare how different factors affect outcomes across states. These results could then be substituted, where appropriate, for factors like those in Bishara (2011) to construct more accurate scales.

3.2.2 *Failure to Properly Reflect Cross-Border Enforcement of Noncompetes*

Garmaise (2011) and Marx et al. (2015) include cross-border job changes in their datasets. Marx et al. (2015) focuses on the supposed "brain drain" from Michigan to "non-enforcing" states following its decision to enforce noncompetes. Such cross-border moves are complex from a legal perspective, because, as Garmaise (2011) properly notes, the law of the state of the former employer will sometimes apply and, in other instances, the law of the state of the new employer will apply.[28] Marx et al. (2015), however, overlook this complexity and erroneously assume that non-enforcing states *always* apply their own law so as to void a noncompete agreement that falls under the law of another state. Even assuming that Marx et al.'s (2015) list of ten "non-enforcing" states is correct—which it is not (see Section 3.2.1.1)—the

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[26] Studies that rely on the Stuart and Sorenson (2003) scale include Marx et al. (2009), Samila and Sorenson (2011), Younge and Marx (2013), Younge et al. (2014), Belenzon and Schankerman (2014), and Marx et al. (2015).

[27] Studies that rely on the Garmaise (2011) scale include Francis et al. (2007), Samila and Sorenson (2011), Belenzon and Schankerman (2014), Conti (2014), Png (2015), Younge and Marx (2015), and Baslandze (2015).

[28] The law of the state of the former employer may either be the state in which the employee was located *or some other state*, to the extent the employer uses a choice of law provision specifying the law of a different state (e.g., its state of incorporation or headquarters) (Lester and Ryan 2010).

only non-enforcing states that generally refuse to enforce out-of-state noncompetes on public policy grounds are California and North Dakota.[29] Yet, even California does not always void out-of-state noncompete agreements (Lester and Ryan 2010). As we explain in detail in Section 5.2, California courts sometimes transfer cases to another state or stay proceedings so those in another state can proceed, particularly when the employment agreement selects that other state's law and courts.

Furthermore, and perhaps more importantly, all states—including California—will generally enforce a *prior* judgment of another state that afforded the parties a full and fair opportunity to litigate the matter. Thus, if an employee is subject to jurisdiction in the state of the former employer, which often will be the case, then the former employer can sue the employee in its home state.[30] If the employee is not subject to an exclusive choice of forum clause, the employee may then sue for a declaratory judgment in the state of the new employer. Although there are important nuances, essentially, whichever court enforces judgment first will typically bind the employee (Glynn 2008; Lester and Ryan 2010).

Marx et al.'s (2015) simplification of these doctrinal complexities renders that study's key assumption—namely, that non-enforcing states always apply their own law—flawed, and thus confounds its causal identification strategy. As we explain in Section 3.2.4, given the small number of annual employee moves out of Michigan to "non-enforcing" states measured in Marx et al. (2015), this flaw could lead to substantial overestimates of the measured effects of noncompetes.

Garmaise (2011) also suffers from difficulties relating to the treatment of out-of-state moves. Specifically, Garmaise (2011) includes within his analysis out-of-state moves, and unlike Marx et al. (2015) assumes for simplicity that these moves are always governed by the law of the state of the *former* employer (Garmaise 2011, p. 390).[31] Because Garmaise's (2011) dataset contains only a little over 600 within-industry transfers (out-of-industry transfers would generally not be governed by

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[29] Here, we use Malsberger (1996, pp. 102, 136-37, 156-57, 201-02, 618, 684, 719, 857-58, 907, 1147, 1160) and the cases cited therein to make this determination, as Marx et al. (2015) rely on the same treatise to classify state enforcement regimes. As we noted earlier, a complete determination would examine the entire period of 1963-2006, during which there were notable changes in state-by-state enforcement.

[30] In this regard, a proper choice of forum clause in the noncompete will typically provide a jurisdictional basis for the state of the former employer to enter judgment (Lester and Ryan 2010).

[31] To be clear, Garmaise (2011, p. 393) recognizes that California often does not enforce out-of-state noncompetes and, generally, that there is sometimes "ambiguity" about applicable state law in the case of out-of-state moves. To overcome difficulties regarding out-of-state enforcement for his cross-sectional regressions, Garmaise (2011) interacts his enforcement index with the level of "in-state competition" for a former employer, namely the fraction of total industry sales generated by in-state competitors. However, because Garmaise (2011) focuses on top executives at only a little over 2600 of the largest publicly traded firms in the United States, it is unclear that in-state competition is particularly meaningful. Large, publicly traded firms tend to compete nationally and internationally, and although local competitors will be more attractive to executives than remote ones, failure to take account of effective enforceability for out-of-state moves is potentially a major limitation.

noncompetes), it is essential to know what percentage of those transfers were out-of-state (and Garmaise (2011) does not disclose as much). If the percentage is large, then some results in Garmaise (2011) may not be accurate.

3.2.3 *No Data on Actual Usage of Noncompete Agreements By State*

Even if one believes these studies accurately categorize strength of enforcement, no study—other than Garmaise (2011)—provides any measure of the actual usage of noncompete agreements within their sample set or how often employers actually enforce noncompetes (Fallick et al. 2006; Marx et al. 2009, 2015).[32] Available evidence suggests widely varying use of noncompete agreements among various executive and technical employee groups,[33] but there is no evidence to our knowledge of the rate of enforcement across states. This inability to differentiate firm-level usage and enforcement behavior among states introduces the possibility that the observed variation in mobility is not the result of differing state-level enforcement regimes but rather unobserved variation of firm-level usage and enforcement of noncompete agreements and substitutes for noncompetes, such as trade secret actions (cf. Risch 2009; Gomulkiewicz 2015). If firms in different states substantially vary in their propensity to use and enforce noncompetes and noncompete substitutes, and this variance is not highly correlated with enforcement strength, regressing on enforcement indices may yield spurious results.

A version of this issue arises with respect to the studies of Michigan's regime change (from largely non-enforcing to largely enforcing, based on the "MARA" statute) in Marx et al. (2009, 2015). These studies assume that, following Michigan's regime change in 1985, pre-existing noncompete provisions automatically became enforceable.[34] This is not the case. MARA included a "savings clause" that provided that the statute repealed by MARA would "remain in force for the purpose" of enforcing any liability under the repealed act (MARA

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[32] On the other hand, it appears Garmaise (2011) does not limit his set of within-industry transfers to those executives actually subject to noncompete agreements.

[33] Garmaise (2011), which studies top-level executives, finds a roughly 70% usage rate, and Bishara et al. (2015), which studies CEOs at S&P 1500 companies, finds an 80% rate. Kaplan and Stromberg (2003), which study founders of VC-backed firms, finds a roughly 70% rate, and an IEEE study of engineers, cited by Marx et al. (2011), reports a 43% rate. Starr et al. (2015) find lower usage rates, reporting about 23% for managers and about 30% in the engineering, computer, and mathematical fields. These differences are arguably explained by the different datasets—Kaplan and Stromberg (2003), Garmaise (2011), and Bishara et al. (2015) focus on the most sophisticated companies, while Starr et al.'s (2015) findings are likely more reflective of firms as a whole. Additionally, Garmaise (2011) and Bishara et al. (2015) focus on top-level executives.

[34] For instance, Marx et al. (2015) states: "Given that the repeal of Public Act No. 305 merely removed the ban and did not stipulate any governing timeframe, all such contracts [i.e., pre-existing noncompetes] would have become immediately enforceable."

Section 18, MCL 445.788).[35] Consistent with the saving clause, Michigan courts declined to enforce noncompetes that were entered into prior to MARA.[36] In other words, *no* existing employees with noncompetes clauses in employment agreements governed by Michigan law became bound by those clauses following MARA. Rather, any employer seeking to bind an existing employee would need to have that employee sign a new agreement or affirmatively assent to a prior agreement, which would generally result in employers incurring transaction costs and possibly providing additional compensation.[37] As a result, one would expect that the number of employees in Michigan actually subject to enforceable noncompetes was quite low for a considerable period following MARA's passage. During this transition period, as we explain below, one cannot legitimately consider all Michigan inventors as being subject to enforceable noncompetes. If the true regime change (that is, taking into account both nominal and effective changes) took considerable time, a sizable portion of the results in these studies are unlikely to be causally linked to changes in noncompete law. Indeed, Marx et al. (2009) find the exact opposite of the effects one would expect from a gradual noncompete adoption post-MARA, stating that "the effect of the policy reversal remained strong for several years and then weakened, both in terms of the magnitude and statistical significance of the coefficient on the interaction variable."

3.2.4 *Use of the Patent Record to Track Employee Mobility is Incomplete*

Marx et al. (2009, 2015) rely on the patent record to track the movement of inventor-employees before and after changes to noncompete law in Michigan. As these studies recognize, using the patent record will fail to identify inventors who change jobs but (1) do not patent at all; or (2) patent only prior to or following the move. Inventors may not patent inventions because they or their employers decide to rely on trade secrecy or the relative cost-benefit ratio of patenting may simply be

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[35] For detailed descriptions of the history leading up to the passage of MARA, see Bristol Window and Door Inc. v. Hoogenstyn, 250 Mich. App. 478 (Mich. Ct. App. 2002) and Cornelius (1986).

[36] Compton v. Joseph Lepak, D.D.S., P.C., 154 Mich. App. 360, 397 N.W.2d 311, 316 (Mich. Ct. App. 1986) ("When an agreement or contract is entered into in violation of the statute, repeal of that statute does not make the agreement valid because the Legislature cannot validate a contract which never had a legal existence."). The subsequent 1987 amendment was also not made retroactive to the pre-MARA period and explicitly stated: "This section shall apply to covenants and agreements which are entered into after March 29, 1985" (Mich. Comp. Laws Ann. § 445.774a (West 1989)).

[37] A federal district court held in 1991 that additional consideration was unnecessary under Michigan law to enter into a binding noncompete with at-will employees. See Robert Half. Intern., Inc. v. Van Steenis, 784 F. Supp. 1263, 1273 (E.D. Mich. 1991). However, the decision was not binding on the Michigan state courts. One Michigan state court affirmed the federal court's approach in dicta in 2004, see QIS, Inc. v. Indus. Quality Control, Inc., 262 Mich.App. 592, 594 (2004), but no state court conclusively decided the issue until 2014 (and by a 2-1 margin in an unpublished opinion), see Posselius v. Springer Pub. Co., Inc., 2014 WL 1514633 (Mich. Ct. App. 2014).

too high (Graham and Sichelman 2008; Graham et al. 2009). Marx et al. (2009, 2015) attempt to overcome this limitation by using a differences-in-differences approach and by relying upon a complex "synthetic" model to predict patenting and mobility rates in Michigan before and after the regime change based on comparisons to other "non-enforcing" states. Even setting aside our doubts about the enforcing/non-enforcing taxonomy in Stuart and Sorenson (2003), which Marx et al. (2009, 2015) incorporate, we do not believe a differences-in-differences approach can adequately control for missed inventor moves before and after the regime change in Michigan.

Although we agree that a fairly restrictive noncompete regime will tend to depress mobility in *equilibrium*, this is not necessarily so in *disequilibrium*— particularly when a region strengthens the enforcement of noncompetes. Specifically, if there are a sufficient number of employees not subject to noncompete covenants just after the strengthening of enforcement, as was the case in Michigan (for reasons explained in Section 3.2.3), this change in enforcement may promote hiring at firms that benefit from strong noncompete laws, such as those firms that rely heavily on trade secrets rather than patents. Similarly, strengthening noncompete laws will depress the relative advantage of those firms in Michigan that do not benefit as much from strong noncompete laws, such as those firms that rely heavily on patenting. Thus, strengthening the enforcement of noncompetes will likely simultaneously lower the effective cost per employee at firms relying more heavily on trade secrets and raise it at firms relying more heavily on patenting.

A differences-in-differences methodology—which compares mobility rates in Michigan to non-enforcing states prior to and after the regime change—will fail to capture all of these differential costs. The regime change in Michigan arguably introduced a labor-cost discontinuity that caused a shock resulting in an immediate reallocation of the labor supply from firms relying heavily on patenting to those relying heavily on trade secrecy, especially within Michigan (given relocation costs).[38] Thus, the regime change allowed greater effective access for firms relying more heavily on trade secrecy to a pool of inventors previously out of reach. After this initial wave of hiring—that is, once this newfound pool of inventors had been tapped—employment trends would presumably return to a steady-state equilibrium, and could be compared to those in other states. But during this disequilibrium period, such a comparison would not hold.

By relying solely on the patent record, Marx et al. (2009, 2015) cannot track inventors who protect their inventions by trade secrets. Critically, if inventors at patenting firms patented prior to the regime change in Michigan, then moved to a firm relying on trade secrecy, continued to invent, but did *not* patent, these inventors would be counted as *not* moving in this study. Because of the disequilibrium following MARA in Michigan (relative to other non-enforcing states in

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[38] The number of inventors moving out-of-state from Michigan following MARA was about an order of magnitude less than those moving within state (Marx et al. 2009, 2015).

equilibrium), Marx et al. (2009, 2015) therefore arguably undercount a substantial number of moves within Michigan of inventors moving from firms relying heavily on patenting to those relying heavily on trade secrecy. Thus, even a differences-in-differences approach will likely *underestimate* the levels of labor mobility within Michigan. Similarly, this approach may wrongly overestimate the *net* levels of inventors leaving Michigan for other states. Following the regime change, firms relying heavily on trade secrecy in Michigan would have gained an advantage relative to similar firms outside Michigan, resulting in a greater inflow of out-of-state inventors to Michigan firms relying heavily on trade secrets than to similar firms in other states, as well as reduced outflow from Michigan of inventors to firms in enforcing states relying heavily on trade secrets. Because Marx et al. (2015) cannot identify all of these inbound or outbound moves (nor do they even report on outflow to *enforcing* states), they potentially overstate the *net* level of brain drain out of Michigan.

These criticisms are especially salient given the relatively small incremental decrease in absolute terms in labor mobility in Michigan identified by Marx et al. (2009, 2015). Marx et al. (2009) consider 98,468 inventors and 27,478 inventor moves within Michigan over the period 1963-2006.[39] Labor mobility actually increased post-MARA over the full time period from 7.18% to 8.98%, whereas in other "non-enforcing" states there was a larger increase, from 7.95% to 10.80%. In other words the difference in Michigan versus non-enforcing states in absolute term was roughly 1%, equating to an absolute difference of about 100-200 moves per year purportedly lost within Michigan due to the enforcement of noncompetes. For inventors moving out of Michigan, the numbers are much lower—the purported difference of inventors moving out of Michigan to non-enforcing states pre- and post-MARA is in the range of merely 20-25 inventor moves per year. Given the very small number of job changes upon which the results of these studies are premised, the potentially negating effect of these missed moves cannot be easily dismissed.

3.2.5 *Most Studies Do Not Distinguish Between Competing and Noncompeting Firms*

Marx et al. (2009, 2015) track the mobility of employees to any firm, rather than mobility to competing firms. No state enforces noncompetes that purport to proscribe employment at *non*-competing firms. Thus, in order to isolate the effects of noncompetes, it is essential to track labor mobility solely among competing firms. In empirical terms, an employee who makes an out-of-industry move to a noncompeting firm is, contrary to the implicit assumptions of Marx et al. (2009, 2015), not effectively subject to a noncompete restriction and hence should not be

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[39] Marx at al. (2015) examine the period 1975-2005.

classified within a "treatment" group.[40]

This distinction is critical. As noted earlier, Fallick et al. (2006) find overall that there is an increased propensity for engineers in the California computer industries to change jobs relative to engineers in the same industries in other states. As such, Fallick et al. (2006) conclude that "[t]hese results are consistent with Gilson's hypothesis regarding California law." However, these results examine whether these engineers moved to *any* other employer, not just employers in the same industry. Hence, they have no direct bearing on Gilson's hypothesis, which only concerns the role California law plays in preventing moves to *competitors*. Indeed, when Fallick et al. (2009) examine within-industry moves, they only find increased mobility in Silicon Valley, not in other California regions with computer industries, such as Los Angeles or San Diego. As Fallick et al. (2009) note, "[t]hese results do *not* offer support for Gilson's hypothesis" (emphasis added). If California noncompete law were strongly promoting mobility, one would expect significant effects not just outside of Silicon Valley for the computer industry, but for many other technology industries in which secrecy plays an important role (Cohen at al., 2000; Graham et al., 2009).[41] Fallick et al.'s (2006) failure to find out-of-region or other-industry effects points towards an explanation that is specific to the nature of the Silicon Valley computer industry, the subject time period (1994-2001, the height of the "Dot com" boom), or the combination of these two reasons.

3.2.6 *Many Studies Are Not Generalizable*

Several of the studies have limited applicability because they focus on particular types of employees or firms. Garmaise (2011) limits his mobility study to top executives of large publicly traded firms, which may not be indicative of the role noncompetes play for engineers or startups (Starr et al. 2015). Marx et al. (2009, 2015) limit their analysis to employees that patent. As Cohen et al. (2000) and Graham et al. (2009) find, many innovative firms rely on other forms of intellectual property protection, in particular trade secrecy. Without some indication of the

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[40] One possible counterargument is that the differences-in-differences approach of Marx et al. (2009, 2015) would compensate for changes in out-of-industry moves, because the 1985 change in noncompete law in Michigan would not affect such moves. Perhaps this is so, but it is impossible to discern as much given Marx et al.'s (2009, 2015) reporting on all industry moves. Thus, the possibility remains that there was an unobserved factor that caused a change in out-of-industry mobility within the same time period that is driving the results in Marx et al. (2009, 2015).

[41] Fallick et al. (2006, p. 479) contend that "hypermobility ought *not* to be a general feature of . . . labor markets" (emphasis in original), suggesting that only agglomeration economies should exhibit these features. However, Fallick et al.'s (2006) theoretical model is based on Acemoglu (1997), which focuses on human capital and related investments in the form of training, rather than the leakage of trade secrets. In a more general model, the ability of employees exposed to trade secrets to share this knowledge with new employers would tend to create strong incentives for mobility across any industry in which confidential information, especially tacit knowledge, plays an important role.

relative importance of patents to trade secrecy and other forms of protection, it is difficult to draw conclusions about the role of noncompetes on innovation overall.

Although Fallick et al. (2006) is not subject to these limitations, that study examines moves among employees in the computer industry during the "Dot.com" boom (1994-2001), in which employees may have been more easily induced to "job hop" given the large amounts of capital available at that time. Because most of the Dot.com firms were located in California, particularly Northern California, the high level of labor mobility in the computer industry reported by Fallick et al. (2006) may simply be an effect specific to a period and a location in which job-hopping opportunities were especially rich, rather than explained by California's noncompete regime.

3.2.7 *Nearly All Studies Cannot Show a Sufficiently Causal Link between Mobility and Noncompete Enforcement Strength*

Consistent with our observations in the previous sub-sections, Fallick et al. (2006) is a purely cross-sectional set of regressions and, therefore, cannot easily eliminate alternative explanations for its findings. Garmaise (2011) presents both cross-sectional and time-series studies. We explained earlier how Garmaise's (2011) cross-sectional studies lacked sufficient validity given that the "12-factor" enforcement scale is unlikely to reflect actual enforcement strength in a given state and given the failure to appropriately account for cross-border employee moves. In addition to the cross-sectional approaches, Garmaise (2011) uses changes in the laws of three states to perform time-series analysis to measure changes in employee mobility, tenure, and compensation, firm R&D, and other characteristics.

Garmaise (2011) claims that only three states experienced significant changes during the period 1992-2004 in their noncompete law that would justify a change in score in their enforcement index. This is an important claim, because Garmaise (2011) uses the other states as "controls for any time-series variation" under the assumption their enforcement scores did not change. However, upon our independent review of the Malsberger (1996, 2004) treatises and other sources, it appears that several other states underwent changes that would justify changes in enforcement scores using the Garmaise (2011) enforceability index measure.[42]

Moreover, contrary to the assertion of Garmaise (2011), the legal changes in the three states do not appear to be "exogenous shocks" in two senses. First, they were not "shocks" in that all of the changes were easily anticipated and shifts in firm and employee behavior could have occurred well before these changes took place.

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[42] One major changed occurred in Nevada in 1995. See supra note 16. Additionally, the raw data from Bishara (2011) indicates notable changes in law between 1991 and 2009 in Georgia, Idaho, Hawaii, Iowa, Massachusetts, Vermont, and Wyoming, presumably some of which occurred between 1992 and 2004.

Second, it is possible that at least some of the changes—particularly the statutory change in Florida—were an endogenous reaction to existing patterns of labor mobility, especially if these changes were the result of lobbying, amicus, and similar efforts by employers.

For purposes of illustration we focus on Garmaise's (2011) description of the supposed change in law in Texas.[43] Garmaise (2011, pp. 390-92) claims that the Texas Supreme Court's 1994 decision in *Light v. Centel Cellular* was a major "exogenous shock" in the law that made it "substantially more difficult to enforce noncompetition agreements in Texas."[44]   In *Light*, the Texas Supreme Court interpreted a statutory provision passed by the Texas Legislature in 1989, requiring that "the covenant must . . . be ancillary to or part of an otherwise enforceable agreement at the time the agreement is made."   The court found that the Texas legislature did not define "ancillary to a contract" and chose a narrow definition that was "consistent with [its] previous decisions."

To the extent there was any change in law in Texas, it was relatively minor compared to previous decisions and generally followed common law standards that a noncompete must further the legitimate interests of protecting goodwill or confidential information. *Light* did make clear that any consideration provided for the noncompete must be tied to other contractual obligations at the time the noncompete is entered into by the employee, which made it difficult for at-will employees to qualify for noncompete treatment absent further consideration. However, the Texas Supreme Court had already held that at-will employees could not be subject to noncompetes *at all* at least since 1991.[45]   Given that *Light* interpreted a 1989 statute in a reasonable way, and its major consequences were already foreshadowed by a 1991 opinion, the decision is hardly an unanticipated "shock."[46] Additionally, this clarified consideration requirement would have had

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[43] Similar problems plague the changes in law in Louisiana and Florida, as we briefly describe in note 46 below.

[44] Light v. Centel Cellular Co. of Texas, 883 S.W.2d 642, 644 (Tex. 1994).

[45] See Travel Masters v. Star Tours, 827 S.W.2d 830, 832-33 (Tex. 1991).

[46] Garmaise (2011) also claims that Louisiana and Florida experienced "exogenous shocks." The supposed change in Louisiana in SWAT 24 Shreveport Bossier, Inc. v. Bond, 808 So. 2d 294 (La. 2001), resolved a split of authority within lower courts that had existed since the 1990s. Thus, the rule in *Bond* was already in place in part of the state, and employers in other parts would arguably have been well aware that the Louisiana Supreme Court could resolve the split among lower courts in the manner it did.

In Florida, the legislature strengthened noncompete enforcement in a statute passed in 1996 (Malsberger 2004), mainly in response to a 1990 statute that had weakened enforcement (Grant and Steele, 1996). Prior to 1990, Florida appears to have enforced noncompetes just as strongly, if not more so, than after 1996. From 1990 to 1996, Florida was in a state of flux, which means prudent employers would likely have predicted the possibility of legal change and reacted accordingly. Moreover, it is likely that the legislature was probably reacting to existing mobility trends within the states, especially because employers most likely participated in lobbying the state legislature to effect the change. Thus, the 1996 statute cannot be viewed as an exogenous shock. Additionally, Garmaise

little effect on large publicly traded firms, the focus of Garmaise (2011). The vast majority of top-level executives, as well as engineers at publicly traded companies, were most likely subject to employment agreements that tied any noncompete clause to consideration made in return for promises not to disclose confidential information or harm the goodwill of the company, making their noncompete obligations most likely enforceable under Texas law.

Thus, the time-series analysis in Garmaise (2011) is unlikely to provide proper causal identification. Specifically, because all of these supposed "changes" could have easily been anticipated by employers—and, in the case of Louisiana, firms in particular regions were already subject to the legal "changes"—there is no exogenous "shock" that can be used to definitively examine trends before and after a certain date. For instance, if employees in Florida anticipated the move to a stronger regime, then employees might have moved in larger numbers to firms willing not to impose a noncompete *prior to* the change, with less mobility afterwards.[47] Without carefully examining pre-shock trends, one cannot rule out that the results in Garmaise (2011) are confounded by these sorts of anticipated actions.

Unlike Garmaise (2011), Marx et al. (2009, 2015) essentially examine a "natural experiment," namely Michigan's repeal of its general ban on noncompetes in 1985, which provided a plausibly exogenous "shock" to Michigan's legal landscape because it appears to have been unanticipated.[48] Nonetheless, it appears Marx et al. (2009, 2015) also suffer from identification concerns that cast doubt on their use of a differences-in-differences (DID) approach to infer causality. A DID approach generally requires that "interventions are random" to infer causality (Bertrand et al. 2004). As we explained earlier, when the Michigan legislature enacted MARA and

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(2011, p. 402) attempts to incorporate the prospective nature of the change in Florida merely by delaying its impact by one year, assuming that new noncompetes would be signed within this time period. We find this assumption highly doubtful as a matter of practice, particularly for top executives. In this regard, executives who had signed agreements prior to 1990 remained subject to a fairly strong enforcement standard (Grant and Steele, 1996).

[47] We thank Evan Starr for this suggestion.

[48] Marx et al. (2009, 2015) characterize the repeal as "accidental" and "inadvertent." We believe it is more accurate to characterize the repeal as not fully anticipated by the market, given certain judicial decisions starting in the 1970s that had eroded the statutory ban on noncompetes (Cornelius 1986). Cornelius (1986) asserts that the repeal was consistent with judicial decisions starting in the 1970s that had eroded the statutory ban on noncompetes. Moreover, the removal of the existing "per se" ban on noncompetes was consistent with the general purpose of the MARA statute, which, as stated in the legislative history, favored the adoption of "rule of reason" over per se rules (the noncompete ban falling into the latter category) to determine antitrust liability. Thus, to some extent the change may have been endogenous in the sense that MARA responded to overall economic conditions, including labor trends. However, it is still plausible that the market had not anticipated the repeal, given that, as Cornelius (1986) and Marx et al. (2009, 2015) note, the legislative history of MARA makes no specific reference to noncompetes and as the Michigan Court of Appeals in *Bristol Window*, *supra*, explained, when originally enacted, MARA contained no specific sections addressing noncompetes.

thereby repealed the ban on noncompetes, courts soon held that noncompetes in effect at the time of the repeal *remained unenforceable*. Thus, contrary to Marx et al. (2009), the set of inventors in Michigan immediately following the passage of MARA is not a randomly assigned treatment group, because those inventors—absent signing an amendment to their existing employment agreement—remained subject to the pre-MARA ban on noncompetes.

Thus, no causality from the regime change can be inferred from mobility estimates for those inventors effectively subject to the pre-MARA, non-enforcing regime. Instead Marx et al. (2009) make the improper inference that "[t]he sharpness of the effect in the years following shortly after MARA, which levels off later, strengthens our confidence in the effectiveness of the natural experiment and differences-in-differences specification." Rather, because Marx et al. (2009, 2015) make no attempt to estimate the percentage of inventors effectively subject to the pre-MARA regime following MARA's passage, there is no reliable basis to infer that the entire reported change in mobility among Michigan is causally attributable to the enforceability of noncompetes.

3.2.8 *Why the Limitations of these Studies Likely Affect their Results*

To be certain, the limitations we have discussed above do not mandate that the results in these studies are substantively incorrect. It may be the case that some studies suffer from "ordinary measurement" error (which would underestimate the size of the effects found in those studies) or the errors we have identified are too minor to plausibly change these studies' results. However, there are strong reasons to doubt that the limitations described above are ordinary measurement errors or essentially trivial, implying that they *are* likely to alter these studies results—either the size or significance, or even the direction and nature, of the effects measured.

First, and perhaps most importantly, the Stuart and Sorenson (2003) scale misclassifies eight of ten states as "non-enforcing" but does not misclassify any of the "enforcing" states. Such misclassification is not random, but rather is a one-way systemic error. Stuart and Sorenson's (2003) misclassification of "enforcing" and "non-enforcing" states lies at the heart of the empirical instruments in Marx et al. (2009, 2015) used to measure worker mobility. Indeed, in absolute numbers, labor mobility within Michigan *increased* following Michigan's change to an enforcing regime in 1985 (Marx et al. 2009, p. 883).

The "decrease" reported in Marx et al. (2009) only arises because the increase in labor mobility in Michigan was less than that predicted *when compared* to those increases in the ten purported "non-enforcing" states. Because eight of these states were in fact "enforcing" states for part or all the time period examined, this comparison may produce spurious results.[49] Specifically, if the increases in labor

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[49] One possible consolation is that Stuart and Sorenson's (2003) "non-enforcing" states may be

mobility after 1985 only occurred in the eight misclassified "non-enforcing" states, and labor mobility in the remaining, actual "non-enforcing" states stayed the same or showed decreases, then the results in Marx et al. (2009) would be completely reversed. In other words, like the increase in absolute levels of labor mobility after 1985 in Michigan, even when compared to the properly classified "non-enforcing" states, Michigan's shift to an enforcing regime could have *increased* overall mobility. Without re-running this study under a proper set of legal classifications, it is impossible to know.

Marx et al. (2015) suffer from the same problem as this study compares mobility from Michigan to the remaining ten "non-enforcing" states before and after 1985. Although Garmaise's (2011) scale appears to suffer more from random error than systemic error, because in our view, there is no scale, even Bishara (2011), that has been definitively validated, it may be the case that Garmaise (2011) is subject to the same limitations as in Marx et al. (2009, 2015). So while the results of Marx et al. (2009, 2015) and Garmaise (2011) may be statistically significant, they are not necessarily *meaningful* when determining the role noncompetes play in suppressing labor mobility.[50]

Second, the failure to properly take account of the non-retroactivity of Michigan's change in law via MARA also casts considerable doubt on the reliability of the differences-in-differences methodology employed by Marx et al. (2009, 2015). Specifically, it confounds these studies' claims to causal identification, because the only Michigan employees not entering entirely new jobs subject to enforceable noncompetes post-MARA were those selected by their employers for "treatment," i.e., the signing of a noncompete provision. Such selection would not be random, but instead would turn on factors such as whether the employee was at-will, had knowledge of company trade secrets, was highly skilled, and the like. For instance, the finding of Marx et al. (2009) that highly skilled employees saw greater

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weaker than their "enforcing" states—for instance, the eleven non-enforcing states on average rank 34th out of 51 states (including the District of Columbia) on another, somewhat more accurate scale (Bishara 2011). However, if these eleven states were indeed the weakest enforcing states, they would average 46th. Given this large deviation and the general doctrinal similarity between nine of the "non-enforcing" states and the "enforcing" states, the Stuart and Sorenson (2003) classifications cannot in our view legitimately be used for empirical analysis, particularly to gauge the magnitude of the effects of noncompetes on labor mobility and innovative activity.

[50] Presumably, one could rerun these studies with only California and North Dakota classified as "non-enforcing." However, given North Dakota's small size, these studies would essentially boil down to California versus other states. Although we believe such studies would nonetheless be instructive, given the numerous shifting economic, regulatory, geographic, and other trends in California, the studies would be unlikely to provide sufficiently definitive answers to the question of how noncompetes *generally* affect labor mobility. Indeed, most of the existing studies attempt to show there is no "California effect" driving their results (Marx et al. 2009, 2015; Garmaise 2011; Stuart and Sorenson 2003; Samila and Sorenson 2011). Thus, a better approach to re-running the studies would be to use a more accurate continuous scale, such as the one we describe in Section 3.2.1.

decreases in mobility post-MARA may simply be an artifact of employers selectively choosing to negotiate with these types of employees rather than the causal effect of a purportedly random treatment by Michigan's choice to enforce noncompetes.

Third, the failure of Garmaise (2011) and Marx et al. (2015) to properly take account of cross-border moves, as we note above, may overestimate the effects of noncompetes on labor mobility, because in some situations these moves would have been governed by a contrary set of laws than assumed in the empirical approaches in these studies.

Fourth, even if these studies' findings are nominally correct, because of various implicit assumptions about the law that are inaccurate—e.g., that noncompetes govern moves outside of an industry, that firm-level usage and enforcement of noncompetes is constant across states, that executives' mobility would be prone to court decisions regarding the role of customer lists, and that changes in certain laws were "shocks"—as we noted in the previous sub-section, one cannot causally attribute decreases in labor mobility wholly to noncompete enforcement trends. To this extent, the empirical specifications in these studies should be modified so as to focus on plausible causal links between noncompetes and labor mobility.

3.2.9 *Summary: Strong Reasons to Doubt Findings of Empirical Studies*

Of the four major studies examining the effects of noncompetes on labor mobility that we reviewed in detail, all suffer from multiple infirmities explained in detail in this sub-section. In our view, these infirmities cast substantial doubt on the validity of the findings in three of these studies (Marx et al. 2009, 2015; Garmaise 2011) and the general applicability of these findings in one of them (Fallick et al. 2006). In other words, there is a strong possibility that these errors would reduce the size of the effects in these studies, result in opposite effects, or potentially eliminate statistically significant effects entirely. As such, none of these studies can be relied upon for a general assessment of the role noncompetes play in restricting labor mobility. All of the additional studies we could locate that find a negative effect on labor mobility from noncompetes appear to suffer from one or more of these limitations.[51] Given the theoretical reasons to doubt that noncompetes have a substantial effect on labor mobility—namely, the availability of substitutes for noncompetes and the lack of evidence for widespread enforcement—we believe a skeptical stance toward even this weak thesis of the "new wisdom" is warranted.

4. Revisiting the Strong Thesis

The strong form of the new wisdom moves beyond a merely descriptive proposition. The strong form proposes a two-step sequence in which banning

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[51] See supra notes 26-27 (listing studies relying on flawed scales).

noncompetes and similar restraints increases employee mobility, which in turn yields welfare gains by accelerating innovation. Enforcing noncompetes would therefore appear to impede innovation by impeding the flow of intellectual capital. We do not reject the proposition that noncompetes impose a transaction-cost burden on knowledge exchange in the form of dispute-resolution, negotiation, and related costs. We are more skeptical of any sizable collective action problems preventing knowledge spillovers, but we recognize these market defects could exist, at least in pockets. Nonetheless, we cannot identify any compelling economy-wide justification to weight the incremental transaction costs, negative externalities, and associated innovation losses attributable to noncompetes *more than* the expropriation risks and associated innovation losses attributable to their absence. Whether or not that skewed weighting is appropriate is indeterminate *a priori*.

4.1   *Employer-Employee Negotiation Over Noncompete Clauses*

Whenever an employer is contemplating including a noncompete or other similar limitation in an employment contract, it faces a tradeoff. Limitations on post-employment opportunities increase the firm's ability to internalize the gains from its training and R&D expenditures. But those gains often come at a price. Employees may demand compensation for agreeing to limitations on the ability to access future employment opportunities,[52] which necessarily reduces the employee's future expected earnings in the event he or she leaves the employer (or limits the employee's negotiating leverage if he or she remains with the employer).[53]

As Garmaise (2011) and Lobel (2013) assert, the firm may incur another implicit cost if employees who are subject to noncompetes reduce the quantity and quality of their output given limitations on post-employment opportunities. However, this last point should be substantially qualified: employees subject to a noncompete clause would still have strong incentives to invest in effort so long as there is (i) less than complete job security (always true); (ii) the employer makes compensation decisions based at least partly on observed effort (nearly always true); and (iii) the noncompete clause is restricted in duration, geography and/or scope (always true). In view of these qualifications and for simplicity, we ignore this last cost category in the following discussion.

Even in a jurisdiction that enforces noncompetes, there is no reason to believe that employers will always or even usually be willing to pay the price that prospective employees may demand in return for a noncompete. This will be less

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[52] Nonetheless, overall employee wages may decrease from signing noncompetes. Any increases in pay may be offset to the extent an employee agrees to a reduction in compensation in order to finance training costs. The "net cost" borne by an employer to "purchase" a noncompete will therefore vary in any particular case.

[53] Heen (2008) finds, for instance, that CEOs who signed noncompetes were paid around twice as much in total separation pay than other CEOs, and rules out other factors, such as weak corporate governance.

likely in the case of firms that can use substitute and potentially less-costly instruments to discourage employee departures. In general, we expect to observe variation in the mix of post-employment constraints as employers and employees in any particular market respectively assign different values to two variables: (i) the *employer*'s net expected future gains from training and knowledge internalization flowing from a noncompete (which raises the price an employer is willing to pay for a noncompete); and (ii) the *employee*'s net expected future gains from post-employment opportunities at the employer's competitors (which raises the price an employee will demand for agreeing to a noncompete).[54] As the employer's expected gains rise in value relative to the employee's, we would expect to see greater adoption of noncompetes since employers value the noncompete highly and employees are willing to "sell" it at a low price; as that ratio is reversed, we would expect to see the opposite. Where both variables are high, results are likely to be mixed

4.1.1 A Preliminary Framework for Determining Firms' Preferences for Noncompetes

Using this decision calculus, we can roughly anticipate markets in which we expect noncompetes will be selected. Based on our previous discussion, industries that exhibit some or all of the following characteristics are less likely to adopt noncompetes: (i) low capital requirements;[55] (ii) short product development times; (iii) rapid product obsolescence; (iv) strong intellectual property protection (including patents, copyrights, and trade secrets); (v) robust complementary assets (such as strong marketing or manufacturing capabilities); and (vi) high levels of industry-specific product interoperability.[56]

Under those conditions, the employer does not highly value maintaining control

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[54] In some situations, the employee may prefer a noncompete because gains to his own human capital from training—which could not occur absent a financing commitment—outweigh any losses from foreclosing potential post-employment opportunities (cf. Rubin and Shedd, 1981). In order to address the new wisdom's strongest argument, we assume here for simplicity that there is a net cost to the employee from agreeing to the noncompete.

[55] Within capital requirements, we include not only financial capital, but also intellectual capital requirements, such as developing inventions and proprietary data; human capital requirements, such as training employees; and social capital requirements, such as developing relationships with clients and customers. In this regard, we find that the relevant literature too often focuses on the effects of noncompetes on investments in human capital (e.g., Fallick et al. (2006)), rather than intellectual and social capital more generally.

[56] In industries involving high levels of interoperability, presumably there is substantial information sharing among firms, which is either protected by patents or not at all, at least within the circle of relevant competitors. Either way the gains from internalizing R&D via noncompetes are reduced in this situation. Additionally, interoperability implies that training results in industry-specific capital, which makes the value of intra-industry post-employment opportunities more valuable for employees. Thus, on balance, industries characterized by high levels of interoperability will, all other factors equal, typically fall into this category.

over its knowledge assets because those assets are not particularly costly to develop, even successful products have short lifetimes, and, in some cases, the product is embedded in a portfolio of IP assets and/or supported by complementary assets that are difficult to replicate. For the same reason, employees in that fast-paced environment are more likely to demand a high price for accepting noncompetes due to the expectation that a current employer's project is likely to conclude rapidly, in which case the employee may be compelled to seek employment elsewhere. Additionally, the rate at which new opportunities arise is likely to be greater in a fast-paced industry. Hence, employment contracts are less likely to include a noncompete clause, and if they do, employers are unlikely to enforce them vigorously. The software industry, particularly the Internet-based sector, tends to fit this mold (Graham et al. 2009).

Noncompetes are more likely to be selected in markets that exhibit the opposite characteristics. In the biopharmaceutical sector, capital requirements are enormous (approaching or exceeding $1 billion in the case of a FDA-approved drug (Di Masi et al. 2003)), product development is long (about 10 years on average), product obsolescence is slow, and interoperability is minimal. Given those considerations, the employer is likely to place a relatively high value on internalizing the gains from R&D investment and therefore should be willing to pay a relatively high price for achieving that objective through restrictions on departing employees. Moreover, the potential costs to a biopharmaceutical employee from a noncompete is presumably lower than in the software industry given longer product development cycles, which—in view of the importance of project-specific knowledge to biopharmaceutical development—tends to ensure longer employee tenures and diminish the number of potential opportunities at competing firms.

4.2 Will the Market Efficiently Select Noncompete Clauses?

The framework above anticipates different patterns in the use of noncompetes in different markets. While these patterns are based on theoretical reasoning, the fundamental point is that competitive labor markets are likely to vary widely with respect to the use and enforcement of noncompetes. It remains to consider whether the market's privately efficient selection of noncompetes will converge upon the socially efficient level of contractual restraints on employee mobility. We argue that there is no reliable ground to believe that a competitive market will ordinarily diverge in the presence of reasonable legal restraints from socially efficient uses of noncompete covenants.

In contrast, Gilson (1999) argues that market contracting may converge on an inefficiently strong use of noncompetes. The rationale is a collective-action problem. Suppose that all firms would be better off if noncompetes were abolished, which would minimize the costs of transmitting intellectual capital across firms, enhance knowledge spillovers, and accelerate innovation in the industry as a whole. Following this logic to its extreme, the new wisdom asserts that collective welfare

is maximized by generally banning noncompetes.[57] Yet, as observed earlier, the collective-action argument is vulnerable to the objection that firms will respond to the ban on noncompetes by using alternative mechanisms to control knowledge leakage and mimic the missing noncompete.

There are two further objections to this argument. First, it is not clear that there is necessarily a collective-action dilemma. In a competitive labor environment, firms may seek to attract the most highly valued labor by offering employment agreements without noncompetes, thereby enabling employees to access the full stream of post-employment opportunities. Even in a jurisdiction that enforces noncompetes, there is no reason to believe that the market would uniformly adopt them. If we observe widespread adoption of noncompetes, it may simply be the case that employers are willing to pay the price demanded by employees in a competitive market for agreeing to noncompete clauses.[58] Alternatively, it may be the case that employers include noncompetes in employment contracts but, in the competitive pursuit of scarce talent, cultivate a reputation for generally not enforcing those clauses against departing employees. For instance, Gomulkiewicz (2015) presents data that technology firms in Washington rarely enforce noncompetes, casting doubt on the proposition that noncompetes have strong deterrent effects across technological industries and firms.[59] Reasons for employers refraining from enforcing noncompetes include high litigation costs, risk of countersuits by the employee and other employers, trade secret disclosure risk, problems of proof, public relations risks, lack of concern over the departing employee, and benefits from the employee starting a new venture to the employer (Gomulkiewicz 2015).[60]

One potential counter-argument to our line of reasoning is that labor markets are not always efficient—in this circumstance, perhaps noncompetes would lead to

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[57] To be certain, Gilson (1999) is more careful than later writers in clarifying that the socially optimal level of constraints on employee mobility will differ by the characteristics of each industry.

[58] Although transaction costs may prevent some employment transactions from occurring, these frictions exist in any market. Thus, absent evidence of extraordinary costs, we do not view these costs as leading to a widespread collective-action problem. Posner, Triantis, and Triantis (2004) hypothesize that even in an otherwise competitive labor market, there is an incentive for employer and employee to externalize the costs of noncompetes to potential future employers, thereby creating incentives for overly broad noncompetes. As they note, and as we explained in Section 2.1, reasonableness constraints and the ability to renegotiate employment agreements serve to diminish these and related external costs (see also Rubin and Shedd 1981).

[59] Marx (2011) presents evidence based on a very limited dataset that noncompetes regularly cause engineers to change fields. One could surmise that the absence of litigation simply reflects general compliance on the part of departing employees (*id.*). Indeed, we argued earlier that the sizable costs of a lawsuit could deter employees from accepting a new position. See supra note 13. However, the credibility of a former employer's threat is presumably correlated to its reputation for noncompete enforcement (cf. Agarwal et al. 2009), and low firm-level enforcement rates would tend to diminish the extent of a collective action problem.

[60] For instance, Gompers and Lerner (1998a, 2000) report that Xerox decided in part against a policy of aggressively litigating against former employees because of potential adverse effects on employee recruitment.

collective action problems. However, even accepting this possibility, this leads to our second additional objection to the strong thesis—namely, any net welfare analysis of noncompetes and related constraints must take into account that precluding the ability to select noncompetes necessarily imposes a social cost by truncating a portion of the possible spectrum of transactional arrangements. The absence of noncompetes may skew the allocation of resources toward innovation projects for which noncompetes are not critical. Even if total innovative output does not decline (or even increases by some measures), the distribution of resources over the total menu of innovation projects may be distorted and, in particular, may be diverted away from long-term innovation projects with the greatest social return. Moreover, the inability to contract for a noncompete covenant may block mutually beneficial transactions. To illustrate, consider the prevalent "acqui-hire" transactions in which a technology firm acquires a target primarily for purposes of retaining its key personnel. Without a commitment from key personnel that they will remain with or at least not compete with the acquirer for some reasonable period of time, the transaction is unlikely to be viable. This partially explains why exempting business acquisitions from noncompete enforcement limitations may be efficient.

These social costs may be mitigated to a certain extent in any economy in which there are multiple jurisdictions that can each select a noncompete policy and human capital can move at some reasonable cost from one jurisdiction to another. If those conditions are satisfied, then it might be expected that jurisdictional competition for human capital would result in a differentiated menu of noncompete policies adapted to different innovation environments. Jurisdictions that sought to attract firms that operate under conditions that tend to engender noncompetes—that is, high capital costs, long development times, long product lives, weak complementary assets, and low levels of interoperability—would typically indicate a willingness to enforce noncompetes, whereas other jurisdictions would not. Note that, but for the possibility of collective-action distortions, the same effective level of differentiation with respect to noncompete polices could be achieved by employers' and employees' contractual and enforcement decisions even within a single jurisdiction that enforced noncompetes.

But it is not clear that jurisdictional competition would converge on an efficiently differentiated menu of noncompete policies. There are two grounds for doubt. First, because the costs of moving business operations are positive, some firms might be compelled to operate under suboptimal noncompete legal regimes. Second, jurisdictions that decline to enforce noncompetes may free ride on jurisdictions that do enforce noncompetes—meaning, firms located in the non-enforcing jurisdictions may appropriate the R&D generated by firms located in the enforcing jurisdictions. For example, if a firm located in Massachusetts seeks to enforce a noncompete against a former employee who is now working for a firm

solely located in California, it will most likely be unable to do so.[61] The result: the California firm can access some of the Massachusetts firm's intellectual capital without compensation (cf. Ben-Atar 2008). In response, the jurisdiction that enforces noncompetes (in this case, Massachusetts) would be under pressure to adopt a bar on noncompetes, potentially resulting in a suboptimally inadequate level of noncompete adoption across the economy as a whole.

In sum, although we do not reject the possibility that collective-action dynamics might result in a socially excessive level of contractual limitations on employee mobility, we emphasize that this outcome is only one of multiple plausible outcomes. Moreover, any social cost attributable to collective-action failure that arises under a largely enforcing regime must be set against the *other* social costs that arise under a largely non-enforcing regime. Any limitation on contractual freedom inherently triggers efficiency losses by excluding a portion of the transactional spectrum over which parties would otherwise freely negotiate. In the innovation context, those losses may include underinvestment by firms in cultivating employees' capital, distortions in firms' allocation of employees across innovation projects, and distortions in firms' allocation of employees across innovation and non-innovation activities. Whether those other social costs exceed the social costs attributed to noncompetes is an empirical question that cannot be determined *a priori*.

4.3 Empirical Studies on the Impact of Noncompetes on Innovation are Inconclusive

Since Gilson (1999)'s hypothesis, several empirical studies have attempted to examine the effects of noncompete regimes on innovation. Like the empirical studies examining labor mobility, there are a handful of prominent studies that have had an outsized effect on the debate, and upon which we focus our critique.[62]

First, Stuart and Sorenson (2003) examined biotechnology startups founded in the wake of an IPO or acquisition of a previous company, finding a significant relationship between in-state noncompete enforcement and overall startup formation. Specifically, in the absence of state-level fixed effects, they find that "states with weak non-compete regimes realize 217 percent higher founding rates than those that enforce non-compete covenants." Second, Garmaise (2011) finds that stronger noncompete enforcement, interacted with a measure of in-state competition, tends to suppress R&D spending and that increased enforceability reduces capital investment per employee. Third, Samila and Sorenson (2011) find that states that enforce noncompetes dampen the effects of venture capital

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[61] See infra Section 5.2.1.5.

[62] Other empirical studies examining the relationship between noncompetes and innovation (e.g., Belenzon and Schankerman (2013), Conti (2014), Baslandze (2015)) suffer from similar shortcomings as those described in this sub-section. See supra notes 26-27 (listing studies that rely on flawed enforcement scales).

investment on firm formation and patenting rates. Based on these findings, they conclude that the enforcement of noncompetes "significantly impedes entrepreneurship and employment growth" (p. 425). Fourth, as noted earlier, Marx et al. (2015) find a "brain drain" of inventors from Michigan to non-enforcing states following its switch to an enforcing state in 1985. Moreover, Marx et al. (2015) find a greater effect for more highly skilled inventors. Fifth, Amir and Lobel (2013) conducted an experimental study that found that participants in simulated "noncompete" treatment groups exerted less effort and made more errors than a restriction-free control group.

4.3.1 *Non-Experimental Empirical Studies*

The non-experimental empirical studies exhibit essentially the same limitations as those we discussed in Section 3.2. Most importantly, they all rely on flawed enforcement indices, either the Stuart and Sorenson (2003) index, which misclassifies eight states as "non-enforcing," or the Garmaise (2011) index, which unjustifiably counts the twelve factors in Malsberger (2004) equally.

Even setting aside these imperfections, none of these studies can show causation between noncompete enforcement and their findings. Other than Marx et al. (2015), they are all cross-sectional regressions, and cannot rule out omitted variables to explain the observed variation. Additionally, Stuart and Sorenson's (2003) finding abstracts away from state fixed effects, and they properly note that they "must interpret this result cautiously, as a number of omitted regional factors might correlate with both the weak non-compete enforcement dummy and the level of entrepreneurial activity in the region." Samila and Sorenson (2012) is subject to similar limitations as well as another endogeneity concern. Specifically, this study uses the number of patents to measure innovative output, but as discussed earlier, patenting is in part a substitute for noncompete enforcement (cf. Agarwal et al., 2009). Thus, finding increased patenting in states with weak nonenforcement, such as California, is not necessarily meaningful. Marx et al. (2015), despite the fact that they examined a seemingly exogenous shock to Michigan law, also suffers from causality concerns because—as we explained at length in Section 3—the regime change did not apply retroactively.

Aside from causality, some of the studies use rough proxies for innovative activity. Stuart and Sorenson (2003) merely examine the relationship of noncompetes to the absolute number of spinoffs following IPOs and acquisitions. Studies on patent value have indicated that a small number of high quality innovations disproportionately account for the total value of all innovations; in other words, not all innovations—and, hence, not all innovative companies—are created equally (Allison et al., 2003). Thus, it is not surprising that in a later study, Starr et al. (2015) find that while noncompetes may depress the absolute number of spinoffs, increased enforcement is associated with the founding of higher quality firms, particularly, ones that began and continued with more employees and survived for

longer periods.[63]

Lastly, these studies suffer from one or more of the other shortcomings we described in Section 3: the failure to properly take account of cross-border moves, the lack of state-level controls for actual firm-level usage and enforcement of non-competes, lack of sufficient controls for substitute mechanisms for noncompetes, the inadequacy of the patent record in tracking inventor moves, not limiting the analysis to employee moves to competitors, and overall limited generalizability.

4.3.2 *Experimental Empirical Studies*

Amir and Lobel's (2013) experimental design abstracts away from the limitations of the empirical studies, but introduces its own concerns that cast serious doubt on its applicability to any actual technology environment.

In the experimental setup, participants are informed that they will potentially complete two rounds of a given task. Each participant is paid $0.50 for the completion of each task plus a potential bonus. However, individuals in the "full noncompete" group are told they cannot participate in the second round. Individuals in the "partial noncompete" group are told they will receive 20% less payment in the second round. Individuals in the "no noncompete" group are given no restrictions. Participants either perform a creative, word association task or an effort-based, matrix addition task. Each participant only performs the first round. Amir and Lobel (2013) find a large negative effect on completing the first round of tasks in the full noncompete group, but not the partial noncompete group, for both the creative and effort-based tasks. Additionally, they find a significantly larger error rate on the effort-based task for the full and partial noncompete group.

Based on this experimental result, Amir and Lobel (2013, p. 863) conclude that "[o]ur behavioral experiment demonstrates that certain postemployment contractual restrictions may negatively impact motivation and performance, as evidenced by the greater rates at which individuals abandon tasks." Although we agree that noncompetes may provide some incentives for employees to underinvest in their own human capital, Amir and Lobel's (2013) experimental setup does not take into account important real-world mechanisms to offset these effects.

First, as we discussed earlier, one of the major reasons for the use of noncompetes is to provide incentives for firms to invest in the human capital of their employees (Rubin and Shedd, 1981). In this regard, Starr (2015), using an adapted version of the Bishara (2011) index, finds that stronger enforcement regimes lead to increased employee training. Amir and Lobel's (2013) setup does not allow for any firm-sponsored training.

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[63] Although Starr et al. (2015) did not compare the *total* innovative activity of the startups in non-enforcing and enforcing states, a smaller number of highly innovative startups in enforcing states could outweigh the innovative activity of a larger number of less innovative startups in non-enforcing states.

Second, the flat payment scheme of $0.50 per task plus a bonus in Amir and Lobel (2013) abstracts away from the numerous means we discussed above—such as vesting options, deferred compensation, and the simple ability for star employees to renegotiate—that are present in a typical employment situation (Bishara and Starr, 2015).

Third, contrary to Amir and Lobel's (2013) setup, a noncompete agreement *never* means that there is no "second round" of performance. Employees are engaged in a repeat-play game with employers, who rationally reward high-performing employees and penalize (or terminate) low-performing employees. Simultaneously, employees are engaged in a repeat-play game with potential outside employers. Given the discipline imposed by the common-law reasonableness constraint and competitive labor markets, noncompetes are always limited in duration, geography, and industry scope. As a result, employees may port their industry-specific skills to competitors after a certain amount of time and may port their non-industry-specific skills to non-competitors at any time. Even during the term of a noncompete, an employee can move to any firm that is willing to pay the price demanded by the existing employer to waive the noncompete.

These three reasons are likely to substantially dampen, if not eliminate, any incentives noncompetes might otherwise create for employees to underinvest in their own human capital. Indeed, Bunstorf et al. (2013) performed a similar experiment but found that those in the noncompete group exerted no less effort than those in the control group. Using a more realistic setup, this experiment paid the noncompete group more to compensate for any disincentives created in the noncompete treatment—which, as we previously discussed, is precisely what would be expected to occur in any rational employer-employee bargaining situation.

In sum, for these reasons and the ones presented in Section 3.2 regarding the labor mobility studies, we do not believe any of the empirical studies justify the new wisdom's "strong thesis" that noncompetes have an *overall* negative effect on innovation. Noncompetes can both promote and dampen overall innovation, and it is *a priori* indeterminate which effect dominates. Rather, local industry, firm, and employee characteristics, as well as larger economic trends, are likely to determine noncompetes' overall effect on innovation, and these effects will vary widely by circumstance.

5. Revisiting the Silicon Valley v. Route 128 Narrative

The new wisdom relies heavily on the canonical narrative, advanced and popularized by Saxenian (1994), that cultural and institutional factors played a major role in promoting the circulation of human capital among competitors in Silicon Valley—which promoted innovative activity, and enabled the region to overtake Boston's Route 128 area as an innovation center. In the legal literature, Gilson (1999) relies on that narrative to suggest that Silicon Valley's rise in the 1980s and 1990s can be attributed in substantial part to California's refusal to enforce

noncompetes. In this Part, we cast doubt on Gilson's hypothesis, and to some extent Saxenian's underlying narrative, based largely on four reasons: (i) there were several exceptions (and other legal causes of action) that substantially qualified California's "ban" on noncompetes during this period; (ii) it is not clear that differences in Massachusetts law on noncompetes and trade secrets resulted in substantial differences in employee mobility; (iii) there are fundamental technological and economic factors that more plausibly account for Silicon Valley's ascendance; and (iv) there is evidence that Route 128 has continued to exhibit robust innovative performance.

5.1 The Standard Account

Saxenian (1994) presents a seemingly compelling story. During the 1960s, Boston's Route 128 region, as compared to Silicon Valley, would probably have been viewed as a more important technology center. As of the mid-1970s, Silicon Valley had caught up and both regions were viewed as key centers for innovation in the electronics industry, but with different strengths. Silicon Valley excelled in semiconductor chips while Route 128 excelled in minicomputers, a category situated between the supercomputer (or mainframe) segment dominated by IBM and the nascent "microcomputer" segment pioneered by Apple. Starting in the early 1980s, Silicon Valley overtook Route 128 and secured its place as the world's preeminent information technology center. Saxenian (1994) attributes the ascendance of Silicon Valley, and the decline of Route 128, to differences in industrial organization and cultural norms. The West Coast environment was characterized by a constant flow of technical personnel among a network of loosely connected firms, which spawned spinoffs that accelerated the innovation process. This structure was supported by industry norms that promoted information sharing and employee movement. By contrast, the East Coast environment was characterized by a small number of vertically integrated firms and exhibited little employee turnover. This structure was supported by industry norms that promoted loyalty to a single employer and discouraged information sharing. Building on Saxenian's narrative, Gilson (1999) argued that the free flow of human capital could be attributed in part to California's refusal to enforce noncompetes, while Massachusetts' insistence on enforcing noncompetes may have stagnated the flow of human capital, resulting in a slowdown in innovation.

5.2 Reasons to Doubt the Standard Account

5.2.1 *Did California courts really never enforce noncompetes?*

Scholars have not adequately questioned whether California courts really did decline to enforce noncompetes during the period in which Silicon Valley overtook Route 128. That seems to be the case based on California's Business and Professions

Code § 16600, which declares void "every contract by which anyone is restrained from engaging in a lawful profession, trade or business of any kind." Given that blanket prohibition, it is curious that California technology firms often insert noncompete clauses in employment agreements (Hyde 2003; Bishara et al. 2015), with available data showing adoption rates of approximately 60% among large, publicly traded firms (Garmaise 2011), which is not dramatically lower than the rates at which those firms in other states use noncompetes.[64] It may also seem curious to learn that Cisco, a repeat Silicon Valley acquiror, typically requires that a target's key employees waive any "golden parachutes" (stock options triggered by a change of control) to which they might be entitled and agree to a two-year noncompete, coupled with stock options that vest over time (Mayer and Kenney 2004).

This discrepancy might be attributed to the possibility that technical personnel are unaware of California law and firms include a noncompete clause as an *in terrorem* device to be used against departing employees. That explanation assumes that these personnel do not consult legal advisors, particularly a potential new employer's legal counsel, or review publicly available information about a basic point of law. Although this may be the case for some junior engineers, it strikes us as implausible for senior personnel, especially management. Alternatively, one might argue because knowledgeable employees understand that noncompetes are generally *not* enforceable in California, it is not worth the transaction and related costs of negotiating with an employer to remove these clauses. At a minimum, it is worth inquiring whether the standard understanding of California law is entirely precise during the rise of the Silicon Valley.

In fact, it is not. Writing in 1989, a treatise on trade secrets law observed: "Despite the clear language of" California's statute, "the California courts do not regard all covenants not to compete . . . invalid *per se*" (Jager 1989, §13.01[2], at 13-13). Specifically, there were five circumstances in which California employers could have had some expectation of being able to enforce a noncompete during the period in which Silicon Valley overtook Route 128. Each but the first is in force to at least some degree today—which at least partially explains why California firms continue to use these clauses.

5.2.1.1   Narrow Restraints. In 1987, the Ninth Circuit held that noncompetes were enforceable under California law if the noncompete "narrowly" restrained post-employment opportunities, as distinguished from a "general" restraint that

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[64] Based on a sample of 874 CEO employment contracts at S&P 1500 firms executed during 1996-2010, Bishara et al. (2015) find that 84% include noncompetes, while California firms in particular include noncompetes at a significant but lower rate of 62%. Garmaise (2011) finds that of executives at large, publicly traded firms, approximately 70% were subject to noncompetes, including 58% of executives at California-based firms. For other data on usage of noncompetes, see supra note 33.

barred entry into an entire profession.[65] From the 1970s through the 2000s, California federal and state courts expressed mixed views for and against variants of the narrow restraint exception.[66]   In 1997 and 1999, the Ninth Circuit applied the exception. [67] Only in 2008, well after Silicon Valley had established its place as the world's technology center, the California Supreme Court resolved this uncertainty by rejecting the narrow restraint exception.[68]

5.2.1.2 Sale of a Business.   Based on a statutory exception (California Business and Professions Code § 16601), both federal and state courts typically enforced (and continue to enforce) noncompetes executed in connection with the sale of a business. The exception applies to noncompetes entered into by majority target shareholders and possibly other target employees with smaller equity interests.[69]   As mentioned previously,[70] this exception provides some of the legal logic behind the now-popular "acqui-hire" transactional structure.[71]

5.2.1.3 Protection of Trade Secrets.   Since the California Supreme Court's 1958

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[65] Campbell v. Board of Trustees of Leland Stanford Univ.*,* 817 F.2d 499 (9th Cir. 1987). The court purported to apply state law precedent, as set forth in *King v. Gerold*, 240 P.2d 710 (1952) and *Boughton v. Socony Mobil Oil Co.*, 41 Cal. Rptr. 714 (Ct. App. 1964).

[66] For cases supporting the exception, see Centeno v. Roseville Community Hospital, 167 Cal. Rptr. 183, 186-87 (1979); Loral Corp. v. Moyes, 219 Cal. Rptr. 836 (1985) (upholding with respect to nonsolicitation and nondisclosure agreements); Latona v. Aetna U.S. Healthcare Inc., 82 F. Supp. 2d 1089, 1094 (C.D. Cal. 1999); Cin-Med Associates, Inc. v. Hemocue, Inc., 2001 WL 1117562, 4 (C.D. Cal. Aug. 30, 2001). For cases rejecting the exception, see Golden State Linen Service, Inc. v. Vidalin, 137 Cal. Rptr. 807, 814 (1977); Scott v. Snelling and Snelling, Inc., 732 F. Supp. 1034, 1042-43 (N.D. Cal. 1990); Liberty Mutual Ins. Co. v. Arthur J. Gallagher & Co., 1994 WL 715613, 3 (N.D. Cal. Dec. 19, 1994); Arrowhead Financial Group, Inc. v. Welty, 2002 WL 31661269, 6-7 (Cal. Ct. App. Nov. 26, 2002); Jan Marini Skin Research, Inc. v. Allure Cosmetic USA, Inc., 2007 WL 1508686, 16 (Cal. Ct. App. May 24, 2007); Thompson v. Impaxx, Inc., 7 Cal. Rptr. 3d 417, 431 (2003).

[67] General Commercial Packaging Int'l v. TPS Package Eng'g, Inc., 126 F.3d 1131 (9th Cir. 1997) (enforcing a one-year noncompete between a contractor and sub-contractor with respect to the contractor's clients); IBM v. Bajorek*,* 191 F.3d 1033 (9th Cir. 1999) (holding that noncompete obligation in stock option agreement did not violate the California statutory ban on noncompetes).

[68] Edwards v. Arthur Andersen LLP, 44 Cal. 4th 937 (2008).

[69] It is not clear how large that equity interest must be. Rulings have been mixed. *See* Hilb, Rogal & Hamilton Ins. Servs. v. Robb, 39 Cal. Rptr. 2d 887, 889-90 (1995) (in connection with merger of insurance company, upholding noncompete entered into with employee of the merged company, who had held a 35% ownership interest in the company, on ground that sufficient transfer of goodwill had taken place); Vacco Inds., Inc. v. Van Den Berg, 6 Cal. Rptr. 2d 602, 610 (1992) (finding that a 3% interest, which was the ninth largest shareholder interest, in conjunction with an officer position, constituted a substantial shareholder).

[70] See supra Section 4.2.

[71] Related statutory exceptions are (and have been) available in the event of a dissolution or dissociation of a partnership and for similar events involving an LLC (Malsberger 1991, 1996, 2004).

decision in *Gordon v. Landau,*[72] California law has recognized that the statutory bar against noncompetes does not extend to post-employment restrictions that are enforced for the purpose of protecting an employer's trade secrets or confidential information.[73] Based on this exception, California courts in the 1980s, 90s, and through the present have applied the trade secret exception to enforce non-solicitation and non-disclosure obligations (and, in one recent case, even a noncompete clause) that were found to be narrowly tailored to protect a trade secret.[74] In 2008, the Supreme Court of California specifically declined to affirm or reject the trade secret exception.[75]

5.2.1.4 ERISA. A California employer can avoid the statutory ban on non-competes by embedding the noncompete in a deferred compensation or severance pay arrangement governed by the Employee Retirement Income Security Act of 1974 ("ERISA").[76] These clauses operate as a forfeiture mechanism that conditions entitlement to certain benefits under the plan upon compliance with the noncompete obligation. As observed in practitioner commentary, this exception typically arises in litigation concerning deferred benefit plans for highly compensated executives (Baker 2011). In 1981 and 1987, the Ninth Circuit held that ERISA preempts state law, specifically including noncompete restrictions.[77] California state courts have

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[72] 49 Cal. 2d 690, 296 (1958).

[73] See Jager (1989, §13.01[2], at 13-13) (observing that California courts sometimes enforce noncompetes to protect trade secrets or other confidential information). For cases stating this principle, see Muggill v. Reuben H. Donnelley Corp., 398 P.2d 147 (1965); Gordon Termite Control v. Terrones, 84 Cal. App.3d 176, 178 148 Cal. Rptr. 310 (1978); Loral Corp. v. Moyes, 174 Cal.App.3d 268, 276 (Cal. 1985); Moss Adams Co. v. Shilling, 179 Cal. App. 3d 124, 224 Cal. Rptr. 456 (1986); American Paper & Packaging Products v. Kirgan, 183 Cal. App.3d 1318, 1322 (1986); Scott v. Snelling & Snelling, Inc., 732 F. Supp. 1034, 1043 (N.D. Cal. 1990).

[74] Hollingsworth Solderless Terminal Co. v. Turley, 622 F.2d 1324, 1327-28 (9th Cir. 1980) (reversing lower court's invalidation of post-employment covenants involving nondisclosure of customer lists and nonsolicitation of former employer's customers); John F. Matull & Associates, Inc. v. Cloutier, 194 Cal.App.3d 1049, 1054 (1987) (upholding non-solicitation obligation); *Morlife Inc. v. Perry,* 56 Cal. App. 4th 1514 (Cal. Ct. App. 1997) (affirming non-solicitation covenant against former employees). For more recent cases, see Lindzy v. Q-Railing USA Co., 2013 WL 4437164 (Cal. Ct. App. Aug. 16, 2013) (finding a nondisclosure clause and a non-solicitation clause valid); Richmond Techs. Inc. v Aumtech Bus. Solutions, 2011 WL 2607158 (N.D. Cal. July 1, 2011) (finding the non-solicitation clause at issue too broad to be eligible for the exception, but the noncompete clause narrowly drafted and likely to only protect trade secrets, therefore, it was likely valid).

[75] Edwards v. Arthur Andersen LLP, 44 Cal. 4th 937 (2008).

[76] The non-compete is valid under ERISA provided the plan provides that forfeiture will not apply to benefits accrued after ten years of employment. 29 U.S.C. § 1053(a)(2)(A).

[77] Clark v. Lauren Young Tire Center Profit Sharing Trust, 816 F.2d 480, 481 (9th Cir. 1987) (involving noncompete under Oregon law); Lojek v. Thomas, 712 F.2d 675, 678 (9th Cir. 1983) (involving noncompete under Idaho law). Gilson (1999) cites a 1965 California Supreme Court decision that invalidated this type of forfeiture provision in a retirement plan. See *Muggill v. Reuben*

adopted the same approach.[78] This enforcement strategy is only limited by the ERISA requirement that a noncompete forfeiture clause cannot be applied to deprive the employee of benefits accrued after ten years of service.[79]

5.2.1.5 Choice of Forum Clauses. As we discussed in Section 3.2, California courts will not enforce a noncompete entered into under the law of another state that generally enforces noncompetes. However, if an employer and former employee are subject to the jurisdiction of an out-of-state court that enforces noncompetes, and the decision is final in that state before any decision in a parallel California action, then a noncompete agreement is typically enforceable within California. In general, the two key factors at issue in such situations are whether (1) the agreement selected another state's courts as the forum for disputes; and (2) whether the employee is now a California resident employed by a California employer. Although California courts will generally not enforce an out-of-state choice-of-law clause, especially if the defendant-employee is a California resident employed by a California firm,[80] they will generally respect an out-of-state choice of forum clause, even if the other state may potentially apply its own law.[81] In practice, this means that California employees employed by an out-of-state employer—i.e., one with corporate headquarters out-of-state—or out-of-state employees moving to California may be subject to enforceable noncompete restrictions under a properly drafted agreement.[82]

H. Donnelly Corp., 398 P.2d 147, 149 (Cal. 1965). However, *Muggill* would not appear to survive the Ninth Circuit's interpretation of ERISA, enacted in 1974.

[78] Weinfurther v. Source Servs. Corp. Employees Profit Sharing Plan & Trust, 759 F. Supp. 599, 602 (N.D. Cal. 1991).

[79] 29 U.S.C. § 1053(a)(2)(A).

[80] See Application Group, Inc. v. Hunter Group, Inc., 61 Cal.App.4th 881 (1998).

[81] Compare Davis v. Advanced Care Techs., Inc., 2007 WL 2288298 (E.D. Cal. Aug. 8, 2007) (finding California law applicable to the case despite a Connecticut choice-of-law provision because California had a materially greater interest; the employee was a California resident, the former employer was based in Connecticut and the new employer was a California-based employer) with Universal Operations Risk Management, LLC v. Global Rescue LLC, 2012 WL 2792444 (N.D. Cal. July 9, 2012) (enforcing a forum selection clause despite the strong possibility that the forum state would uphold the covenant not to compete).

[82] *See, e.g.*, Meyer v. Howmedica Osteonics Corp., 2015 WL 728631(S.D. Cal. Feb 19, 2015) (ordering a transfer of forum to New Jersey consistent with the forum selection clause, there was also a choice of law provision for New Jersey law) (citing Swenson v. T–Mobile USA, Inc.*,* 415 F.Supp.2d 1101 (S.D. Cal. 2006) (dismissing a California declaratory relief action in presence of forum selection clause when previous action was pending out-of-state)); Universal Operations Risk Management, LLC v. Global Rescue LLC, 2012 WL 2792444 (N.D. Cal. July 9, 2012) (enforcing a forum selection clause despite the strong possibility that the forum state would uphold the covenant not to compete); Advanced Bionics Corp. v. Medtronic, Inc., 29 Cal.4th 697 (2002) (vacating a lower court's issuance of a temporary restraining order (TRO) against the former employer from pursuing a previously filed noncompete action out-of-state); Biosense Webster, Inc. v. Superior Court, 135 Cal. App. 4th 827, 830 (Cal. Ct. App. 2006) (extending the holding of *Advanced Bionics* to circumstances in which no previous action had been filed out-of-state); Google, Inc. v. Microsoft Corp., 415 F. Supp.2d 1018

5.2.1.6 Substitutes for Noncompetes. In addition to the five exceptions described above, as we discussed in Section 3.1, California firms could elect from a large menu of substitute measures to deter employee mobility, including patent, trade secret, and other intellectual property suits; business torts, such as conversion or unfair business practices; and contractual mechanisms, such as stock option plans. As we noted in Section 3.2.1, it is critical to examine not only variation among states in noncompete law but also in these substitute mechanisms when attempting to explain differences in the rates of labor mobility among regions.

5.2.2 Was Massachusetts' noncompete and trade secret law significantly different from California's?

The traditional narrative relies on a significant difference in legal treatment between Massachusetts and California with respect to the enforcement of noncompetes and related doctrines that impact employee mobility. Below we look more carefully at comparative differences between Massachusetts and California law in the enforcement of noncompetes and trade secret law. We do not discern any meaningful differences with respect to trade secret claims. Although there are material differences in noncompete enforcement, the comparison is much more nuanced than commonly explained, especially taking into account the exceptions to California's supposed ban on noncompetes.

5.2.2.1 Trade Secrets. As Gilson (1999) observed, trade secret law under California and Massachusetts law is similar. If anything, since enactment of the California Uniform Trade Secrets Act ("CUTSA") in 1984, California law has been slightly *more* protective of trade secret holders in a few areas (Risch 2009).

In particular, following common law, Massachusetts will only recognize a trade secret if the information is in "continuous use in the operation of a business."[83] By contrast, CUTSA abandons the continuity requirement and, as made clear in the statute's legislative history, recognizes a trade secret even if the information has not yet been used by the trade secret claimant.[84]

Second, CUTSA specifically authorizes courts to award attorneys' fees in trade

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(N.D. Cal. 2005) (staying noncompete proceedings pending those in Washington in order to prevent forum shopping).

[83] Portfolioscope, Inc. v. I-Flex Solutions Ltd., 473 F. Supp. 2d 252, 255 (D. Mass. 2007); Blake v. Prof'l Coin Grading Serv., 898 F. Supp. 2d 365, 394-395 (D. Mass. 2012).

[84] Cal. Civ. Code § 3426.1, Legislative Committee Comments—Senate. ("The definition of 'trade secret' contains a reasonable departure from the Restatement of Torts (First) definition which required that a trade secret be 'continuously used in one's business.' The broader definition in the proposed Act extends protection to a plaintiff who has not yet had an opportunity or acquired the means to put a trade secret to use.").

secret litigation.[85] Massachusetts has no comparable statutory provision, although its courts have sometimes awarded fees.[86] Given this explicit statutory instruction, California provides an employer with a slightly more credible litigation threat, especially if the defendant is an individual unprotected by an indemnity from a corporate employer.

It may appear that Massachusetts is more hospitable to the inevitable disclosure doctrine because its appellate courts (unlike California) have never explicitly rejected the doctrine. This appearance is deceptive. As noted earlier, under the inevitable disclosure remedy, a court can enjoin an individual from working for a new employer on the ground that the individual will "inevitably disclose" trade secrets belonging to the former employer. As of the late 1970s and early 1980s, neither jurisdiction recognized the inevitable disclosure doctrine or any equivalent under trade secret law. Following common law, California courts required that a plaintiff in a trade secret litigation show actual, not just threatened, use of a trade secret to support a misappropriation claim.[87] In 1984, however, it was California— not Massachusetts—that signaled openness to the inevitable disclosure doctrine by adopting the UTSA, which provides that a plaintiff can obtain relief under trade secret law if the court finds there is "threatened misappropriation."[88] Hence, a Silicon Valley practitioner observed in 1997 that it was unclear whether the inevitable disclosure remedy was available under California law (McMahon et al. 1997). Although California has since rejected the inevitable disclosure remedy,[89] it does preserve the possibility of obtaining relief under trade secret law for threatened misappropriation.

5.2.2.2 Noncompetes. During the time in which Silicon Valley overtook Route 128, and continuing through the present, Massachusetts law has provided employers with a higher level of confidence in the enforceability of noncompetes. But the differences should not be exaggerated. Like almost all states, Massachusetts applies the common-law reasonableness standard.   This standard limits the enforceable scope of a noncompete by duration, scope and geography, provided that the noncompete is deemed necessary to protect the employer's legitimate business interests.[90]   Additionally, Massachusetts courts have held that noncompete

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[85] Cal. Civil Code § 3426.4.

[86] See Specialized Tech. Res., Inc. v. JPS Elastomerics Corp., 2011 Mass. Super. LEXIS 33, *36-38 (Mass. Super. Ct. 2011); LightLab Imaging, Inc. v. Axsun Technologies, Inc., 469 Mass. 181, 187-188, 13 N.E.3d 604, 609-610 (Mass. 2014).

[87] Architectural Models, Inc. v. Neklason, 264 F. Supp. 312, 322 (N.D. Cal. 1967) aff'd, 397 F.2d 405 (9th Cir. 1968). The same was true of Massachusetts courts. See Tracerlab Inc. v. Industrial Nucleonics Corp., 313 F.2d 97 (1st Cir. Mass. 1963); Dynamics Research Corp. v. Analytic Sciences Corp., 400 N.E.2d 1274 (Mass. App. Ct. 1980).

[88] Cal. Civil Code 3426.2.

[89] Whyte v. Schlage Lock Co., 101 Cal. App.4th (Cal. Ct. App. 2002).

[90] Analogic Corp. v. Data Translation, Inc., 371 Mass. 643, 647 (1976); Marine Contractors Co.,

agreements are to be construed in favor of the employee.[91] For this purpose, Massachusetts courts defined the employer's legitimate interest narrowly. In a trilogy of cases decided in 1974, the Massachusetts Supreme Court emphasized that noncompetes were only enforceable to the extent required to protect the employer's goodwill, trade secrets, or confidential information.[92] In 1979 and 1982, the Massachusetts Supreme Court extended the reasonableness standard to employment contracts that required employees to forfeit certain deferred compensation upon termination, on the ground that these provisions implicitly operated as a noncompete.[93] Moreover, since 1968, Massachusetts courts have recognized the "material change doctrine," which bars enforcement of noncompetes if the employee's position and salary changed significantly since starting employment.[94] Contrary to the standard narrative, Massachusetts courts during the "decline" of Route 128 were far from enthusiastic about noncompetes and applied the reasonableness standard to limit their enforceability.

5.2.3 *Did weak enforcement of noncompetes really cause the Valley to rise?*

The standard narrative correctly observes that Massachusetts was an early pioneer of technological innovation. Ironically, the Boston area essentially originated what is now viewed as the Silicon Valley model consisting of a strong academic research complex coupled with a robust venture capital community and substantial movement of human capital among academia, startups, and large firms. In 1945, a Boston firm established the first major successful venture capital enterprise (the American Research and Development Corporation ("ARD")). Supported by federal defense funding and local VC investors, MIT and Harvard university labs spawned hundreds of spinoffs throughout the 1960s and 70s (Roberts 1968). Those spinoffs included firms that later pioneered the "minicomputer"[95]

Inc. v. Hurley, 365 Mass. 280, 287 (1974); Alexander & Alexander, Inc. v. Danahy, 21 Mass. App. Ct. 488, 498 (1986); New England Canteen Service, Inc. v. Ashley, 363 N.E.2d 526 (Mass. 1977)

[91] Lanier Services Inc. v. Ricci, 192 F.3d 1 (1st Cir. 1999); Sentry Ins. v. Firnstein, 14 Mass. App. Ct. 706, 707 (1982).

[92] All Stainless Inc. v. Colby, 364 Mass. 773, 308 N.E.2d 481 (1974); Marine Contractors Co. v. Hurley, 365 Mass. 280, 310 N.E.2d 915 (1974); National Hearing Aid Centers, Inc. v. Avers, 1974 Mass. App. Ct. Adv. Sh. 547, 311 N.E.2d 573.

[93] Cheney v. Automatic Sprinkler Corp. of America, 1979 Mass. Adv. Sh. 179, 187 n.7, 385 N.E.2d 1961, 965 n.7; Kroeger v. The Stop & Shop Companies, Inc., 13 Mass. App. Ct. 310, 311-12, 319, 432 N.E.2d 566, 569, 571 (1982).

[94] F.A. Bartlett Tree Expert Co. v. Barrington, 353 Mass. 585, 587-88 (1968).

[95] The minicomputer refers to a class of computing devices that delivered computing power at a significantly reduced cost (and physical size) relative to the mainframe market (dominated by IBM). The minicomputer was principally targeted to industrial users and could perform some of the functions of a mainframe. Advances in miniaturization accelerated the development of high-density memory chips and the microprocessor, and the minicomputer was overtaken in the business market by the desktop "microcomputer," which we now refer to as the PC. For helpful discussion, see Cerruzzi (1998).

market, such as Digital Equipment Corporation ("DEC") (founded in 1957 as a MIT startup with funding from ARD), Wang (founded by a Harvard physicist in the 1950s), Data General (founded in 1968 by an ex-DEC engineer), and Prime (founded in 1972 by seven engineers from Honeywell) (Kenney & Von Burg 1999, Saxenian 1994, Browne and Sass 2000, Ceruzzi 1998, Dorfman 1982).

Contrary to Saxenian's (1994) account of cultural norms, Cerruzi (1998) describes the most important Route 128 firm, DEC, as having been characterized by a non-hierarchical engineer-driven culture that dispensed with the formalities and bureaucracy of incumbents such as IBM. Certainly, as DEC and other large Route 128 firms grew, they tended to adopt vertically integrated structures (Kenney & Von Burg 1999; Kuhn 1982; Best 2001). But it would be inaccurate to describe the Route 128 environment in its heyday as a monolithic industry consisting of a handful of vertically integrated incumbents. Although DEC and three other Route 128 firms (plus IBM) dominated the minicomputer segment in the late 1970s and early 1980s (Dorfman 1982), observers and studies systematically documented) that those firms spawned a continuing flow of small-firm spinoffs (Roberts 1968, Romanelli 1987, Dorfman 1983, Cerruzi 1998, Saxenian 1994, Rosegrant & Lampe 1992).[96]

An interview-based study of 22 Massachusetts-based computer firms between 1965 and 1975 found that half of the firms' products "were the result of direct technology transfer from previous employers and another quarter indirect transfer" (Dorfman 1983). In a manner akin to accounts of Silicon Valley, those spinoffs could procure required inputs from a disaggregated network of small to medium-size component producers and suppliers, assemblers, and distributors (Dorfman 1982, Saxenian 1989, Todtling 1994). A history of the period concludes: "[C]ompanies spinning off from other companies were at the very heart of the monumental growth that the Route 128 area experienced from the 1960s through the 1980s" (Rosegrant and Lampe 1992).

On the West Coast, Silicon Valley pioneered innovations in the mass production of semiconductors and, by the late 1970s, was the recognized leader in the field (Kenney and Von Burg 1999). Historical accounts of Silicon Valley's semiconductor industry typically attribute its origins to the departure in 1957 of leading engineers from Shockley Transistors to form Fairchild Semiconductor, which generated a sequence of leading semiconductor firms (Cerruzi 1998). As Kenney and Von Burg (1999) observe, semiconductor chips are a critical component in a wide array of computing and electronics products and operated as a launching pad for Silicon Valley to achieve dominance in information technology more generally. Even after lower-cost Japanese producers in the 1980s undermined the local memory chip production industry, Silicon Valley adapted by shifting resources to the design and development of customized chips (Saxenian 1990) and developing

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[96] In particular, during a period spanning the 1960s and 1970s, almost 60 firms were formed by engineers who had worked for established Massachusetts minicomputer manufacturers (Romanelli, 1987).

strengths in hardware and software markets. By contrast, the Massachusetts minicomputer industry did not recover as quickly from the entry of lower-cost workstations and personal computers (Kenney and Von Burg 1999; Browne and Sass 2000, Cerruzzi 1998). As Kenney and Von Burg (1999) explain, Massachusetts had bet on the wrong horse and was unable to recover the lead.

The historical and management literature as a whole shows no consensus view as to the factors that best explain why Silicon Valley overtook Route 128 as an information technology center. Starting with Gilson (1999), the legal literature has focused on the explanation advocated by Saxenian (1994), who attributed this development to cultural norms and vertically integrated structures that constrained the flow of intellectual capital. However, this explanation overlooks several other more fundamental reasons why Silicon Valley may have overtaken Massachusetts. Most commonly, the literature identifies factors such as the draw of warm weather, luck (in particular, Shockley Transistors' choice to locate in the Bay Area, which then gave rise to the Fairchild spin-off),[97] and, most compellingly, the fact that Silicon Valley had achieved leadership in a general-purpose technology (namely, the microprocessor pioneered by Intel in the 1970s) that could be applied to a wide variety of industrial, business, and consumer markets (Kenney and Von Burg 1999).[98]

By contrast, the leading Massachusetts firms in the late 1970s and early 1980s had focused on developing specialized minicomputer and other technologies targeted for technical and industrial users (Dorfman 1982). Hence, pioneering Massachusetts firms such as DEC tended to focus on technologies that would service existing markets for technical and industrial users, rather than developing innovations that would open up new and much larger markets in the corporate, small-business and home segments (Cerruzzi 1998, pp. 243-45). Other commentators observe that Route 128 firms offered closed hardware systems, dooming a dominant firm such as Wang, which had pioneered the development of word processors for the corporate market (Best 2001, pp. 122-23). Of course the same could have been said of Apple, a Silicon Valley firm that has mostly offered closed hardware systems, ultimately to great success but once to its near-downfall when it approached insolvency in 1996.

Wang was not the only "slow-moving" East Coast firm that made pioneering contributions to the computer industry. In 1981, IBM launched the "personal computer" and rapidly achieved acceptance of its modular product architecture as the market standard, which in turn precipitated the decline of DEC and other leading

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[97] Accounts of Silicon Valley repeatedly mention the element of historical accident that led to the formation of a high-technology cluster in this region. In the words of Intel's co-founder: "[L]uck played a role in nearly every component of this story of semiconductors and the birth of Silicon Valley" (Moore and Davis (2004, p. 36).

[98] Other potential factors include a culture of cooperation and risk-taking that grew out of the California culture of the 1960s (Saxenian 1994); more available land for offices and labs in Silicon Valley; and the increasing quality of Stanford University, especially its faculty and students.

Massachusetts firms. IBM's success is attributable in part to its then-novel decision to outsource design and production of many of the PC's components (most notably, the operating system (to Microsoft) and the microprocessor (to Intel)), as well as its inadvertent commodification of the PC's hardware. But these were strategies that could have been taken by a firm like DEC, a firm that had previously made pioneering contributions to computing technology. In fact, DEC attempted to do just that. In 1988, IBM and DEC collaborated to establish the Open Software Foundation, an effort to develop OS/2, a non-proprietary operating system intended to challenge Microsoft's Windows system (Rifkin and Harrar 1988, Chs. 24-25); Steffens (1994, pp. 183-84, 222-223)). Similarly, some of DEC's Route 128 peers responded to the decline of the minicomputer by adopting less vertically integrated structures (Todtling 1994, p. 332). Moreover, two Route 128 firms launched the first commercially successful spreadsheet applications (Visicalc, released in 1979, and Lotus 1-2-3, released in 1984), which are recognized as key factors in the widespread adoption of the Mac and PC, respectively. Hence, there does not seem to be any compelling reason to attribute the decline of DEC and other leading Massachusetts firms substantially to cultural norms or vertically integrated forms of industrial organization.

A similar observation complicates Gilson's (1999) argument that Massachusetts' willingness to enforce noncompetes suppressed labor mobility, which hindered the region's innovative performance. As we observed in the empirical studies, this argument fails to contemplate that Route 128 firms could have chosen *not* to request or enforce noncompetes if competitive pressures in the labor market drove them to do so. Gilson argues that collective-action pressures precluded that possibility. But there is evidence that Route 128 firms sometimes, if not *typically*, elected to forgo enforcement of noncompetes. Contemporary accounts in the early 1980s observed that Route 128 was characterized by frequent spinoffs (Garvin 1983), talented engineers often left their employees to form start-ups, and large incumbents were typically parents of multiple spinoff firms (Kuhn 1982, Dorfman 1983, Dorfman 1982, p. 69, Rosegrant & Lampe 1992, pp. 29, 154-57).[99] One observer records that Route 128 firms tolerated or even welcomed the movement of technical personnel "because they value the knowledge they obtain by hiring employees from other firms more than they fear the loss of proprietary

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[99] Hence, Kuhn (1982) observes as follows: (i) "some firms prefer to hire away employees of other computer manufacturing firms" (Kuhn 1982, p. 72), (ii) Route 128 has "an unusually high turnover rate" among its technical employees (Kuhn 1982, p. 124-125), and (iii) Route 128 firms provided survey responses indicating heavy reliance on hiring employees from competitors (Kuhn 1982, p. 125). Similarly, Dorfman (1983, p. 310) remarked that the Route 128 area is characterized by a start-up entrepreneurial culture in which firms "bid away" experienced employees from competitors. She further observed that "scientists repeatedly leave their employers to commercialize and market new products whose concepts they helped to develop in the laboratory of a former employer" and it is a "challenge to find new enterprises whose founders did not come from an academic laboratory or another high tech firm" (*id.*).

information" (Dorfman 1982, p. 9) and that entrepreneurs often conceive of ideas "in the lab of an employer" (*id.*, p. 69). Those accounts make no mention of the use of noncompetes to restrain employee turnover. Rather, Kuhn (1982, p. 125) mentions that firms attempted to retain valued employees by offering superior terms and more interesting work—something that would have been unnecessary if noncompetes were legally potent. The lesson seems clear: when technical talent is scarce and market demand for that talent is high, bargaining leverage shifts to employees and differences in the enforceability of noncompetes make little practical difference. Any employer who foolishly sought to enforce a noncompete would be punished in the labor market.

There may be an additional material factor behind Silicon Valley's ascendance, which existing scholarship has overlooked. In 1979, the Department of Labor modified the "prudent man rule" to permit pension fund trustees to invest in venture capital.[100] Based on this signal from federal regulators, state pension fund trustees took the view that it would be consistent with their fiduciary obligations to invest an appropriate portion of a fund's assets in venture capital and other "alternative" investments. This change triggered a dramatic inflow of capital into VC investments and, by the late 1980s, the emergence of pension funds as the single largest investor class in VC funds (Gompers and Lerner 1998b). Presumably, the same is true of California pension funds' increase in VC investment at approximately the same time, given that CalPERS, the principal California state pension fund, followed the lead of the Department of Labor and directed assets toward venture capital funds, formally establishing an Alternative Investment Management program in 1990 (Zanglein 1995). Like other state pension funds (including Massachusetts), California state pension funds exhibit an in-state bias in both their public equity holdings (Brown, Pollet and Weisbenner 2015) and limited-partner investments in VC and private equity funds (Hochberg and Rauh 2013). VC funds in turn exhibit an in-state bias in the selection of portfolio firms (Lichtenstein 2006).[101] The much larger size of the California pension system, combined with the in-state biases of California state pension fund managers and California VC principals, implies that Silicon Valley startups likely have had access to a much larger pool of capital than Boston-based startups.[102]

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[100] Preamble to Rules and Regulations for Fiduciary Responsibility; Investment of Plan Assets under the "Prudence" Rule, 44 Fed. Reg. 37,221 (June 26, 1979), codified at 29 C.F.R. § 2550.a-1 (1990).

[101] For further evidence that venture capital funds favor investments in geographically proximate regions, see Schoonhoven and Eisenhardt (1992, pp. 244-45).

[102] Although data is not available from the time period in question, to get a sense of the sums involved, consider that, during 2008-14, CalPERS has held between 8.5% and 13.5% of its "private equity" investments in California-based firms. In 2014, it held $31.5 billion of "private equity" investments, of which 11.5% was invested in California-based firms (CALPERS for California Annual Reports (2010-14); CALPERS 2009; CALPERS 2008). Private equity includes VC investments as well as other investments in firms that are not publicly traded. The Massachusetts'

We last note one other previously unnoticed investment-related factor that may have driven some start-up firms from Massachusetts. In 1980, Apple Inc. held its much-awaited IPO; however, due to a determination by Massachusetts securities regulators, residents of Massachusetts were barred from taking part. This determination was made under a state "blue sky" regulation that enabled regulators to bar residents from participating in offerings in which the price was more than 20 times earnings. While officials in California operated under similar guidance, they chose not to follow the action taken by Massachusetts. As quoted in the press, the Massachusetts regulator indicated a particularly aggressive view, saying that it regretted not having used this power to bar participation in the Genentech IPO that had taken place a year earlier (Rustin and Lynch 1980).[103] Given that regulatory climate, start-ups and venture capital investors may have decided that California offered a more suitable investment climate.

The advantages in access to capital, along with the technological and other reasons presented above, provide—at least at first blush—more compelling reasons behind Silicon Valley's exceptional rise as an innovation center, rather than nuanced differences in noncompete law.

5.2.4 *Did Massachusetts really decline?*

The traditional narrative relies both on the rise of Silicon Valley as a center of innovation in the electronics industry and the decline of Route 128. While it is correct that Silicon Valley has achieved a uniquely preeminent position, this narrative overstates both Massachusetts' relative historical prominence as a technology center and its relative retreat from that position in more recent decades.

While Route 128 was an historical pioneer in the IT industry since World War II, the period during which it was clearly a dominant center was a short period limited to the height of the minicomputer market during the late 1970s and early

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Pension Reserves Investment Trust Fund, which manages private equity investments on behalf of the Massachusetts' state pension system, reported that, as of June 2014, it held $6.9 billion in investments in private equity (of which $1.4 billion was invested in venture capital). *See* Pension Reserves Trust Investment Fund, Comprehensive Annual Financial Report (2014, p. 35). The report does not disclose what portion of those funds were allocated to Massachusetts-based investment funds, although it does indicate that 27% of its private equity investments were made outside the U.S. Hence, it is extremely unlikely that Massachusetts pension fund managers invested more capital in Massachusetts-based VC firms, as compared to CalPERS' investments in California-based VC firms.

[103] While this bar did not apply to financial institutions (which presumably would include a venture capital fund), it could constrain the ability of a venture capital fund to raise capital from angel investors, since it could not stand by a contractual obligation to convert an individual investor's preferred stock into registered common stock at the time of an IPO. Similarly, it could constrain the ability of a startup to incentivize employees since it could not stand by a contractual obligation to convert employee stock options into registered common stock at the time of an IPO.

1980s (Best 2001, p. 121). Even during that time, there was no single overwhelmingly dominant innovation center akin to Silicon Valley's place today. Relative to the Boston area's important but less than preeminent position as of the early 1980s, it does not appear to have suffered a permanent decline in innovative performance since the collapse of the minicomputer industry (Best 2001, pp. 117-162). Rather, the Boston area has recovered its place as a leading regional innovation center, even if it no longer rivals Silicon Valley in the IT market. Multiple innovation metrics provide suggestive evidence in support of this view. During 1985-2013, the Bay Area has held and expanded its lead in the volume of VC investments while the New England region has consistently occupied the second or third-place position (National Venture Capital Association Fig. 3.08-09). From 1987 through 2011, Massachusetts has never suffered *any* decline in R&D intensity (defined as private R&D expenditures as a percentage of state GDP) and has always been among the top four states in terms of R&D intensity.[104] After the San Francisco area, the Boston area is the second-most popular location in the U.S. that companies select for their primary R&D center (selected by 230 firms as of 2011, compared to 380 firms for San Francisco) (NSF 2011).[105]

The Boston area has preserved or regained a significant presence in biotechnology and the life sciences, computer systems design, telecommunications equipment, data storage, technical instruments, and industry-oriented software tools (Best and Xie 2006; Best, Paquin and Xie 2004; Wood 2000). In the life sciences (including biotechnology and medical devices) sector in particular, the Boston area is especially prominent (31% of all VC financings in New England in 2013 flowed to this sector (NVCA 2015)) and trade and scholarly commentary typically situates it among a triplet of leading biotechnology clusters along with the Bay Area and San Diego (PriceWaterhouseCoopers 2015; Breznitz 2006; Best 2006), in some cases ranking it as the leader among those three locations.[106] As of 2015, Massachusetts employed more personnel in biotechnology R&D than any other state and, on a per capita basis, received more funding from the National Institutes of Health than any other state.[107] During 2012-14, San Francisco firms received each quarter approximately 30-50% of funding in the national life sciences industry while Boston firms received each quarter approximately 20-40% of funding (PriceWaterhouseCoopers 2015, Fig. 13). Stuart and Sorenson (2003b) show that, during the period 1978-1996 (precisely the period during which Silicon Valley

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[104] Authors' calculations, based on data published on an alternating year basis by the National Science Foundation, Bureau of Economic Analysis. For this purpose, we excluded federal R&D dollars in order to avoid reflecting any taxpayer subsidies that might understate regional markets' abilities to sustain innovative activities.

[105] Source: http://www.nsf.gov/statistics/infbrief/nsf14315/

[106] *Boston's Biotech Hub is Surviving the Challenge from Silicon Valley,* THE ECONOMIST, Jan. 16, 2016.

[107] See id.

overtook Route 128 in the computer industry), the Route 128 area was the most fertile region of the country for new biotechnology firms, with the Palo Alto area being a close second.[108]

On a state-to-state level comparison, it may be surprising to learn that Massachusetts and California do not materially differ by multiple measures of innovative health. On a state by state basis, the Milken Index (2012) finds that both states fall within comparable ranges for multiple innovation measures, including: (i) engineers as a percentage of all occupations (in the range of 1.48-1.7%); (ii) R&D as a percentage of total state GDP (CA: 4-4.8%; MA: 4.8-5.6%); (iii) business-performed R&D as a percentage of total private industry output (4.2-4.8%); (iv) patents awarded per 1,000 individuals in science and engineering occupations (MA: 25-30; CA: 35-40); (v) high-technology establishments as a percentage of all business establishments (9.6%-10.75%); (vi) employment in high-technology establishments as a percentage of total employment (13.2%-14.4%). The State New Economy Index (2012)—including measures such as information technology jobs, patents, number of scientists and engineers—placed Massachusetts in first place and California in fourth place.[109]   In 2015, the Bloomberg State Innovation Index (including measures such as patenting rates, R&D intensity, and density of high-technology firms) placed Massachusetts in first place, followed closely by California (Jamrisko and Lu 2016).[110]

All told, the exemplar of the new wisdom focuses on one industry in two regions across a limited time-period, based on stylized historical accounts. If noncompetes were the major factor driving substantial differences in technological results, one would expect notable differences to appear in multiple industries relying heavily on tacit knowledge and to persist over lengthier periods of time. As we have explained, the story is not so simple; contrary evidence and other persuasive reasons considerably cast doubt on it. Nor do the later empirical studies rescue it.

Conclusion

Today much of the scholarly literature asserts that limiting the enforcement of noncompetes and other contractual limitations on employee mobility promotes innovation. Some legislatures are listening seriously in an understandable effort to

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[108] While this ranking would probably be inverted if the Palo Alto area were consolidated with the Bay Area more generally, the Boston area would still retain a prominent runner-up position nationally.

[109] *See* THE 2012 STATE NEW ECONOMY INDEX, THE INFORMATION TECHNOLOGY & INNOVATION FOUNDATION (2012).

[110] Two caveats are that we have not closely examined the methodology behind these indices and any state-by-state comparisons must be discounted because they punish California for its size and heterogeneity. Nonetheless, the results support the modest observation that Massachusetts did not suffer a dramatic and long-lived absolute decline in its innovative capacities.

build robust innovation ecosystems. We contest this "new wisdom" on two grounds. First, we contest the proposition that adopting this policy would significantly accelerate the circulation of human capital inputs, especially taking into account other mechanisms for influencing employee mobility. A close review of recent empirical studies that purport to support the proposition reveals serious limitations. Second, we contest the proposition that banning noncompetes and other limitations on employee mobility would necessarily promote overall innovation. This proposition is typically illustrated by reference to the standard narrative of the rise of Silicon Valley and the decline of Route 128, as well as several empirical studies. A close review shows that these studies' findings are also unjustified. Technological and economic fundamentals, rather than differences in legal regimes, most likely account for different innovation profiles across states and regions. In short, from an efficiency perspective, current evidence provides little compelling support for abandoning the traditional measured approach toward enforcing noncompetes and other contractual limitations on employee mobility in innovation markets.

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