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THE NEW COGNITIVE PROPERTY:

HUMAN CAPITAL, KNOWLEDGE CREATION, AND THE REACH OF INTELLECTUAL PROPERTY

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Sciretuumnihilest, nisi tescire hoc sciat alter
[your knowledge is nothing if no one else knows you know it]
– Latin Proverb

INTRODUCTION

Human capital is a dynamic, self-replenishing resource. Unlike other natural resources that become endangered by overuse, pollution, and free riding, human capital is endangered when it is under-used, isolated, and controlled. This article argues that contemporary policy is grounded in the conviction that not only the *outputs* of innovation – artistic expressions, scientific methods, and technological advances – but also the *inputs* of innovation – people, their skills, experience, knowledge, professional relationships, creative and entrepreneurial energies, and the potential for innovating – are subject to control and propertization. In other words, we now face a reality of not only the expansion of intellectual property but also *cognitive property*.

This article introduces the field of human capital law and its evolution. Regulatory and contractual controls on human capital – post-employment restrictions including non-competition contracts, non-solicitation, non-poaching, and anti-dealing agreements; pre-innovation assignment agreements of patents, copyright, as well as non-patentable and non-copyrightable ideas; and confidentiality and non-disclosure agreements and trade secrets enforcement against former insiders - are among the fastest growing frontiers of market battles.[1] These regimes heavily shape industrial competition, regionally and globally, and through this web of extensively employed mechanisms, skill and knowledge that have traditionally been deemed public in intellectual property law have become proprietary. The expansion of controls over human capital has thus become the blind spot of intellectual property debates.

[1] ORLY LOBEL, TALENT WANTS TO BE FREE: WHY WE SHOULD LEARN TO LOVE RAIDS, LEAKS, AND FREE RIDING (Yale University Press 2013).

While human capital has risen above tangible assets as a key ingredient for economic success, human capital law remains diffuse and murky. The realities of twenty-first century production and competition, which have changed the patterns of work and increased the premium on constant innovation, coincide with the accumulation of new empirical insights on innovation. While these developments are of great significance, legal scholarship on human capital remains surprisingly thin. The talent wars, the ongoing battle to claim ownership over human capital and the cognitive capacities for innovation, are traditionally understood in similar terms of the patent and copyright wars. The traditional and under-developed analysis asserts that human capital controls are necessary to generate investment and growth. At the same time, a growing body of empirical evidence points to the detrimental effects of excessive human capital controls. Building on this new research, this article challenges orthodox economic assumptions about the human capital/innovation nexus. The article further calls for the recognition of talent qua talent as a shared public resource. Law's role in safeguarding and promoting human capital as a shared resource is little understood. A closer study of human capital law regimes suggests that successful industries and regional economies rely on law and collective action to nurture a cognitive commons, to protect mobility and encourage the densification of knowledge networks.

The article proceeds as follows. Section I argues that the debate about the scope of intellectual property has obscured the broader ways in which knowledge and potential for innovation are controlled. The section presents three interrelated expansions of human capital controls. First, subject-wise, it describes the expansion of controls into the intangibility spectrum that propertizes knowledge that would fall outside the scope of patent and copyright, as captured by the rise in contractual clauses assigning all innovation "*whether patentable or non-patentable.*" Second, time-wise, it analyzes the expansion of ownership over future innovation, as well as attempts to go back in time and capture prior knowledge that an employee had when joining the company. Finally, scope-wise, it demonstrates the colossal rise in the use of non-competes along with a shift from individualized controls to meta-controls, or cognitive cartels, as evidenced in the current class action against high-tech giants, including Apple, Google, Intuit, and Pixar, which agreed to not hire each other's employees. Turning to economic research and empirical study on the nexus between innovation and human capital, Section II explains how the new cognitive property reaches beyond traditional intellectual property controls by offering a novel taxonomy of different types of knowledge as they relate to human capital flows: tacit, relational, networked, motivational, and

disruptive. Each of these aspects of knowledge helps explain the overall harmful effects of the new cognitive property. Section III relates the questions of human capital law and knowledge flows with contemporary economic theories about endogenous growth and search theory and explains why regions benefit from continuous investment in shared cognitive capital. Section IV outlines research frontiers and policy directions that must be developed if we are to fully recognize the need to nourish and protect our human capital pools.

I. DIMENSIONS OF COGNITIVE FENCES: FROM OUTPUTS TO INPUTS

A. Knowledge Economy and the Human Capital Puzzle

Nobel Laureate Elinor Ostrom, who pioneered research on the commons, described *knowledge* as "a shared resource, a complex ecosystem that is a commons—a resource shared by a group of people that is subject to social dilemmas."[2] Ostrom and Hess defined knowledge as all intelligible ideas, information, and data. In the past two decades, scholars from a wide variety of disciplines have warned against the over-expansion of knowledge controls through intellectual property policy. The debate regarding the effects of intellectual property laws on inventive activity and technological progress is enduring and lively. At the same time, the field of human capital – at the intersection between intellectual property, employment law, and antitrust– has been relatively neglected and presents fertile grounds for important new inquiry.

The legal protection of knowledge as a form of property is a recent development from a historical viewpoint. In ancient times, there was little formal protection for intangible goods. Over the centuries, notions of ownership of ideas have evolved. The drive to control ideas through legal tools is evident: in its natural state, information travels freely. Knowledge is, by its very nature, a public good. Without effort, ideas flow freely; they multiply without running out. Thomas Jefferson viewed the free spread of ideas, "over the globe, for the moral and mutual instruction of man, and improvement of his conditions" as "peculiarly and benevolently designed by nature, when she made them, like fire, expandable over all space, without lessening their density in any point, and like the air in which we breathe, move, and have our physical being, incapable of confinement or exclusive appropriation." At the same time, ideas and information can have

[2] CHARLOTTE HESS AND ELINOR OSTROM, UNDERSTANDING THE KNOWLEDGE COMMONS (2006).

enormous commercial value. For this reason, over the last century, intellectual property rights have expanded in length of protection, subject matter, and scope. Patent eligibility has expanded to new categories, such as computer software, business methods, and genetically modified organisms; copyright protections have been extended and lengthened; trademark law now protects the value of the brand beyond consumer confusion; trade secrets span new subject matters and modes of infringement. Intellectual property has been hailed "the foundation of the modern information economy: it fuels the software, life sciences, and computer industries, and pervades most of the products we consume."[3] But as the scope of IP protection expands, the field has also become one of the most contested areas of policy. From music file sharing and copyright disputes to drugs for AIDS and patent law reform, "the intellectual property wars are on."[4]

The fierce battles raise questions about the costs and benefits of controlling knowledge and the distributional effects of the intellectual property regime. In general, granting IP rights is a quid pro quo bargain: inputs to innovation are rewarded with exclusivity over the innovation outputs for a limited time. The prevailing consensus is IP protections themselves are largely harmful, but the incentives behind them are valuable. In other words, most scholars agree that IP is a necessary evil: it promotes innovation by creating a partial monopoly. The debates normally surround the scope of enclosure and the limits of this necessary evil.[5] A decade ago, a group of scholars and activists denounced "excessive, unbalanced, or poorly designed intellectual property protections" when they drafted an open letter to the Director General of the World Intellectual Property Organization.[6] The letter called for updated approaches to knowledge building and sharing. The quest to reach the right balance between public domain and intellectual property protections vigorously continues.

While the scope of intellectual property has triggered lively contestations and exchanges, under the radar, excessive, unbalanced and poorly designed (to borrow the language of the WIPO letter) human capital controls have wildly expanded. Their expansion has been mostly under the radar of the IP wars. The impulse to control human capital manifests in the

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[3] Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When is it the Best Incentive System?*, 2 INNOVATION POLICY AND THE ECONOMY 51-78 (2002).

[4] Gaia Bernstein, *In the Shadow of Innovation*, 31 CARDOZO L. REV. 2257 (2010).

[5] A growing but significant minority of commentators advocate against intellectual property more broadly. The commentators view intellectual property as an unnecessary evil that reduces access and slows down progress in the arts and sciences. MICHELE BOLDRIN AND DAVID K. LEVINE, AGAINST INTELLECTUAL MONOPOLY (2008)

[6] Open Letter to WIPO, Nature 424, p.118, 10/7/03.

growing use of non-competes, non-disclosure agreements, and pre-invention assignments. Controls over human capital have become widespread in almost every industry. These contractual and regulatory constraints on the use of knowledge, skill, and information acquired during employment consist of (1) pre-invention assignment agreements that go beyond the subjects that intellectual property deem to be commodifiable; (2) confidentiality, non-disclosure agreements and secrecy restrictions which span beyond traditionally defined secrets under trade secret law; (3) non-compete agreements and meta-non-competes, anti-competitive labor market collusion through anti-poaching agreements. Each of these three central mechanisms, increasingly employed by companies to propertize human capital, are subject to doctrinal rules and litigation and yet these developments have received surprisingly little attention as a field of law.

B. The Intangible Spectrum: "Whether Patentable or not Patentable; Copyrightable or not Copyrightable"

1. Evan Brown's Abstract Solution

Eureka! The moment of discovery; the coveted flash of genius. Evan Brown, a computer programmer from Texas, claims to have experienced such a flash while driving his Mercedes one sunny weekend. What had become clear to him was "the Solution," as court holdings later repeatedly referred to it with a capital 'S.' For twenty years he had been contemplating a computer program that would convert software written for obsolete systems into usable programs for newer computers. Then suddenly, at one fast-driving moment everything came together in Brown's mind. The Solution that crystallized was a groundbreaking algorithm that would allow for the easy upgrading of computers, making older software compatible with newer hardware. One major hurdle loomed in front of Brown's Eureka discovery. At the time the Solution became clear to him, Brown was working in the technical support department of the mega telecom company DSC/Alcatel USA. Even though Brown claims that the Eureka moment happened during the weekend on his day off, he had signed a contract granting his employer "full legal right, title and interest" in all of his inventions. Brown's contract required disclosure and transfer of all innovation made or conceived from his first day of employment with the company until his departure. When Brown refused to reveal his Solution to Alcatel, he was fired and then sued. Five and a half years of litigation

ensued. Eventually, a Texas court ruled in favor of Alcatel holding that the algorithms Brown developed belonged to his former employer. Following the court order, Brown was forced to travel to Alcatel's offices for three months and write down hundreds of pages of computer code without pay. Outraged, he has documented his woes on his website. In his own words, here is how Brown describes those troubled years of litigation:

> Now DSC/Alcatel has legal right and title to thoughts that existed only in my brain when they filed the lawsuit. DSC/Alcatel used their corporate influence with court system to deny me my rights and steal my thoughts. I am extremely discouraged . . . I had an idea that I had developed on my own time over many years. My idea had not been written down or recorded in any way. DSC/Alcatel claimed that since I was their employee at the time I solved the last portion of the problem, they owned my idea even though they had never paid me to work on it. DSC/Alcatel told the court that I stole their 'invention' and misappropriated their Intellectual Property . . . In the end there were no winners, everybody lost. Now that the case is over, I'm going back to what I enjoy, computer programming.

Brown's story, although not particularly unique in its legal history, has become a symbol of the moral outrage felt by inventors who are required to hand over their ingenuity to their former corporate employers. Brown's battle attracted a great deal of publicity around the world. From stories in Forbes to Playboy, the media latched on to the story, fascinated by its greater implications for modern inventors, with titles like "Not a Penny for Your Thoughts"(*Wired*), "Calling Mr. Orwell"(*Time*), and "Another Case for the Thought Police" (*London Times*). Even Scott Adams inspired to create a Dilbert strip about the Brown experience, showing an employee required to "cough up his idea."

Why has Brown's battle struck such a chord with inventors all over the world? Perhaps because the Solution, entirely in Evan Brown's mind, was still in incubation. Perhaps, as we will discuss in the next section, from a temporal perspective, the Solution seems to be the product of Brown's life work, spanning a career that bookends his decade at Alcatel. The Texas court viewed the case as a simple breach of contract and ordered Brown to hand over his idea. The court ordered complete disclosure of the Solution to Brown's ex-employer and refused to apply a non-compete analysis of reasonableness to the contract Brown had signed early on in his career at

Alcatel. The court understood the case as a simple contract dispute in which the broad invention assignment clause gave the employer the power to demand any and all of Brown's ideas. However, the media attention and public controversy, rightly point, to the complexities of such cases.

At what point can a broad concept developed in the mind of one person be considered a material invention owned by another? Brown claimed that his job had nothing to do with the Solution. But, even more acute, the Solution had remained in its abstract stages throughout the dispute. The idea, while valuable, was incomplete and unwritten. It was not, as patent law would require, reduced into practice. It had no external expression. Brown had not worked out the details of its operation and he had not put it down in writing. The Solution never left his mind. For all of these reasons, coercing disclosure at such an early stage of innovation is technically premature and ethically harsh. Pragmatically, and indeed, cynically, the legal result leads to the conclusion that Brown would have been better off never revealing the fact that he had an idea, but rather quitting and pursuing its development on his own. Consequently, and perversely, transferring ownership of fledgling and individually conceived innovation may impede the move from conception to a full blueprint by disincentivizing the very person who possesses the foundational ingredients.

In both copyright and patent, the attempt to define protectable subject-matter is fundamental. In patent law, in order for information to be patentable it must be reduced to practice, have utility, and be inventive. Abstract ideas cannot be the subject of a patent. In copyright, ideas are not subject to protection while expressions receive such privilege. The idea-expression dichotomy was developed early on by the courts in copyright cases, and incorporated into the Copyright Act of 1976 as section 102(b) stating "in no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated or embodied in such work."[7] The abstract/practical and idea/expression divides are the heart of the bargain struck in intellectual property. While fine-tuning these lines remains a contested and highly litigated effort, the principle that these lines ought to be policed remains strong in both copyright and patent law. And yet, when we shift our gaze from the traditional pillars of IP to contractual extensions, we uncover a wholly different picture.

2. Carter Bryant's Concept

[7] 1879 case of Baker v. Selden.

Like Evan Brown, Carter Bryant had signed an agreement that all his concepts and know-how would belong to his employer, Mattel. Bryant's employment agreement provided the following:

> I agree to communicate to the Company as promptly and fully as practicable all *inventions* (as defined below) conceived or reduced to practice by me (alone or jointly by others) at any time during my employment by the Company. I hereby assign to the Company ... all my right, title and interest in such inventions, and all my right, title and interest in any patents, copyrights, patent applications or copyright applications based thereon.

The contract defined the term `inventions' to included, "but is not limited to":

> All discoveries, improvements, processes, developments, designs, knowhow, data computer programs and formulae, *whether patentable or unpatentable."* (emphasis added).

Bryant, who worked at Mattel for seven years, was a fashion and hairstyle designer for high-end Barbie dolls. He had an idea for a set of multi-ethnic, trendier girls - Zoe, Lupe, Halide, and Jade, who eventually made it to market as Cloe, Yasmin, Sasha and Jade: the first generation of Bratz dolls. While still at Mattel, Bryant made the initial doll designs out of pieces he found in the Mattel recycling bins: a Barbie body and Ken's boots.

He pitched the idea of Bratz to MGA Entertainment. In 2000, Bryant left Mattel to work full-time on the development of Bratz and a year later, MGA introduced Bratz to the toy market. Launching a $2 billion lawsuit and decade-long litigation, Mattel sued MGA for ownership over the Bratz empire, claiming that since Bryant created the doll while still a Mattel employee, the doll line, copyright, and trademark, and thereby all profits from its sales belonged to Mattel. Bryant had signed an agreement under which he assigned all his creative ideas and inventions to his then-employer.[8] Mattel argued that the contract meant it owned a major stake in the Bratz Empire.

During the first jury trial, the court interpreted Bryant's employment agreement to assign all possible ideas to Mattel. The jury was simply instructed to decide *which* ideas Bryant came up with during his time with

[8]New York Times (July 18, 2008).

Mattel. The jury then found that MGA interfered with Bryant's agreement, giving Mattel his ideas on the doll line. The district court imposed a constructive trust over all Bratz-related trademarks and awarded Mattel $100 million stemming from the breach of Bryant's contract.[9]

On Appeal, Judge Kozinski, in an attempt to determine whether ideas at large were included in the pre-invention assignment agreements resorted to conventional contract interpretation. He noted the lack of the word "ideas" in the contract itself, as well as the emphasis in the language of the contract that the list is not meant to be finite. Judge Kozinski thereafter compared the other categories listed against the term "ideas:"

> Designs, processes, computer programs and formulae are concrete, unlike ideas, which are ephemeral and often reflect bursts of inspiration that exist only in the mind. On the other hand, the agreement also lists less tangible inventions such as "know-how" and "discoveries".

Judge Kozinski continues to inquire on the right way to interpret the contract by also emphasizing the contractual word "conceived," which he interprets as suggesting that "Bryant may have conveyed rights in innovations that were not embodied in a tangible form by assigning inventions he "conceived" as well as those he reduced to practice." Judge Kozinski sent these inquiries back for a second jury trial that would look into the contract interpretation more carefully. In other words, Judge Kozinski, in overturning the first jury trial, supported a better drafted contract that could fence up all ideas, abstract and without protection. In the same decision, Judge Kozinski warns about the chilling effects of overly broad copyright protection. As we've come to expect in his lineage of intellectual property cases, Judge Kozinski is well aware of the threat that strong controls over information pose to cultural production. When he turns to the actual drawings of the Bratz dolls that Bryant had sketched and sold to MGA, he emphasizes the idea/expression distinction at the core of copyright law:

> Degas can't prohibit other artists from painting ballerinas, and Charlaine Harris can't stop Stephanie Meyer from publishing *Twilight* just because Sookie came first. Similarly, MGA was free to look at Bryant's sketches and say, "Good idea! We want to create bratty dolls too."

[9] http://www.usatoday.com/money/industries/retail/2008-08-26-mattel-bratz-dolls_N.htm.

And yet, the same decision gives a contract the power, with the right phrasing, to pre-assign far more than what is, as expressly stated in the contract, patentable or what is copyrightable.

This gap between the scope of intellectual property and the scope of contractual pre-innovation assignment is illuminating. Like Evan Brown, Carter Bryant had an idea for a different product in his respective industry. Brown's idea was patentable only once it became more than an abstract idea solely in his mind, while Bryant's idea, a new product line, was copyrightable only once it was penned and drawn on paper, and even then, only the expression, not the concept and idea were protected by copyright law.

At what point can ideas become the subject of transfer requirements? Is it when these ideas are patentable or copyrightable as the traditional intellectual property protections require? Or is it even earlier, when still abstract and barely developed in the mind of their creator? Both the patent assignment dispute over Evan Brown's algorithm and the copyright dispute over Carter's concept of Bratz raise a central question of whether an abstract idea can be pre-assigned and exclusively owned.

3. Sergey Aleynikov's Crime: Expansion of Trade Secrets through NDAs and the Escalation in Secrecy Hysteria as a Control Device

Sergei Alyenikov was a star programmer at Goldman Sachs for two years. A month after leaving Goldman Sachs, he was arrested by the FBI, prosecuted and convicted for eight years in federal prison. He was convicted for stealing proprietary technology from his employer. Goldman Sachs accused Alyenikov of stealing computer code and sending himself 32 megabytes of source code. Goldman Sachs had discovered these downloads two days earlier and called the FBI which immediately sent agents for his arrest. He was prosecuted under the Economic Espionage Act of 1996. Alyenikov had worked as a programmer for Goldman's high frequency trading platform. During his work at Goldman, Alyenikov, like the other programmers, used open source software daily. Despite the vision and frequently the requirement of open source to be put back to the common pool after use and modification, Goldman had a strong one-way attitude about open-source. They took huge amounts of open source, and once they took it, it became Goldman's proprietary information. Journalist Michael Lewis who investigated described Alyenikov's experience at Goldman:

> "Once I took some open-source components, repackaged them to come up with a component that was not even used at Goldman Sachs," [Alyenikov] says. "It was basically a way to make two computers look like one, so if one went down the other could jump in and perform the task." He described the pleasure of his innovation this way: "It created something out of chaos. When you create something out of chaos, essentially, you reduce the entropy in the world." He went to his boss…and asked if he could release it back into open source, as was his inclination. "He said it was now Goldman's property."…Open source was an idea that depended on collaboration and sharing, and Serge had a long history of contributing to it. He didn't fully understand how Goldman could think it was O.K. to benefit so greatly from the work of others and then behave so selfishly toward them. "You don't create intellectual property," he said. "You create a program that does something."

During Alyenikov's trial, his attorney presented evidence of identical pages of computer code: one marked with open-source license and a copy at Goldman, with the open-source license removed and replaced with a Goldman Sachs logo. When Alyenikov quit his position at Goldman he agreed to remain in his position for six more weeks to help teach others at Goldman all he knew. During that time, he mailed himself source code he had been working on. The code contained large amounts of open-source code he had been using for two years, intertwined with code that was developed at Goldman. His claim at trial was that he sent this code to himself because he hoped to later disentangle the two and have the open source available if he needed a reminder of what he had used.

There is no doubt that Alyenikov broke Goldman Sachs' rules. There is also no doubt that trade secret law serves an important function in market competition and that employees are generally required to keep a company's secrets secret. The claim here is that trade secret law, like other area of intellectual property, has been understood as a bargain between the benefits of maintaining some information secret to encourage investment in innovation. Trade secret law has clear boundaries: information deemed trade secret must be confidential, not generally known in the industry. It must be valuable and the company must derive value from and must exert efforts in maintaining its secrecy.

Trade secret law is about innovation policy. As Madhavi Sunder suggests, it is also about the relationship between firms and individuals.[10] The Alyenikov case raises doubt about whether the original bargain struck in trade secrecy has been abandoned. In several ways, the case points to an unbalanced enforcement of confidentiality in a form that creates cognitive controls beyond the actual secrecy of the information at stake. First, the evidence in the case pointed to the little value that the source code would have for anyone outside of Goldman. Second, there was no actual use of the information taken. The only evidence was his new employer testified that he had absolutely no interest and no use of the code. Third, much of the code was open source code that Alyenikov had taken from the Internet. He insisted convincingly to the panel of experts who examined the evidence post-trial that he took the code for those elements, which Goldman had not returned to the public domain, likely in violation of the open-source licensing agreements.[11] Fourth, the manner in which he downloaded the code was not of a thief trying to be inconspicuous; he could have easily downloaded the information into a thumb drive. Fifth, perhaps most striking, Alyenikov took very little, "eight megabytes in a platform that consisted of an estimated one gigabyte of code" and nothing of true value, namely Goldman's trading strategies – the secret sauce ("But that's like stealing the jewelry box without the jewels" said one of the experts that examined the facts post-trial). Sixth, procedurally, these questions were tried in the absence of actual expertise about the nature of the information and the allegations of its value.[12] Finally, seventh, the harsh consequences:

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[10] Sunder, Trade Secrets paper cite.

[11] An expert in the trading industry sympathetically explained why Alyenikov's actions were understandable: "If Person A steals a bike from Person B, then Person A is riding a bike to school, and Person B is walking. A is better off at the expense of B. That is clear-cut and most people's view of theft. In Serge's case, think of being at a company for three years and you carry a spiral notebook and write everything down. Everything about your meetings, your ideas, products, sales, client meetings—it's all written down in that notebook. You leave for your new job and take the notebook with you (as most people do). The contents of your notebook relate to your history at the prior company, but have very little relevance to your new job. You may never look at it again. Maybe there are some ideas or templates or thoughts you can draw on. But that notebook is related to your prior job, and you will start a new notebook at your new job which will make the old one irrelevant. . . . For programmers their code is their spiral notebook. [It enables them] to remember what they worked on—but it has very little relevance to what they will build next. . . . He took a spiral notebook that had very little relevance outside of Goldman Sachs."

[12] "The one outside expert witness on the subject called by the government, a professor at Illinois Institute of Technology named Benjamin Van Vliet, had never actually done any high-frequency trading himself and had little to add on the value or the gist of what Serge

the eight year imprisonment of a former programmer, a father of three with no criminal record, for the act of emailing his work to himself.

Michael Lewis, attempted to understand why Goldman fought hard under such non-threatening circumstances to make sure a former star programmer would be sentenced to jail ("Why on earth call the F.B.I.?" Lewis asked. "Why coach your employees to say what they need to say on a witness stand to maximize the possibility of sending him to prison? Why exploit the ignorance of both the general public and the legal system about complex financial matters to punish this one little guy? Why must the spider always eat the fly?"). The best explanation he finds is that Goldman had to send a message that their code is original and genius. If anyone discovered that 95 percent of it is open-source, it would kill the Goldman's reputation and the high bonuses of Goldman traders might suddenly seem less justifiable.

A year into his imprisonment, the Second Circuit Court of Appeals overturned Aleynikov's sentence on a technicality.[13] The court found that

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had taken. About the market itself he was badly misinformed. (He described Goldman Sachs as "the New York Yankees" of high-frequency trading.) He turned out to have testified as an expert witness in an earlier trial involving the theft of high-frequency-trading code, after which the judge had described what he'd said as "utter baloney." trading code, after which the judge had described what he'd said as "utter baloney." The jury consisted mainly of high-school graduates and lacked anyone with experience programming computers. "They would bring my computer into the courtroom," recalls Serge incredulously. "They would pull out the hard drive and show it to the jury. As evidence!" Save for Misha Malyshev, Serge's brief employer, the people who took the stand had no credible knowledge of high-frequency trading: how the money is made, what sort of computer code is valuable, etc. Malyshev, who'd been subpoenaed as a witness for the prosecution, testified that Goldman's code was of no use whatsoever in the system he'd hired Serge to build—he insisted that it had never been his plan to import code from anywhere because he wanted to build Teza's system from scratch. He wanted something flexible and fast, that he could continuously upgrade. Even if offered Goldman's entire high-frequency-trading platform he would not have been interested—but when he looked over he saw that half the jury appeared to be sleeping." Michael Lewis

[13] A few months after Aleynikov's appeal, In August 2013, the Second Circuit affirmed the criminal conviction of Samarth Agrawal for violating both the National Stolen Property Act (NSPA) and the Economic Espionage Act (EEA) in a very similar case, where the employee was found to have misappropriated high-frequency trading code at the time he was leaving the company. The difference was that unlike Aleynikov, Agrawal printed SocGen's code on paper, making his theft tangible. According to the Second Circuit, "[t]his makes all the difference." Although it found that the cases were identical in "moral culpability," the court stated, "it is Congress's task, not the courts', to define crimes and prescribe punishments." See also, http://www.mondaq.com/unitedstates/x/256732/Terrorism+Homeland+Security+Defence/

the two statutes which were used for his conviction had loopholes.[14] The National Stolen Property Act (NSPA) was not written to cover intangible goods but only "goods, wares, merchandise, securities or money" while the Economic Espionage Act (EEA) covered the misappropriation of trade secrets that were designed to enter into commerce. In his concurring opinion, Judge Calabresi called Congress to amend the EEA to cover the kind of information Aleynikov downloaded. Congress quickly reacted and closed the gap with a bipartisan vote and President Barack Obama signed the reform into law.

C. The Timeline: Back to the Future

1. Before

Businesses seek to expand their control over the time of innovation through broad invention assignment contracts. Quite pervasively, companies require the pre-assignment by contract of the creative work, including all ideas regardless of their protection by intellectual property, and before the ideas are conceived by the employee. Both the Evan Brown/Alcatel and the Bratz/Barbie dispute are battles over contractual extensions of ownership over innovation, even before the ideas make their debut inside the designer's mind. Today, the employee-inventor agrees in advance to assign her rights to any future invention to the employer.

If one just looks at intellectual property law, innovation rights are granted to authors and inventors. The Court has repeatedly explained that intellectual property is sourced in the belief that the "encouragement of individual effort by personal gain is the best way to advance public welfare

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Virtually+Identical+Trade+Secret+Theft+Cases+Result+In+Opposite+Conclusions+Lessons+From+The+Second+Circuits+Attention+To+Detail

[14] Aleynikov is still being charged in New York state court for unlawful use of secret scientific material and unlawful duplication of computer related material, facing a four-year prison sentence. He is currently on bail. Aleynikov challenged the charges on double jeopardy grounds; the judge found that the charges were different and that the federal charges were dismissed based on the inadequacy of the indictment, and not the evidence, therefore not double jeopardy. More recently, Aleynikov filed a complaint in September, 2012, seeking costs for his legal fees as a former corporate officer. On January 21, 2014, Goldman Sachs asked the 3rd Circuit to overturn that order because he did not qualify under company bylaws. The fees amount to more than $2.4 million.

through the talents of authors and inventors."[15] Both patent law and copyright law are reasonably clear that ownership, as a default, is vested to the author of an invention or creative expression. The author of a copyrighted work is the person who transforms an idea into a tangible expression. The exception however is in the context of work. In patent law, the courts developed the hired-to-invent doctrine. In copyright, the work-for-hire doctrine was codified into the Copyright Act, shifting the definition of "authorship" in the context of employment from employee to the employer that commission the work.[16]

The devil however, is in contract law. Even though the legal default in patent law leaves most inventions employee-owned – only inventions that were the purpose of the employee's work – under the work-for-hire in copyright and hired-to-invent doctrine in patent law were employer-owned-- the default can be changed by contract. In practice, businesses routinely demand such contracts that involve ceding all rights to future inventions. Many companies demand that all of their employees, from the low-level manufacturing employees to design engineers and creative workers, sign such an invention assignment clause upon hiring. In turn, employee inventors receive only a token payment, if any at all, in exchange for the transfer of all property rights of past and future innovation.[17]

At times, these future innovation assignment agreements reach back into the past. Evan Brown began translating computer programs from one system to another while he was an undergraduate student at Texas A&M, almost two decades before starting to work at Alcatel (then DSC). Brown claimed to have conceived of the basic idea for the conversion algorithm almost ten years earlier. During those early years, Brown wrote computer conversion programs for several different companies. He did not deny that while working at Alcatel he perfected his brainchild. When he felt that his basic idea was nearly complete, and after working at Alcatel for almost ten years in other software development, Brown requested that he be released from his invention disclosure agreement. Carter Bryant had worked on creative designs of angelic looking creatures since his childhood. Indeed, during the trial, his attorneys presented mounting evidence of his early drawings during his high school and college years.

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[15]Mazer v. Stein, 347 U.S. 201, 219 (1954).

[16] Catherine Fisk has documented the development of the work-for-hire principle and has called it a legal fiction that frequently renders the employer the author.

[17] Cherensky, Steven (1993). "A Penny for Their Thoughts: Employee-Inventors, Preinvention Assignment Agreements, Property, and Personhood." *California Law Review*. 81(2), 597–666.

The temporal reach of corporate ownership occurs not only through individual contract but through institutional policy. While an undergraduate lab assistant, Petr Táborský, a talented science student at the University of South Florida, discovered a way to turn cat litter into a reusable human waste-cleaning device. Although Táborský had not signed an assignment agreement or any other employment agreement, the court deemed that he stole his own research because it was, by virtue of university policy, the property of the university. The project began with a small grant from a Florida utility company, Florida Progress Corp. The project as initially scheduled had ended before Táborský made his discovery, but the young researcher received permission to continue to pursue the research path under the supervision of his professors and as part of his master's thesis. When he made the breakthrough, both the university and the utility company claimed the invention as their own because Táborský made it using the department laboratory.

Táborský was convinced that the discovery was his to keep. He filed for a patent and held on to his handwritten lab notebooks. These notebooks became the heart of the litigation that eventually led to his imprisonment. When he refused to hand them over, the university brought criminal charges against Táborský, for the theft (self-theft, if you will) of his handwritten notebooks. Táborský readily admitted that he possessed these four notebooks that he had purchased and always kept in his possession on and off campus. Peter Táborský, later said about his decision to go to prison and not give up control over his notebooks:

> When you think about going to jail, it's so terrifying I couldn't get out of bed in the morning. But at some point I made the decision I wasn't going to let them use the criminal court to get something they weren't entitled to.

Táborský refusal to comply with the judge's order to transfer ownership of his patent and to hand over the notebooks landed him in a maximum-security state prison. When offered clemency by then Florida Governor Lawton Chiles, Táborský declined and stated that accepting would be tantamount to admitting guilt.

2. After

A trailer clause, otherwise termed an invention assignment holdover, is designed to ensure a company's right to future inventions, even after the employee quits or is fired. A typical trailer clause states that after the

employee leaves her job, her former employer owns any patent filed within a specified period. Like other cognitive controls, trailer clauses raise questions concerning their wisdom, legitimacy, enforceability, and scope.

*** Expand; also – the contractual nexus with post-employment patent litigation - the assignor estoppel doctrine in patent litigation – Expand ***

3. And Everything in Between: Weekends and Nights

Much of the trial drama in the Mattel-MGA case centered on whether the court could pinpoint the moment that Carter Bryant created his brainchild, the Bratz doll. Recall that Bryant's employment agreement provided assignment for all inventions conceived or reduced to practice "at any time during my employment by the Company." Bryant argued that he came up with the concept of the doll while on a year leave from Mattel in 1998. Alternatively, he argued that even if he had worked on the concept during the period in which he was employed, he did it during his off-time, at home at night and during the weekend. The question becomes, even if one assigns their rights for all innovation while employed, can that include all cognitive power 24/7?

In looking at the issue, once again Judge Kozinski considered this question one of contractual interpretation. Judge Kozinski rejected Mattel's simplified version of the work a contract does in assigning innovation beyond what the law grants:

> Mattel argues that because employers are already considered the authors of works made for hire under the Copyright Act, 17 U.S.C. § 201(b), the agreement must cover works made outside the scope of employment. Otherwise, employees would be assigning to Mattel works the company already owns. But the contract provides Mattel additional rights by covering more than just copyrightable works.

Judge Kozinski interpreted the contract to include all possible creative functioning outside the time of actual work. But, he remanded the case so that the lower court can interpret the ambiguous contract by looking at past practices and industry norms. Once again, Judge Kozinski accepted the expansion by contract but urged the use of clear language. A learning curve for cognitive fences, if you will.

The U.S. Constitution provides that inventors shall have "the exclusive right to their discoveries." Based on this principle, federal patent law

requires individual inventors to file their own patents. Corporations themselves cannot *author* a patent, but corporations can nonetheless become patent *owners*. These days, in practice, they almost always do. Because most inventions today occur in the context of the workplace, corporations, not hired inventors, own the vast majority of inventions. Inventions that occur as the job itself for which one was employed belong to the employer.[18] For example, even in the absence of a contract requiring the relinquishing of invention rights, an employee who had made original sketches of an invention at his home can still lose ownership rights because the company had tasked him with inventing the process at issue.[19] Recently, courts have expanded the definition of what it means to be "hired to invent" and have held that even if hired for a general purpose, an employee charged with the specific task of invention, among many work responsibilities, implicitly cedes ownership of all related inventions to the employer.

The law has attempted to incentivize employees to invent without being asked to do so by their employer, striking a balance between the employee's ownership and the employer's interest in having a partial stake in the invention. The solution has been the 'shop-right,' or an implied license granted by the inventor to his or her employer. The shop right gives employers a non-exclusive right to use an invention related to the company and to which the work environment contributed, even when the invention was not within the scope of the employee's duties.[20] Today, this doctrine is becoming obsolete because expansion through contract has tipped the balance to include innovation far beyond work-for-hire and hire-to-invent. In the absence of a signed contracts, some courts will even allow pre-innovation assignments via oral or implied agreements.[21] Although other countries with high patent rates limit the ability to demand such pre-assignment, in the United States only a minority of states, including California, restrict the scope of these agreements by prohibiting employers from demanding pre-assignment of patent ownership of inventions wholly unrelated to one's job.[22]

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[18] Solomons v. United States, 137 US 342, 346 (1890).
[19] Teets v. Chromalloy Gas Turbine Corp., 83 F.3d 403, 408 (1996).
[20] Dubilier, 289 US at 188.
[21] Dickman v. Vollmer, 736 N.W.2d 202 (Wis. Ct. App. 2007) (holding that agreements to assign do not need to be in writing; upon sufficient proof, oral pre-assignments may be upheld); Larson v. Correct Craft, Inc., 537 F. Supp. 2d 1264 (M.D. Fla. 2008).
[22] These states statutes include: Cal. Lab. Code § 2870 (West 1989) (enacted 1979); Del. Code Ann. tit. 19, § 805 (1995) (enacted 1984); 765 Ill. Comp. Stat. 1060/2 (West 1998) (enacted 1983); Kan. Stat. Ann. § 44-130 (1993) (enacted 1986); Minn. Stat. § 181.78 (1998) (enacted 1977); N.C. Gen. Stat. §§ 66-57.1 to 66-57.2 (1992) (enacted 1981); Utah Code Ann. § 34-39-3 (1997) (enacted 1989); Wash. Rev. Code § 49.44.140 (1990) (enacted

California's labor code states that an employment agreement requiring an employee to transfer her rights to an invention is not enforceable if the invention was developed entirely on her own time and without using employer resources or trade secrets, unless the invention was anticipated as part of the job for which she was hired.[23] It is a narrow exception, but if I invent a new pedometer for cycling, the California-based university that employs me cannot demand ownership over it because my job as a law professor does not cover athletic inventions. Beyond the few states that have similar limitations inscribed in their written laws, several other states, such as Massachusetts (but not, as we know from the Brown/Alcatel battle, Texas), limit the scope of assignment using a court-developed standard of reasonableness. A Massachusetts court observed that, "for over one hundred years, courts have looked skeptically upon employment contracts that require an employee to assign his inventions to his employer." Nevertheless, the reasonableness inquiry is rather limited and even the statutory limitations, where they exist, are usually drawn quite narrowly.

Finally, it might be illuminating to note a paradox. What about overtime? In employment law, we militantly police the lines between on the job and off the job hours for the purposes of wage and hour. This past term, the Supreme Court spent hours deciding a case concerning whether donning and doffing work gear should be deemed time worked or uncompensable arrival time to the workplace.

However, human capital law has shifted to allowing the propertization of knowledge work far beyond the reach of these policed lines. It is worth noting that the American system of uncompensated contractual cognitive assignment is quite exceptional among highly innovative countries. In the United States, private employers are under no affirmative duty to compensate employees for profits derived from their inventions. By contrast, other countries with high patent competitiveness legally require businesses to pay fair compensation to the inventor who assigns an invention to them.

Germany, for example, requires that the employee-inventor be fairly

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1979). Donald J. Ying A COMPARATIVE STUDY OF THE TREATMENT OF EMPLOYEE INVENTIONS, PRE-INVENTION ASSIGNMENT AGREEMENTS, AND SOFTWARE RIGHTS 10 U. Pa. J. Bus. & Emp. L. 763 2008.

[23]Cubic Corp v. Marty, 229 Cal.Rptr. 438 (Cal.Ct.App.1986); Cadence Design Systems, Inc. v. Bhandari, 2007 WL 3343085 (N.D.Cal.,2007) (holding that under *Cal. Labor Code § 2870*, inventions that are "related to" an employer's business interest are not limited to the smallest business division in which the employee actually works; inventions within the general scope of the employer's business may be pre-assigned.)

compensated for any assigned invention. Under German law, inventions cannot be subject to carte blanche pre-assignment agreements. Rather, during the term of their employment, employees are obligated to report any invention connected to their employment, after which the employer has four months to claim the invention and file for a patent. If the employer chooses to do so, it is obligated to compensate the employee with an initial lump sum and a fair share of the patent value. Compensation will be lower if the employee's job duties include inventing or if the employee significantly relied on company resources and knowledge.[24]

Similar mandatory fair compensation requirements exist in France and in Scandinavian countries, including Finland and Sweden. China grants employers full rights to "service inventions." A "service invention" is any invention made during the course of employment while using the employer's materials and technical resources as well as any inventions produced within one year from an employee's resignation. In other words, China has a default trailer requirement tracing inventions back to ex-employers. And yet, in contrast to the United States, Chinese employers are required to reward the employee-inventor with reasonable compensation, including at least two percent of any profits from the invention and at least ten percent of licensing profits.

The Japanese system also guarantees employee-inventors a reward for assigned work.[25] Japanese employers must provide their employees with reasonable compensation, proportionate to the employee's relative contribution to the invention. So like Germany and China, and unlike the United States, Japan gives every employee the right to reasonable remuneration for her patentable inventions.[26]

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[24] German Law on Employee Inventions, http://www.wipo.int/clea/docs_new/pdf/en/de/de039en.pdf. Roland Kirstein and Birgit Will, Efficient compensation for employees' inventions, Eur J Law Econ (2006) 21: 129–148.Kesten (1996, 657); Reimer, Schade, and Schippel (2000).

[25]Vai Io Lo, *Employee Inventions and Works for Hire in Japan*, 16 Temp. Int'l &Comp.L.J.279, 306.

[26] Recently, the Japanese Supreme Court breathed new life into these compensation standards. When an inventor named Shumpei Tanaka, a former employee of the Japanese company Olympus Optical, developed a key video disc-reading component that is commonly used in CD and DVD players, Olympus claimed the rights to the patent. Tanaka as the employee-inventor was compensated according to Olympus's usual internal policies. While Olympus made millions from the invention, the company awarded Tanaka about $1,800. After leaving Olympus, Tanaka filed suit claiming that the compensation he received was not the "reasonable remuneration" required by the Japanese Patent Act. The Japanese court agreed and found that Tanaka was entitled to 5% of the total licensing profits. This landmark decision has since sparked a wave of claims against Japanese employers, several of which have yielded multi-million dollar for employee-inventors. Dr. Shuji Nakamura sued his previous employer, Nichia Chemical, for compensation for his

D. The Partiality/Totality Spectrum: Non-Competes and Non-Competes on Steroids

1. The Rise of the Post-Employment Covenant Thicket

The use of the word "piracy" has been a significant metaphor in defense of strong IP protections. Intellectual property uses the concept of property to describe legal monopolies over intangible assets. Once information is deemed property, its unauthorized use may be deemed theft. Unsurprisingly, as propertization shifts beyond specific information and into the zone of human capital, claims about piracy are carried to battles over cognitive controls. With battles over cognitive assets on the rise, a recent article describes employees who dream of becoming entrepreneurs despite signing non-competes; the advent of modern day pirates. The article quotes an attorney who explains the difference between these new subversive pirates and the old swashbucklers:

> The owner of a merchant vessel clearly knows when his ship comes under pirate attack. Buccaneers armed with cutlasses board his vessel. In the workplace, employee pirates steal an employer's treasure -- trade secrets, proprietary information and customer relationships. Unlike sea pirates…this theft is often carried out by trusted, supposedly honest employees.[27]

In other words, as human capital becomes one of the most important assets to companies, the impulse is to control it and view its loss as theft. The new pirates are stealing their own brains away from the firm.

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contributions to a commercial blue light emitting diode. Initially, the company had awarded Nakamura $200 for his invention, but a Tokyo District Court awarded Dr. Nakamura ¥20 billion ($190 Million). In other recent cases, the Tokyo High Court awarded ¥160 million to a former Hitachi employee and supported a similar settlement between the employee-inventor of Flash memory and Toshiba. As a result of this surge in litigation claims by employee-inventors, Japanese companies are sitting up and taking notice. A number of them have revised their inventor compensation schemes, guaranteeing higher levels of compensation for patented products.

[27] http://www.adn.com/2014/02/23/3343090/lynne-curry-keep-an-eye-out-for.html#storylink=cpy

The signing of a non-compete contract has become a standard requirement in many industries. In the earliest known case on non-competes, in medieval England, a clothes dryer attempted to prevent a former employee from competing in town for 6 months. The court's reaction was to threaten to imprison the employer for initiating such a frivolous lawsuit that restrains trade. Much has changed.

Today, employees routinely signed non-competes promising to not work in their profession in the same region for a period of time. Non-compete clauses exist in almost 80% of chief executive contracts[28] and over 70% of the contracts of senior executives.[29] The vast majority of venture-capital contracts mandate that their portfolio companies use non-competes.[30] Beyond the employees at the top, for all other, non-managerial employees, non-competes are also on a sharp rise.[31] Such restrictions are often broadly drafted in an attempt to prevent all possible forms of competition, or indeed, departure, of employees. A recent example is illustrative. A non-compete agreement prohibited a former sales rep from working for a competitor in any capacity, "including as a custodian." In this case, the North Carolina court of appeals deemed the contract overly broad and unenforceable.[32] And yet, important to the understanding of the effects of the widespread use of non-competes is that the legal disputes only reveal a tip of the iceberg. Most employees will never challenge unreasonable non-competes but rather alter their careers and decision-making to avoid risk.

Most potential new employers will not risk a lawsuit by hiring an employee already bound by a non-compete. For example, in a recent case, a former employer sent a competitor who hired its departing employee a letter about the existence of a non-compete. In a standard move, the employee was immediately fired from the new job. In this case, the employee filed a lawsuit against his former employer for tortious interference with his relationship with the new employer. The court dismissed the case, explaining that a former employer has a right to send such warning letters and that the result of the firing does not present a legal issue.[33]

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[28] http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2166020

[29] http://personal.anderson.ucla.edu/mark.garmaise/noncomp7.pdf

[30] http://www.sifr.org/PDFs/kaplanstromberg(res2003).pdf

[31] http://asr.sagepub.com/content/76/5/695.full.pdf+html

[32] CopyPro, Inc. v. Musgrove.

[33] *Bonds v Philips Electronic North America*, 2014 WL 222730 (E.D. Mich. January 21, 2014).

Current policies delineating the enforceability of these controls are largely ad-hoc and inconsistent. Courts usually apply the rule of reason, or 'reasonableness,' to scrutinize these various controls. The reasonableness standard is an open-ended legal term, and its respective balancing tests, between "legitimate business interests," "employee hardship," and the "public interest," are applied by the courts on a case-by-case basis, without referencing contemporary data and without generalizing beyond the particular facts of each dispute. The reasoning is often conclusory and subjective.[34]

2. Name Game: Non-Solicitation, Non-Dealing, Non-Poaching Restrictions

*** client lists – as trade secrets or as off-limits no-dealing lists - to be written***

3. Cognitive Cartels

In 2010, the Antitrust Division of the United States Department of Justice filed a complaint against tech giants Adobe Systems, Apple, IBM, Yahoo!, Google, Intel, Intuit, and Pixar - the pillars of the Silicon Valley. The federal investigation focused on the hiring practices of these companies, who had allegedly entered into agreements not to recruit or hire away each other's top talent. These practices were investigated by the Department of Justice because they appeared as collusive restraints on trade and competition. Former recruiters from the companies confirmed the existence of "do not touch" lists were maintained within each recruiting department. The companies under investigation argued that the agreements allowed them to enter into alliances on key projects and initiatives with competitors without the fear that their workers would be poached. The non-solicitation agreements covered the entire workforce of each company and were not limited by geography, job function, product group, or time period. The breadth of the agreements led the Department of Justice to conclude that these agreements were *per se* violations of American antitrust law. The settlement reached between the Department of Justice and the high-tech companies enjoins the non-solicit agreements and, more broadly, prohibits agreements regarding solicitation and recruitment. But while the Federal

[34] Orly Lobel, *Intellectual Property and Restrictive Covenants*, *in* ELGAR ENCYCLOPEDIA OF EMPLOYMENT LAW AND ECONOMICS (Kenneth Dau-Schmidt, Seth Harris & Orly Lobel eds., 2009)

investigation ended with a settlement and a promise to halt these anti-competitive practices, a class action involving 64,000 former employees of these high-tech giants is underway, maintaining that these anti-competitive practices depressed their wages in the industry.

According to the allegations, these practices lasted for approximately five years, beginning in 2005 until the federal investigation. Steve Jobs was the driving force in these initial agreements. Jobs sent out emails to Google warning, "If you hire a single one of these people that means war." The secret agreement that followed was so strong that when a Google recruiter did contact Apple engineers, Jobs immediately reminded Google of his warning. Google fired the recruiter immediately. According to the lawsuit, Jobs was even asked permission from Google to hire former Apples employees. It appears that the executives at these Silicon Valley giants understood the possible illegality of these agreements. Eric E. Schmidt who was Google's CEO at the time asked his people to not keep a paper trail about the Do Not Call agreements. Some companies involved in the do-not-hire scheme, Pixar, Disney and Intuit, have settled with the class agreeing to pay $20 million. While from the perspective of the employees this labor market cartel indeed had the effect of depressing wages, these "do not touch" practices in the Silicon Valley should be understood more broadly as meta cognitive controls.

II. DIMENSIONS OF KNOWLEDGE AND THE DETRIMENTAL EFFECTS OF COGNITIVE PROPERTY

In 1675, Sir Isaac Newton wrote in a letter to his rival Robert Hook, "If I have seen further (than you and Descartes) it is by standing upon the shoulders of Giants." The effects of propertizing human capital, creating cognitive property -- need to be understood in relation to the multiple dimensions of human knowledge. New field and experimental research about talent flows and growth, enriched by contemporary theoretical analysis, presents a clearer understanding of the risk of the new cognitive property. The following subsections unpack these concerns by developing a novel taxonomy of the multiple facets of knowledge as it inhabits human capital pools.

Human capital policy debates track similar concerns and tradeoffs as the general intellectual property debate. We want initial investment in human capital but we also want this investment to be utilized and built

upon. We want firms to nourish the minds of their insiders and use them in the most effective way but we also want these insiders to continue to flourish and draw upon their human capital in a competitive open environment. Under traditional economic analysis, externalities are a type of market failure. Just as tort liability aims to internalize negative externalities – the harm to others, for example by pollution, traditional analysis accepts intellectual property controls as necessary to internalize positive externalities, the benefits that flow from innovation. But human capital policy also has unique features and is an under-investigated area of research and practice. The many realms of knowledge help explain that cognitive controls, the policies and norms that constrain the use and flow of talent – concern the very essence of science, research, and knowledge networks. In other words, these controls concern the core building blocks of human knowledge and the stepping-stones of innovation and progress.

A. Tacit knowledge

Hess and Ostrom suggest that "an infinite amount of knowledge is waiting to be unearthed. The discovery of future knowledge is a common good and a treasure we owe to future generations. The challenge of today's generation is to keep the pathways to discovery open."[35] Knowledge, however, is not merely a good to be unearthed and traded, and then bequeathed as "a treasure" to future generations. In its dual meaning, knowledge cannot be captured by merely considering codified information, the kind that can be embedded in intellectual property. Knowledge is also the human skills, communications, and know-how that exist within people. The direct interactions between people are the primary vehicle of transmitting these aspects of knowledge.

The new cognitive property should be understood as an attempt to capture not only codified but also non-codifiable knowledge. Given that information is not fully captured by sources outside the minds of individuals, one of the central ways knowledge flows in the market is through employee mobility and professional interaction. There are multiple reasons why even in the age of information, when the digital sphere provides abundant access, knowledge exchanges continue to rely on direct human contact. Knowledge is frequently difficult to transmit by simply reading a patent document or a scientific journal. It remains tacit rather than codified both because of the nature of certain types of knowledge and

[35] CHARLOTTE HESS AND ELINOR OSTROM, UNDERSTANDING THE KNOWLEDGE COMMONS (2006).

because, frequently, even when knowledge is amenable to codification, those holding the knowledge often lack incentive to codify it.[36] A useful way to understand the complexity of knowledge and its relation to human capital is that knowledge embodies a "dual function": it exists as a thing external to the human mind but it is also the foundation of our cognitive systems – to be human is to know. Machlup identified the distinction between "*knowing that*" and "*knowing how,*" referring to the latter as *brainwork*.[37] Polanyi relatedly distinguished between connoisseurship, which is the art of knowing, and skills, which is the art of doing.[38] In broader terms, spanning beyond any one individual, knowledge is both a resource society possesses and the very essence that constitutes a society.[39]

B. Relational Knowledge

Beyond the flow of tacit knowledge, mobility and interaction of people creates opportunities for connecting between distinct types of knowledge and ideas. It is in fact partly the existence of tacit knowledge that drives the formation of social ties and a professional community.[40] In turn, these social and professional relationships facilitate the flow of knowledge while isolation impedes knowledge.[41] Knowledge flows between people through relationships, which continue after people move jobs, evolving into professional connections where past colleagues remain acquaintances and potential collaborators. Recent empirical studies consistently teach us that professional interaction spurs creativity. A series of new studies test the importance of collaboration of professionals over time. One study for example demonstrates that the existence of prior professional ties will highly impact the likelihood of individual entrepreneurial activity, by enabling an individual to identify entrepreneurial opportunities and increasing her motivation to pursue those

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[36] Ajay Agrawal, *Engaging the Inventor: Exploring Licensing Strategies for University Inventions and the Role of Latent Knowledge*, 27 STRATEGIC MGMT. J. 63-79 (2006).

[37] F. Machlup, *Semantic Quirks in Studies of Information*, *in* THE STUDY OF INFORMATION: INTERDISCIPLINARY MESSAGES (F. Machlup and U. Machlup eds., 1983).

[38] MICHAEL POLANYI, PERSONAL KNOWLEDGE: TOWARDS A POST-CRITICAL PHILOSOPHY (1958)

[39] Jerome Reichman and Jonathan Franklin, *Privately Legislated Intelecutal Property Rights" Reconciling Freedom of Contract with Public Good Uses of Information*, 147 U. Pa. L. Rev. 875-970 (1999).

[40] Z. BAUMAN, COMMUNITY: SEEKING SAFETY IN AN INSECURE WORLD (2001); *see also* H. Ishihara & U. Pascual, *Social Capital in Community Level Environmental Governance: A Critique*, 68 ECOLOGICAL ECONOMICS 1549-1562 (2009).

[41] Ajay Agrawal, *Engaging the Inventor: Exploring Licensing Strategies for University Inventions and the Role of Latent Knowledge*, 27 STRATEGIC MGMT. J. 63-79 (2006).

opportunities.[42] Such effects are strongest for those without exposure to entrepreneurship in their family, suggesting that market ties serve as substitutes for community ties. Another study, examining millions of scientific articles over 5 decades and two million patents, demonstrates that teams increasingly dominate solo authors in the production of knowledge across nearly all fields and that team-developed patents and articles are more frequently cited and produce exceptionally high-impact knowledge.[43] Research also shows that the more collaborators an individual has, the more likely she is to participate again in a collaborative venture.[44] In other words, knowledge is produced within relationships and the loss that stems from controlling human interactions and flow is, therefore different, and indeed greater, than the formal knowledge that any single individual may possess.[45] The loss is that of ties and relationships, and in turn, vision and creative energy.

C. Networked Knowledge

While relational knowledge is about the interaction between two minds, networked knowledge is the insight that information exists within networks. In other words, the network is the combined knowledge that exists within a region or a professional community. Contemporary social psychology research illuminates the ways knowledge is embedded in

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[42] R. Nanda & J. Sorenson, *Title*, (Harv. Bus. Sch. Entrepreneurial Mgmt., Working Paper No. 08-051, 2009)

[43] S. Wuchty et al., *Multi-University Research Teams: Shifting Impact, Geography, and Stratification in Science*, 322 SCIENCE 1259-1262 (2008).

[44] J. Singh, *Collaboration Networks as Determinants of Knowledge Diffusion Processes,* 51 MGMT. SCIENCE 756-770 (2005).

[45] Importantly, Coleman (1988) differentiated between social capital (or Bourdieu's habitus (Bourdieu 1986)), which cannot be transferred and intellectual capital, which can be transferred through education or training. Here, I define human capital as the bundle of capacities and potential that individuals possess and that facilitate the production of economic value. Social capital is related to the different facets of human capital, as unpacked in the knowledge typology below, but the term at times is orthogonal to the typologies of knowledge. Bourdieu defined social capital as the aggregate resources which are linked to a network. Coleman defined social capital functionally as anything that supports productive activity through social norms, reciprocity and trust. Indeed, there are rich debates between economists (Arrow 1999, Solow 1999) and sociologists (Fine 2001) on the definition of social capital as a form of capital or as a social structure. Importantly for this article, I consider social capital as a functional structure that supports human capital, for example the existence of relational and networked knowledge, but it is the knowledge embedded in the individual that is the focus of the inquiry in this article, examining how the controls and freedoms of human capital support or impede the formation of types of knowledge.

institutions.[46] Organizations, groups, and networks can be understood to have "DNA" in the sense of patterning individual processes. For example, the richness of ties in a locality can determine the quality and breadth of creativity found in that region. When a regional network of inventors is dense, it will significantly increase the number of future inventions coming out of that region. Connections between innovators increase the overall numbers of patents per capita in an area, as well as the number of co-authored patents.[47] The greater the number of people in contact, the more creative each member of the network becomes. The flow of human capital increases the density of networks and facilitates the diffusion of complex information.[48]

D. Motivational Knowledge

These days, human capital is agreed to be the premier resource that gives companies their competitive edge. And yet, human capital is not a static resource in the way real estate or building materials serve a construction company. It is both a resource and a living subject who makes constant judgments, decisions, and choices about the quantity and quality of outputs. Put differently, human capital is a resource with built-in motivation. Non-competes, trade secrets, and other controls over human capital may discourage employees from investing in their work performance because inter-firm competition for their human capital is less likely to occur. Motivation may also be reduced because employees whose human capital is propertized have less entrepreneurial opportunities. In recent behavioral studies designed to identify the effect of human capital controls and contractual arrangements on performance and motivation, participants bound by non-compete agreements and other post-employment restrictions did not perform as well and were less motivated to stay on task than those unbound.[49] Recent field data supports these experimental findings.[50] One

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[46] Orly Lobel, *The Four Pillars of Work Law*, 104 MICH. L. REV. 1539 (2006).

[47] M.T. Hansen, *The Search-Transfer Problem: the Role of Weak Ties in Sharing Knowledge Across organization Subunits*, 44 ADMINISTRATIVE SCIENCE QUARTERLY 82-111 (1999).

[48] P. Mardsen & N. Friedkin, *Network Studies of Social Influence*, 22 SOC. METHODS AND RES. 127 (1993).

[49] On Amir & Orly Lobel, How Noncompetes Stifle Performance, Harvard Business Review 2014; On Amir & Orly Lobel, *Driving Performance: A Growth Theory of Non-Compete Law*, Stan. Tech. L. Rev. (2013).

[50] Mark J. Garmaise, *Ties that Truly Bind: Noncompetition Agreement, Executive Compensation, and Firm Investment* 27 J. L. ECON. & ORG. 375-398 (2011).

study finds that companies invest *less* in research and human capital development when non-competes are strongly enforced, providing further evidence that investment decisions are affected by workers themselves in their assessments on their own ability to move to, or to be recruited by, a different company. [51] Intellectual property is designed to add the "fuel of interest to the fire of genius."[52] The aggregate result of the law and contract of human capital is that interest and genius are most often bifurcated. Individuals in firms rarely retain the rights in their innovation, concepts and ideas, defined far more broadly than the scope of patent and copyright. Understanding human capital as a dynamic resource helps explain why over-propertization depletes and reduces its quality.

From an investment perspective, new economic models help explain why people invest in their own human capital without knowing the type of work that will eventually result, just as companies must make investment decisions in technology and capital funds without knowing whom they will end up hiring.[53] Acemoglu describes the conditions of uncertainty as forming a virtuous circle: when workers invest more in their human capital, businesses will invest more because of the prospect of acquiring good talent. In turn, workers will invest more in their human capital as they may end up in one (or more) of these companies. In other words, in Acemoglu's model, the likelihood of finding good employees creates incentives for overall investments in human capital. Empirical research shows that in most places, there is under-investment in human capital.[54] The trend toward expanding cognitive property can help explain this under-investment: the over-use of human capital controls not only slows down the flow of knowledge and reduces the positive effects of market uncertainty but also reduces the likelihood of being able to employ good employees. Consequently, the incentives to invest in human capital are lowered.

E. Disruptive Knowledge

Motivating talented people, groups, and organizations to receive and generate ideas is no small feat and often entails a psychological shift.

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[51] Mark J. Garmaise, *Ties that Truly Bind: Noncompetition Agreement, Executive Compensation, and Firm Investment* 27 J. L. ECON. & ORG. 375-398 (2011) (Garmaise concludes that "non-competes bind human capital to firms, and in doing so they change the quality of that capital.")

[52] Lincoln's 1859 lectures on discoveries and inventions, as cited in Fisk (1998, p. 1129).

[53] Daron Acemoglu, *Patterns of Skill Premia*, 70 REV. OF ECON. STUD. 199-230 (2003).

[54] Daron Acemoglu & David Autor, *What Does Human Capital Do?*, J. OF ECON. LIT. (forthcoming 2012).

Phenomena like *Not Invented Here* (NIH), an institutional pathology that prevents groups from benefiting from outside knowledge and *groupthink* – where cohesive groups overlook important alternatives because of the desire for consensus and conformity - are mitigated by the flow of "new blood" to the organization.[55] Even in today's globalized market, research shows that firms, often to their detriment, overlook outside ideas and solutions simply because of a not-invented-here mindset and because groups become entrenched in their old ways.[56] This counter-productive lock-in happens in greater frequency where there is little turnover and companies are overly stable. In one study, teams with little turnover became progressively less productive.[57] Firms in remote locations with stable personnel are more likely to draw upon the inventions of their own firm and to draw upon the same set of prior inventions compared to firms in more diverse locations.[58] From this perspective, cognitive property hinders institutional openness and the absorptive capacity of firms, their ability to identify and make use of good ideas.

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Traditional economic analysis would allow the expansion of cognitive property to go unchecked, as it is theorized that contractual agreements over the propertization of human capital are a response to the need to internalize all positive externalities that may occur from the flow of knowledge and talent outside of the firm. And yet, as we unpack the way knowledge is embedded in people, human capital spillovers cannot be understood as a market failure but a constitutive part of the market itself. To use the terms of the commons / anti-commons literature, the underuse of people – the expansion of cognitive property –is perhaps the greatest

[55] Early on, NIH was linked to nationalism – American companies and consumers often refused to adopt innovation developed outside its borders. There are dozens of examples throughout the 20th century of advanced technologies that were slowly adopted because the technologies were produced elsewhere. For example, Japanese and American markets largely ignored home computers produced by British companies. Japanese cars, now among the most popular automobiles in the world, were at first slow to reach beyond the domestic market because dealers and consumers preferred national products. ORLY LOBEL, TALENT WANTS TO BE FREE: WHY WE SHOULD LEARN TO LOVE RAIDS, LEAKS, AND FREE RIDING (2013).

[56] Ralph Katz & Thomas J. Allen, *Investigating the Not Invented Here (NHI) Syndrome,* 12 R&D MGMT. 7-19 (2007).

[57] Ralph Katz & Thomas J. Allen, *Investigating the Not Invented Here (NHI) Syndrome,* 12 R&D MGMT. 7-19 (2007).

[58] Ajay Agrawal et al., *Not Invented Here? Innovation in Company Towns,* (Nat'l Bureau of Econ. Research, Working Paper No. 15437, 2009).

tragedy of all.[59] In blunt economic terms, the deadweight loss from controls and restrictions over human capital is the person herself who is prevented from using her talent, skill, and passion. When minds are made to suppress ideas; when skill remains untapped; when knowledge is cut up into small fragments and is deemed confidential proprietary information – society as a whole loses.

In recent years, several interrelated developments have coalesced and created contemporary realities that require us to refocus our attention on human capital as commons: the dramatic changes in labor markets along with the rise in litigation over human capital should be considered against the deepening research in innovation. The economic realities of the early twenty-first century, characterized by high turnover, lack of job security, fast-paced global competition, and a growing reliance on knowledge work, require new approaches to fermenting talent pools.[60] With the intensification of digital technology and global competition, the shift from industrial to knowledge production is salient throughout the world. If in the past work was characterized by narrowly defined tasks and strict managerial supervision, more than ever before today's workers self-direct, exercise independent thought, and create and invent. The patterns of the work-life cycle have also dramatically evolved. Where in the past work relations promised certain degrees of security and stability, today employers constantly recruit new talent. Workers are expected to manage their own job-hopping careers and frequently re-skill without the expectation of long-term employment. The heightened significance of human capital as a valuable resource has effectuated record numbers of disputes and conflicts.[61] Understandably, in some industries, litigation expenses are calculated as part of the costs of a new start-up. Contemporary markets, therefore, present a central and substantial challenge for law and policy to support, rather than impede, the nourishment of human capital and knowledge networks.

The modern accumulation of scientific knowledge regarding successful innovation enables us to better assess different strategies and policies. The science of innovation, a cross-disciplinary field of rising interest to researchers, provides us with new insights about how innovation grows in creative settings and how certain policies can best support industrial and regional development. Interdisciplinary research allows us to

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[59] Michael Heller, *The Tragedy of Anti-Commons*, 111 HARV. L. REV. 621 (1998).
[60] Orly Lobel, *The Four Pillars of Work Law*, 104 MICH. L. REV. 1539 (2006).
[61] ORLY LOBEL, TALENT WANTS TO BE FREE: WHY WE SHOULD LEARN TO LOVE RAIDS, LEAKS, AND FREE RIDING (2013).

unpack the many types of knowledge required in thriving innovation markets.

Science offers new tools to test the connections among individuals and their relations to productive endeavors. Network imaging has developed significantly in the past several years, exploring the patterns of links formed over time through professional ties, friendships, communication, and commerce.[62] Currently, network theory can demonstrate the connections between millions of individuals in their communications over the web, professional interactions, search patterns, and consumption habits. In the context of human capital flows and their significance to innovation, contemporary researchers have devised, for example, inventor-matching algorithms that assess the rates of collaboration between inventors and map the data of their shared patent and copyright authorships. These applications not only provide insight to past connections among individuals in particular endeavors, but they also enable computer simulations to predict future flows.

As we saw above, there is consensus in the research that effects of knowledge flows are geographically localized.[63] Firms are more likely to quote research from a local university rather than a distant university in patent applications.[64] Dense metropolitan areas enjoy a 20 percent advantage in the number of patents per capita when compared to other metropolitan areas half as dense.[65] Geographic density of creative ventures provides a space for professional meetings, meet face-to-face, and dense social connections. When comparing the magnitude of positive and negative knowledge spillovers, recent research provides evidence that positive spillovers exceed the negative spillover for firms.[66] This growing body of evidence demonstrates that high employee turnover, regional human capital concentration, and strong professional networks contribute to economic

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[62] DUNCAN J. WATTS, THE SCIENCE OF A CONNECTED AGE (2002).

[63] Ajay Agrawal, I. Cockburn & John McHale, *Gone but Not Forgotten: Knowledge Flows, Labor Mobility, and Enduring Social Relationships*, 6 J. OF ECON. GEOGRAPHY 571 (2006); Peter Thompson & Melanie Fox-Kean, *Patent Citations and the Geography of Knowledge Spillovers: A Reassessment*, 95 AM. ECON. REV. 450-460 (2005).

[64] A. Jaffe et al., *Geography Localization of Knowledge Spillovers as Evidence by Patent Citations*, 108 QUARTERLY J. OF ECONS. 577 (1993); P. Almeida & B. Kogut, *Localization of Knowledge and Mobility of Engineers in Regional Networks*, 45 MGMT. SCIENCE 905-917 (1999).

[65] Gerald Carlino et al., *Matching and Learning in Cities: Urban Density and the Rate of Invention* 17-23 (Fed. Res. Bank of Phila., Working Paper No. 4-16/R, 2005).

[66] Nicholas Bloom et. al., *Identifying Technology Spillovers and Product Market Rivalry*, Natural Bureau of Econ. Res. (2007).

growth, which in turn creates more wealth and investment by drawing entrepreneurial energy. These effects help explain how certain companies and localities have become magnets for creative people. The interdisciplinary study of innovation is booming, providing a multitude of important insights pertinent to human capital law.

Perhaps the most direct and fascinating strand of contemporary research considers the effect of human capital law itself on innovation and economic growth. While most jurisdictions have seen an intense rise in controls over human capital, some regions have approached the expanding controls over human capital with greater caution. These regions govern human capital more clearly as a common resource, encouraging its flow and use. For example, as we saw, under existing law a minority of states in the United States, most notably California, do not enforce non-competes in the employment relationship. Similarly, a minority of states statutorily limit the ability of employers to contractually pre-assign all employee inventions.[67] Jurisdictional variation provides natural experiments to uncover the effects of human capital protections on innovation and to test the models and insights. Drawing on inter-jurisdictional variation, this new body of research challenges the conventional policy that exists in most regions: that more controls over human capital, the propertization of skills, knowledge and capacity, ultimately increases incentives to innovate. For example, a recent study exploits Michigan's inadvertent reversal of its non-compete enforcement legislation as a natural experiment to investigate the impact of non-competes on mobility.[68] Using the U.S. patent database and a differences-in-differences approach between inventors in states that did not enforce and did not change enforcement of non-compete laws, the article finds that mobility decreased by 34% in Michigan after the state reversed its policies. Moreover, this effect was amplified 14% for "star" inventors and 17% for "specialist" inventors. In another recent study on investment and non-competes which examines dozens of cities across the United States, Samila and Sorenson conclude that the enforcement of human capital restrictions impedes innovation and entrepreneurship.[69] In a third study comparing the evolution of networks in the Boston (which like most states enforces post-employment covenants not-to-compete) and Silicon Valley

[67] Orly Lobel, *Intellectual Property and Restricitive Covenants, in* ELGAR ENCYCLOPEDIA OF EMPLOYMENT LAW AND ECONOMICS (Dau-Schmid, Harris & Lobel. eds., 2009)
[68] M. Marx, D. Strumsky, and L. Fleming, *Mobility, Skills, and the Michigan Non-compete Experiment*, 55 MGMT. SCI. 875-889 (2011).
[69] Sampsa Samila & Olav Sorenson, *Non-Compete Covenants: Incentives to Innovate or Impediments to Growth*, 57 MGMT. SCI. 425 (2010)

(which under California law prohibits the use of employment non-competes) regions, the researchers find that small isolated networks transition more quickly into one large knowledge network under latter regime, which supports human capital flows.[70] A virtuous circle is put into motion where labor mobility supports networks, which in turn enhance regional innovation.[71] Together this body of literature can be understood as a more complex model to analyze the effects of cognitive property. Instead of the simplified prediction that more controls will lead to more investment in human capital, we can begin to understand the question as one of overall effects over time, as depicted in Figure 1 below.

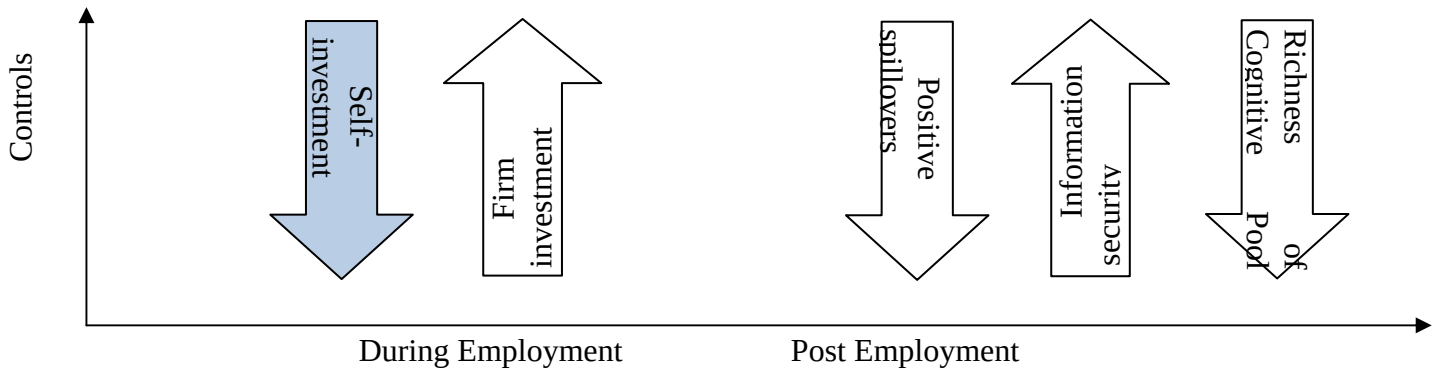

Figure 1: Modeling the Effects Human Capital Controls

[70] L. Fleming & K. Frenken, *The Evolution of Inventor Networks in the Silicon Valley and Boston Regions*, ADVANCES IN COMPLEX SYSS. 57-71 (2007).; J. He & M. Fallah, *Is Inventor network Structure a Predictor of Cluster Evolution?* J. OF TECHNOLOGICAL FORECASTING AND SOC. CHANGE (2009).

[71] P. Almeida & B. Kogut, *Localization of Knowledge and Mobility of Engineers in Regional Networks*, 45 MGMT. SCIENCE 905-917 (1999).

III. THE THIRD ENCLOSURE MOVEMENT: ENDOGENOUS GROWTH, SEARCH, AND THE KNOWLEDGE COMMONS

A decade ago, James Boyle warned of the *Second Enclosure Movement*, the enclosure of the "intangible commons of the mind" through a rapid expansion of intellectual property rights.[72] Boyle was referring to the expansion of copyright and patent protections, the outputs of innovation and human creativity. We are now facing a third enclosure movement, the under-the-radar enclosure over the inputs of knowledge, cognitive property of the mind itself. For knowledge to flow, for networks to remain dense, for motivation to keep innovation high, for new blood to disrupt stagnated paths, human capital must not be overly propertized.

When comparing regions in their pace of growth and economic trajectories, variations in the quality and application of human capital have become key to understanding the challenges of developments. New models of economic growth help link human capital flows and regional success.[73] Under endogenous growth theory, economic growth relies not simply on competitive win-lose production, but on processes of positive spillovers, in which knowledge is transferred within industries and regions. Under endogenous growth theory, investment in human capital is a central ingredient for economic success. An enduring puzzle for development economics is that similarly situated countries diverge so significantly in their rates of growth. Paul Romer developed a model to explain these differences, suggesting that it is not only the raw access of companies to capital and labor that determines success, but also the availability of local knowledge and its dynamics. According to Romer, economies of specialization, where a region chooses to focus on a specific industry, such as Japan with electronics or Italy with Haute Couture, are efficient and lead to regional success. Because knowledge is predominantly industry-specific, geographic concentration will create growth for the entire specialized economy. Differences between the quality of human and social capital have become key to understanding the challenges of development. Paul Krugman in his book *Geography and Trade* similarly explains how nations hold important economic advantages depending on their regional location and

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[72] James Boyle, *The Second Enclosure Movement and the Construction of Public Domain*, 66 LAW AND CONTEMP. PROBS. 33-75 (2003).

[73] P.M. Romer, *Increasing Returns and Long-Run Growth*, 94 THE J. OF POL. ECON. 1002-1037 (1986); Robert Lucas, *On the Mechanics of Economic Development*, 22 J. OF MONETARY ECONS. 3-42 (1988); Robert Lucas, *Why Doesn't Capital Flow from Rich to Poor Countries*, 80 AM. ECON. REV. 92-96 (1990); C. Jones, HUMAN CAPITAL, IDEAS AND ECONOMIC GROWTH (2006).

industrial positioning.[74] Michael Porter in *The Competitive Advantage of Nations* also looks at how regional industrial clusters give nations a global competitive edge.[75] Porter, specifically considering the role of law in aiding this competitive advantage, concludes his book with recommendations about better enforcement of antitrust laws to end monopolies and lessen impediments on competitive entries. Porter focuses his discussion of anti-trust on traditional monopolies of tangible resources and production. However, monopolies are not simply about goods and services. Once we have a broader understanding of the ways controls over human capital and skill have expanded intellectual property and ventured into cognitive property, we can better understand the need to employ antitrust principles to the ways we govern our human capital pools. Following Porter's focus on the harms of monopolies, we can conceptualize human capital controls as a form of systemic antitrust in cognitive resources, skills and knowledge. A recent Carnegie Mellon University report *Renewing Globalization and Economic Growth in a Post-Crisis World* describes the damaging effects on regions of limiting job mobility. The report focuses on immigration policies, social benefits, and underlying social norms, such as the unwelcoming of others and xenophobia, that shape the patterns of talent flow. Human capital law though plays a major role in limiting job mobility. The new cognitive property remained under the radar for too long.

*** expand on search theory and investment ***

IV. FRONTIERS FOR RESEARCH AND POLICY

In the history of ideas about intellectual property, two competing theories are prominent: Lockean and utilitarian. The Lockean theory of labor explains IP protections by the intrinsic right one has to the fruits of one's labor while the utilitarian theory focuses on measured outcomes.[76] Today, utilitarian intellectual property theories prevail over the principle

[74] PAUL KRUGMAN, GEOGRAPHY AND TRADE (1992).

[75] Michael Porter, The Competitive Advantage of Nations (1990).

[76] John Locke, Two Treatises of Government 285-302 (Peter Laslett ed., Cambridge Univ. Press, student ed. 1988) (1690). ("Labour, in the Beginning, gave a Right of Property, wherever any one was pleased to employ it, upon what was common." Though the Earth and all inferior Creatures be common to all Men, yet every Man has a Property in his own Person. This no Body has any Right to but himself. The Labour of his Body, and the Work of his Hands, we may say, are properly his. Whatsoever then he removes out of the State that Nature hath provided, and left it in, he hath mixed his Labour with, and joined to it something that is his own, and thereby makes it his Property. It being by him removed from the common state Nature placed it in, it hath by this labour something annexed to it, that excludes the common right of other Men."

that people have a natural right to the fruit of their labor. Intellectual property is understood as a necessary means to the end of promoting innovation. But perhaps the two theories – Lockean and utilitarian – are intertwined. What if ownership and the freedom to create affected innovation in very real ways suggesting an inextricable link between the means and ends of innovations?

Human capital policies – enforcing non-compete contracts, delineating confidential information as protected trade secrets, pre-assigning inventions and creative work of individuals to corporation - have traditionally striven to protect freedom of contract and to encourage businesses' initial incentives to invest in innovation.[77] The adjudicatory lines drawn between protectable and non-protectable interests in intellectual property and human capital remain unclear and inconsistent among jurisdictions, with each state applying its own laws and policies. As we've seen in the previous section, new research challenges us to rethink our approach to human capital regimes. The evidence is nearly universal. Overall, excessive controls over mobility and inventiveness are harmful to careers, regions, and innovation. The harm is not simply caused by the aggregate reduction in mobility, knowledge flow, and network richness, but also generated by the motivational and behavioral aspects of creative individuals as they interact with their environment.

Public policy can benefit from examining human capital controls through a competition legal lens, or as the field is termed in the United States - antitrust law. Competition law, the body of regulation designed to promote and maintain market regulation by preventing anticompetitive industry behavior, prohibits agreements and practices that restrict free trade and competition between businesses, including repressing free trade by monopolies and cartels. The history of these laws dates back to Ancient Rome, and contemporary principles of competition law have spread globally and internationally. Propertizing human capital has clear anti-competitive effects, including creating barriers to the entry of new firms, limiting optimal matches between jobs and people, and suppressing the flow of knowledge and the nourishment of talent. Human capital controls, however, are rarely understood as part concerning antitrust policy.

Beyond policy, social norms and industry practices play a large role in the dynamics of the talent wars. Although holding the legal right to pursue litigation, organizations frequently choose to pursue other channels

[77] Orly Lobel, *Intellectual Property and Restrictive Covenants*, *in* ELGAR ENCYCLOPEDIA OF EMPLOYMENT LAW AND ECONOMICS ([FIRST NAME] Dau-Schmidt et al. eds., 2009).

to protect their interests.[78] Historian Robert Allen describes the nineteenth century English steel industry as engaged in "collective innovation," where competitors willingly revealed valuable information to their rivals.[79] Upon investigating the puzzling practices of the early steel firms, Allen concludes that this practice advantaged competitors. The entire steel industry moved together rapidly instead of one firm making sporadic leaps ahead of the others. Recent case studies reveal similar practices in contemporary markets that have developed strong norms of sharing. Von Hippel finds that engineers in the steel industry are still willing to share information with professional colleagues at rival firms.[80] When they receive calls from their colleagues requesting information, engineers make ad hoc judgments about the tradeoffs in sharing. For each act of kindness, the calculation is not explicit but over time, there is an implicit expectation of reciprocity. A study of research labs developing lasers concludes that, like the engineers of the steel industry, reciprocity is the basic rule for sharing.[81]

In the twenty-first century, human capital is our most acute collective challenge and building a human capital commons should be our shared goal. In the quest to preserve and nourish this cherished resource, we must recognize its exceptional features and be aware of the ways it is affected by legal arrangements. The evidence suggests that we have too much, not too little, protections over human capital– too many walls surrounding and entrapping knowledge and creative potential. By relying on misguided assumptions, we risk depletion of human capital pools, dangerously impeding the use of knowledge, energy for innovation, and entrepreneurial dynamism.

CONCLUSION

*** To Follow

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[78] Orly Lobel, *The Paradox of "Extra-Legal" Activism: Critical Legal Consciousness and Transformative Politics*, 120 HARV. L. REV. 937 (2007).
[79] Robert Allen, *Collective Invention*, J. OF ECON. BEHAV. AND ORG. (1983).
[80] Eric Von Hippel, *Cooperation Between Rivals: Informal Know-How Trading*, 16 RES. POL'Y 291-302 (1987).
[81] H.M. Collins, *Tacit Knowledge and Scientific Networks, in* SCIENCE IN CONTEXT (Barry Barnes & David Edge eds., 1982).