The Gig Economy, Smart Contracts, and Disruption of Traditional Work Arrangements

Seth Oranburg[*] *and Liya Palagashvili*[**]

Abstract: The rapid growth of technology is not only creating innovative goods and services, but it is also fundamentally altering the workplace and the traditional understanding of employee and employer relationships. This can be seen today with the rise of the gig economy and alternative work arrangements. Our paper seeks to explain how technology has reduced the cost of transacting with the market and lowering monitoring costs, and thereby driving the expansion of contracting, as seen in the rise of the gig economy. We then anticipate blockchain technology and smart contracts will further reduce transaction costs and continue to alter the employee-employer relationships, leading to more decentralized work that mirrors the fundamentals of "contract at-will" employment. This will have significant implications for labor law because the standard labor regulations surrounding health and retirements benefits to employees will lose relevance as the employee-employer relationship dissipates. We suggest that reforms to labor laws should move in the direction of portable-benefits solutions.

* Assistant Professor of Law, Duquesne University School of Law; Research Fellow, New York University School of Law.
** Assistant Professor of Economics, State University of New York-Purchase; Research Fellow, New York University School of Law.

Section 1: Introduction

Richard Epstein's scholarly influence expands through a broad range of topics connecting law, economics, and business. In particular, Epstein has written extensively on employment and labor regulations (Epstein 1982; 1983; 1984; 1985; 1994; 2015; 2017). Motivated by his research during such a timely period of significant changes to labor, we sought out to discuss the connection between technology and labor.

The recent rapid growth of technology is not only creating innovative goods and services, but it is also fundamentally altering the workspace and the traditional understanding of employee and employer relationships. Most notably, this is seen in the rise of the gig economy and the "freelance" movement. A conservative estimate is that 15.8% of the current labor force engage in gig, contractor, or freelance work as their *main* source of income, which is an over 50% increase of workers in alternative work arrangements as their main job from 2005-2015 (Katz and Krueger 2016). Other measures find that there were 57.3 million freelancers in 2017—meaning that close to 50% of the U.S. labor force engaged in freelancing, either as a main *or* side source of income (FIA 2017). When measuring the number of 1099-MISC vs. W-2 tax forms, there has been a 22% increase in the use of 1099-MISC forms since 2000, and over that same period there was a decline of 3.5% in W-2 form usage (Dourado and Koopman 2015). Over the last few years, freelance work has grown three times more than the growth of the U.S. workforce (FIA 2017). This is an unprecedented change to labor in the United States, and it appears to be accelerating. Why might this be happening? Can we expect it to continue to happen?

This paper draws on the economics of transaction costs literature to help explain how technology has reduced the broad notion of "transactions costs," and specifically how it has reduced the managing and contracting costs that firms face. With lower transaction costs, firms will rely less on indefinite long-term employment contracts for labor and utilize more market mechanisms and "contract out" for labor.

Furthermore, we argue that this growth will continue and even be enhanced by innovations in blockchain technology, especially the development of smart contracts. Smart contracts are computer programs that can automatically execute their own terms when a preconfigured condition occurs, which can solve many problems in contracting that currently

need intermediation.[1] We argue that blockchain technology in general, and smart contracts in particular, will continue to incentivize greater use of contractor and freelance work. With countervailing factors held constant, this can lead to more disruption in traditional work arrangements. In other words, just as technological advancements up until this point have reduced transaction costs that have enabled more gig economy work, smart contracts will continue to reduce these costs and push the decentralized notions of workspace that mirror "contract at-will" employment that Richard Epstein defended over 30 years ago (Epstein 1984).

We acknowledge that the various reductions of transaction costs are not the only factors leading to the transformation of work today. Following Epstein and other labor law scholars, we contend that various labor regulations have made it more costly to use employees over contractors Unless labor laws are updated to make long-term employment contracts more affordable option for firms vis-à-vis contracting out for labor, they will continue to incentivize firms to utilize contract labor. In other words, the counter-intuitive results of labor regulations designed to protect employees is that regulatory costs will drive firms to use gig workers and smart-contract labor (at least to the extent that labor laws fail to make onboarding and off boarding employees more efficient).

Lastly, we conclude by discussing how these changes will have significant implications for labor because the standard labor regulations surrounding health and retirements benefits to employees will lose relevance as the employee-employer relationship dissipates. This is already starting to cause tension in the gig economy as many point out that gig economy workers—since they are contractors, they are not "protected" under labor law. We suggest that reforms to labor laws should move in the direction of portable-benefits solutions.

Our paper will proceed as following: Section 2 will present the theoretical framework on firms, transaction costs, and the decisions to contract out labor. Section 3 will apply contract-labor theory to the gig economy and Section 4 will apply it to smart contracts. Section 5 will discuss the implications for labor law and conclude.

Section 2: Theoretical Framework for Firms and Contract Labor

The study of alternative labor arrangements and firms' decisions to contract out labor has attracted the attention of business, economics, and law scholars. There is a host of organizational

[1] For a description of smart contracts, see Crosby, M.A., Pattanayak, P., Verma, S., Kalyanaraman, V. (2016), Blockchain Technology: Beyond Bitcoin, Applied Innovation, No. 2, at 8.

and management literature on the characteristics and industries of firms that will begin to use external labor arrangements. The main variables identified are the presence of unions, the type of industry, firm size, and bureaucratic hiring and termination procedures (Davis-Blake & Uzzi 1993; Kalleberg & Schmidt 1996; Uzzi & Barsness1998). On the worker side, there is also research on the characteristics of workers in external labor arrangements—traditionally, these are age, gender, race, education, and skill (Howe 1986; Williams 1989; Cohen & Haberfeld 1993). A large number of these studies focused on skill with the hypothesis that low-skill labor would be more suitable for contract work. However, some studies have found that the use of contractor work is more prevalent in higher-skilled occupations (Kalleberg and Schmidt 1996) or found that occupation was not a significant predicator of the use of contract work (Davis-Blake & Uzzi, 1993; Uzzi & Barsness, 1998).

Offering a different perspective, Abraham and Taylor (1996) find that firms' decision to contract out more labor is influenced by the volatility of demand, the wage and benefits savings it could realize, and by the availability of specialized skills possessed by the contractor. Recently, Weil (2014) argues that competitive pressures cause a "fissuring" of the workplace whereby large firms slim down their "core competencies" and outsource many aspects of the jobs that need to be done to subcontractors—in other words, they give greater responsibility for larger areas of work to third parties and contractors.

An important aspect of the firm's decision to hire or contract out has its theoretical underpinnings in economics, and specifically in the transaction costs economics literature. There has been some empirical work in management and organizational journals testing the transaction costs perspective (Davis-Blake & Uzzi 1993; Mangum et al. 1985; Sloane 1989; Uzzi & Barsness 1998; Masters and Miles 2002).

The transaction costs conception has its beginnings in Ronald Coase's (1937) nature of the firm explanation, and the massive literature that has grown out of it (Alchian and Demsetz 1972; Williamson 1981; Williamson and Ouchi 1981; Grossman and Hart 1986; Hart and Holmström 1987; Hart 1988; Rosen 1988; Holmström and Milgrom 1991). These papers attempt to define exactly what is meant by transaction costs and the determinants under which transactions will be internalized within the governance of a firm or externalized to the market. The transaction costs perspective emphasizes that a firm's decision about whether to fill a given position using contract labor or internal labor depends on the costs of making that transaction. It

emphasizes that because there is potential for opportunistic behavior from various parties to the exchange, there are a number of factors that determine whether it would be more efficient for firms to utilize market arrangements (contract out) or to utilize governance structures (i.e. long-term employment relationships) to govern the transaction.

There is also important work done by Easterbrook and Fischel (1996), Blair and Stout (1999), Henderson and Casey (2015), and other "contractarians" along these lines on the theory of corporate governance. They argue that corporations should be understood not as an entity but as a nexus of contracts whereby relationships between shareholders and managers are essentially contracts-at-will. The implication of that research is, generally, that statutory corporate law should not require more or less of the board of directors than the shareholders prescribe in the certificate of incorporation, bylaws, and other private arrangement; in other words, the contractarians believe in shareholder primacy. Other prominent research established by Blair and Stout rely on the team production theory to provide a rationale for the role of board members in corporations—specifically how the board becomes a mediating hierarchy—which leads to the conclusion that corporations are best understood as a team of shareholders, directors, investors, creditors, and other stakeholders, in which the board is a sort of organizer or coach for the team, thus justifying statutes and regulations that mandate duties of the board to team members. Additionally, scholars such as Henderson and Casey have argued that the limit case of the team production theory is readily observed from business reality: for example, significant creditors often lever substantial control over the board through contractual debt arrangements, which does not evidence a devolution of power from team members to the board.

This line of inquiry on corporate governance and law and team production are important for the broader research, but for the purposes of our paper, we do not theorize on corporate governance per se. Instead, we focus narrowly on the employers' decision to contract out work, and specifically on how technology has altered and is continuing to alter the economic factors of transaction costs that can lead to further disruption of traditional employee relationships. While the ability to contract efficiently has implications for corporate governance, we begin with Coase's more fundamental question of when a firm will grow and when a firm will shrink. However, we believe there is a fruitful area of inquiry for investigating how the factors discussed in this paper can also be applied to understanding corporate governance and law.

For the remainder of this section and paper, we delve in the Coasian theory of the firm and transaction costs literature to understand what mechanisms within the transaction costs literature are changing with technology in way that would explain the emergence of the gig economy. We then examine these same mechanisms and apply them to the next set of technological innovations in blockchain, and argue how this will lead to further contract work and potential disruption of traditional labor arrangements.

2.1 Theory of the Firm

Economists draw on the research of Ronald Coase and the line of literature following his seminal paper on "The Nature of the Firm" (1937) to help explain why there has been a rise of contractor work. In this piece, Coase poses a puzzle: Why are some activities directed by market forces and other by firms? Specifically, he explains the puzzle as: "Outside the firm, prices movements direct production, which is coordinated through a series of exchange transactions on the market" (Coase 1937, 388). But within the firm, these price movements are eliminated and replaced with a manager who directs production—why? In other words, Coase is asking why firms exist, and the answer he gives is also relevant for how firms behave, the size of firms, and for the purposes of this paper, why firms would contract out for labor instead of hiring employees.

Coase answers his puzzle with the concept of "transaction costs." Transaction costs means all costs associated with carrying out an exchange. Transactions costs include the costs of originating, negotiating, consummating, monitoring, and enforcing a contract for any given exchange. For example, the costs of hiring movers include research on local movers, finding one, researching that the mover is reputable and trustworthy, negotiating the price, arranging a suitable time for the transaction, arranging for payment, assigning risk and potentially incurring legal costs if there are problems of movers breaking, stealing, or not holding up their end of the agreement, and a host of other issues depending on the context. This makes the use of the market system somewhat costly for ongoing exchanges. Coase explains that it may be less costly for firms to setup and create one contract (an employment contract) when a job has to be done repeatedly. In other words, rather than creating an infinite series of potentially costly contracts on the market, the institution of a firm can create one contract for each "employee," which would enable an authority (the owner/manager) to direct resources and production. Coase (1937, 391)

explains that the owner "does not have to make a series of contracts with the factors with whom he is co-operating within the firm, as would be necessary of course, if this cooperation were a direct result of the working of the price mechanism."

From this, it follows that the higher the cost of transacting across markets, the greater the advantage of organizing within the firm. Or the corollary, as transaction costs decrease, there will be a tendency for greater use of the market system rather than use of the firm. Firms will expand or shrink until the cost of the last transaction internally equals what the transaction would have cost using the market system. Perhaps in a world with no transaction costs at all, we would not see large firms and instead the structure of industries would be comprised of individuals or very small firms. As will be discussed in Section 4, that world can become more realistic as blockchain technology smart contracts will further drive down transactions costs.

The relevance of Coase for the gig economy and for the transformation of employee-employer relationship is as follow: if technological advancements can reduce the costs of transacting outside of the firm (in the market) rather than inside of the firm, then this can help explain the rise of contractor work. Take, for example, the reduction of transaction costs that has already occurred: search costs have fallen with the expansion of the Internet and search engines like Google; payment methods have become easier with PayPal and credit cards; the reputation of suppliers has become more open with online review systems, and a host of other technological changes have enabled our modern digital platform systems that have reduced the costs of finding and contracting with individuals across the world.

2.2 Transaction Cost Economics and Monitoring Costs

While Coase's research set up the groundwork, he was ambiguous about the specifics of transaction costs. This created a massive opportunity and research agenda that investigated into the particulars of transaction costs. One of the earliest works that received notable attention came from Alchian and Demsetz' (1972) notion of team production and monitoring costs. According to Alchian and Demsetz, monitoring costs are one type of transaction costs that drives the formation of firms. In their conception, firms arise to solve the problem of team production and organization, and the difficulty in metering outputs and monitoring shirking of team members. Specifically, Alchian and Demsetz explain that for a cooperative productive activity (called team

production), it is difficult to measure individual productivity and make payments in accordance with that work since several types of resources are used and the output cannot be divided as the sum of separable outputs of each cooperating resource. They give an example of two men who load heavy cargo into trucks: it would be virtually impossible to determine each person's marginal productivity by solely observing the total weight loaded per day. They explain, "in team production, marginal products of cooperative team members are not so directly and separably (i.e. cheaply) observed" (Alchian and Demsetz 1972, 780).

Accordingly, firms arise to monitor the use of inputs in team production of complex goods. Firms measure performance and act as a central organization for contracting relating to individual stages of production. Monitoring plays an important role in the emergence of a firm because each individual member has an incentive to "shirk"—that is because individual output cannot be ascertained, individual team members could take many "smoke breaks," without fully internalizing the costs of that decision. Monitoring becomes more important because the "clues" to each member's productivity can be ascertained by observing the behavior of their individual inputs—i.e. the hours that they work. Alchian and Demsetz propose that owners and managers specialize in monitoring input performance of team members. Consequently, the manager would have to be incentivized to monitor the team members. This can be done by tying part of the manager's income to the performance of the team. Alchian and Demsetz (1972, 782) explain, "Managing or examining the ways to which inputs are used in team production is a method of metering the marginal productivity of individual inputs to the team's output."

Thus, Alchian and Demsetz explain that the firms are centralized contractual structures that arise as a way to enhance efficient organization of joint production. They conclude, that in particular, "the ability to detect shirking among owners of jointly used inputs in team production is enhanced (detection costs are reduced) by this arrangement and the discipline (by revision of contracts) of input owners is made more economic" (1972, 794).

Economists following in the line of transactions costs research continued to build off the notion of team (or joint) production and the problems of monitoring costs. The idea is that where output is more easily measured and workers can be compensated directly for their performance, then contracting out labor becomes more attractive. Oliver Williamson and other scholars in the Transaction Cost Economics (TCE) literature extend this argument further and identify three specific areas that impact transaction costs. The TCE argument begins with the assumption that

parties have an incentive to behave opportunistically and to take advantage of their counterparties. This can be done when two parties come to an agreement, and once the transaction begins, either the buyer decides to pay less or the supplier decides to raise the price. In an ordinary transaction, this would not be a problem—i.e. when I walk to Whole Foods and see that their prices are higher, I will walk out and go to Trader Joe's instead. It only becomes a problem in certain types of transactions, and the TCE research identified those problems arising when there are instances of (1) likelihood of repetition, (2) high asset-specificity, and (3) uncertainty of performance.[2] These three problems will now be addressed in turn.

First, firms are more likely to use contract labor for positions that have a low likelihood of repetition. This is because if firms believe that the need for the worker will be for the longer-term, then the potential costs of negotiating a series of contracts to fill the position decreases the efficiency advantages of market contracting.

Asset-specificity refers to the notion that the assets developed in the process (i.e. physical assets or knowledge, or firm-specific skills), are more valuable to that particular transaction than they would be if they were deployed for any other purposes. High asset specificity ties one party to another party because the investments do not have many other uses or purposes, besides this individualized transaction. This means that the market will be less equipped with governing exchanges and guarding against opportunism, as parties become more "tied." Firms are thus more likely to use contract labor for positions that require less firm-specific skills and less likely to use contract labor when there are more firm-specific investments. In other words, from a business analysis perceptive, firms will tend to "hire" rather than "rent" when there is high transaction specific investment.

The third characteristic of transactions is uncertainty, which is "the ease with which the productivity of human assets can be evaluated" (Williamson 1981, 564). In those cases where there is more uncertainty about individual performance, traditional employment offers an advantage over contracting out to the market because it gives firms the opportunity to closely monitor employee performance and minimize any form of opportunism—like shirking and taking many "smoke breaks."[3] When the performance of a worker is more definable and

[2] Incomplete contracts and other factors are also important to this discussion, but for simplicity, we do not delve into this research

[3] Williamson (1973, 318) discusses this condition as "Information impactedness" whereby one party (i.e. the firm) will have a difficult time determining whether working are using their energies and inventiveness to the fullest. "Under such conditions, workers can shift from consummate to perfunctory effort, thereby destroying any potential efficiency gains that market contracting might provide."

immediately measurable, the worker's ability to act opportunistically is minimized and the market can more efficiently govern the relationship. Therefore, firms are more likely to use contract work when performance is easier to assess.

What does mean for the gig economy and smart contracts? Taken together, this literature tells us that if technological changes can lead to such factors as greater detection of individual performance, reduction of supervision and monitoring costs, and greater dissemination of reputational information, then we should expect greater use of contract labor for employees.

Section 3: Application to the Gig Economy

There are several different terms used interchangeably regarding the "Ubers" and "Airbnbs" of this new economy. The term 'gig economy' refers to business models that are characterized by a prevalence of short-term contract or freelance work. For example, Uber's drivers are all contractors; Handy, the "Uber" for household cleaners, has a similar business model where all of their maids and suppliers are contractors; Upwork is a platform designed to connect freelancers of all types to individuals who may need their services. All of these examples are referred to as the gig economy because the labor supply side is characterized by these short-term contracts. Gig economy is similar to the 'on-demand' economy, which refers to a digital marketplace that matches consumer wants with providers to immediately deliver those goods and services. [4] Uber and Handy are also examples of the on-demand economy because they provide that on-demand service, however, not all gig economy needs to be in the on-demand classification. Though typically, on demand-economies will utilize contract work precisely because the on-demand business models necessitate a flexible labor supply (Palagashvili 2017). Lastly, the term 'sharing economy,' refers to platforms that provide access to users sharing their existing goods and services (i.e. ride-sharing, bike-sharing, or home-sharing)—this allows underutilized resources to be put in use. Thus, Airbnb is an example of the sharing economy, but not necessarily the on-demand economy. However, sometimes the sharing economy will be used broadly to describe *all* sales transactions that are done via online market places.

[4] THE ON-DEMAND ECONOMY, theondemandeconomy.org (last visited Jan. 30, 2018) [https://perma.cc/M33H-B9SM] (The definition used by the coalition of on-demand companies is as follows: "The On-Demand Economy is defined as the economic activity created by digital marketplaces that fulfill consumer demand via immediate access to and convenient provisioning of goods and services.").

Section 3.1: A Theory of the Firm in the Gig and Sharing Economy

Michael Munger (2015, 2016) is one of the first to apply Coase's insights to understanding the sharing economy. Munger argues that the sharing economy is jumpstarting a "Transaction Cost Revolution," whereby technology is enabling entrepreneurs to sell the service of "reductions in transaction costs" (2015, 189). These type of entrepreneurs, herein referred to as "platforms" and otherwise known as middleman, help make transactions possible by connecting riders and drivers (Uber) or homeowners with renters (AirBnB)—and more broadly, by facilitating exchanges through information delivery, assurance of quality, and payment services. That is, neither Uber nor AirBnB are producing or selling a good or service, they are servicing an economy whereby people are more extensively using existing goods and skills of service providers.

It's important to emphasize this fundamental transition into the sharing economy. In the traditional economy, value is created from resource extraction. This means mining raw materials from the earth, smelting ore, and assembling products like cars. To understand the manufacturing value chain in the traditional economy, consider the manufacture of a car. First, coal is mined, to make steel. This steel has more value than the coal in the ground did. Second, that steel is transported to a car assembly-line factory, where it has more value as car door panel. Third, that door panel is incorporated with other "inputs" from other "upstream producers" such as glass windshields and electronic components to create a functional car. A whole car that can drive is worth more than the sum of its static parts. Fourth, the finished product (our new car) is transported from a centralized manufacturing facility in Indiana to retail auto dealers all over America, where it is more convenient for prospective buyers to test and acquire that car. Fifth, salespeople at those dealerships inform buyers about the car's features, help buyers secure financing, and teach them to use the technical feature on the vehicle. Sixth, independent aftermarket car maintenance and repair services providers help keep that car running. Each step in this process, which can be visualized as a river upon which inputs flow from upstream supply to downstream sales, adds value to the product.

In contrast, the sharing economy is based on resource re-allocation. The resources that were extracted and sold in the traditional economy may be under-utilized. For example, consider a vacant home. This home is built from materials extracted via the traditional economy. It was sold to someone who no longer has much use for it, but it's not a good candidate for resale due to

tax or other reasons. This vacant home is an under-utilized asset. The sharing economy provides technological solutions to make better use of this asset. As an example, the AirBnB platform at connects those individuals who have vacant homes with individuals who would pay to stay in those vacant homes. Cars are also underutilized assets that sit in driveways and parking garages. Uber's platform connects those who have the cars to people who need short-term use of the cars (a 'ride' from point A to point B). Getaround employs a similar concept—it's a peer-to-peer car-sharing platform where individuals literally borrow a parked car on the street or in someone's driveway. Here's how it works: Car owners place a piece of technology on their car that tracks the location of the car, and is used to lock/unlock the car. With the tap of an app, owners can indicate when they want to make their car available or when they're taking it off the market. Car borrowers will be matched with different cars—the app will show them the location of the parked car nearby. After clearing identification via the piece of technology, the car opens up and there's an extra key under the mat ready to be used. When the car is ready to be returned, the app finds a new parking spot for the car, under a set of conditions for how far the owner would like it to be from the original location. A decade ago, this type of exchange would have been too costly to facilitate, and it would have been easier to buy or rent a car in the traditional manner. But with this new technology and platform, peer-to-peer biking riding, clothes sharing, and a host of other assets are now proliferating the market.

As technology is reducing transaction costs and allowing for the emergence of the sharing economy exchanges, it is also influencing the firm size and labor market side of things. Firms are facing the "rent or buy" decision in terms of labor. With the reduction of transaction costs, it's becoming more common for firms to "rent" workers rather than create long-term contracts with them (i.e. "buy" them). This is creating what is known as the "gig economy." As we discuss in Section 4, this movement can continue from further technological advancements—specifically, we point to the blockchain technology and smart contracts. Munger predicts this as well—emphasizing that the "very notion of a firm may start to be eroded. A group of people, each of whom has developed a set of specialized skills and a reputation based on ratings on software such as LinkedIn, would be hired for a project" (2015, 206). As technology advances and entrepreneurs are able to reduce transaction costs, fewer transactions within the firm will become profitable.

Section 3.3: Transaction Cost Economics and Monitoring in the Gig Economy

How has technology influenced the specific transaction costs factors discussed above? First it's important to put the gig economy in the context of what has already been happening over the last 15 years with monitoring costs. For example, new software has developed that can keep track of how many hours a person is using a particular device, such as a phone or computer. This is important for monitoring costs because if technology can reduce the monitoring costs, then there is less of a role for managers. In traditional call centers—whether they were in the U.S. or outsourced abroad—there was an on-site manager who monitored the employees to make sure they are answering phones and not shirking on the job. With the advent of new software that monitors the length of time on the phone, firms can engage in capital-labor substitution, whereby they replace the manager (labor) for the software that can now monitor individuals. As a result, firms can now contract out the customer services roles to individuals (rather than employees) or to an agency that works with individuals as contractors. That is, previous "employees" of the company (or agency call center) can now be turned into market transactions where individual input is monitored by capital. In this way, technology has already altered the necessity of traditional firms as arrangements that manage and monitor joint production of output.

Today, the emergence of platforms in the gig economy reduces transaction costs in several ways. First, the platform reduces transaction costs across multiple dimensions. The platform is a standard contract for the provision of services. Such a contract is less costly to draft and is also more likely to be complete because it is based on the feedback of millions of contract parties who have encountered countless situations. The platform also makes it easier for contracts to be enforced. For example, Uber charges a rider's credit card before a driver makes a pick up, ensuring that cash is available for the service. Moreover, the platform's standardized approach makes it much easier to substitute one worker for another. Most passengers do not care who drivers them to the airport so long as they arrive safely and on time. Gig economy platforms do not value repetition as much as traditional employers who have to train employees and who have a particular brand identity that must be upheld.

Furthermore, companies in the gig economy platform reduce uncertainty about performance. Technology such as GPS and real-time feedback solve information asymmetry problems that would otherwise make contract performance hard for one party to prove. In other words, the gig economy platform reduces the set of things that are credence goods and service. In

the case of Uber, it effectively holds the rider's payment in escrow for the driver until the ride is completed, these funds are automatically released when the destination is reached. Drivers no longer have to worry that a rider will have insufficient funds to pay when the destination is reached. Meanwhile, the rider has much better information about the quality of the driver before taking the ride. A robust two-way rating system employed by most gig economy platforms provides valuable information about quality that would be uncertain in a traditional economy. In this way, the technology has enabled better monitoring and assessment of individual input (tracking devices) and of individual output through consumer review processes. Automated surveys, aggregation of reviews, and "big data" has led to worker output being more easily measured, which allows workers to be compensated directly for their performance.

Section 4: The Blockchain Revolution

Blockchain technology (or simply "blockchain") allows transactions to be recorded without a centralized authority. Blockchain has the power to reduce transaction costs in many industrial applications. While blockchain is presently best known for propagating cryptocurrencies, blockchain actually has a much broader set of applications including identity verification, the internet of things, smart property, and smart contracts. It is not cryptocurrency but **smart contracts** that we believe will most significantly impact the nature of the firm for reasons discussed in the next section. But first, we explain basic concepts about blockchain itself, and it is probably easiest to understand blockchain through its original use case of cryptocurrency. The concept of blockchain originated in 2008 as a solution to a double-spending problem that would otherwise make decentralized cryptocurrencies unreliable, although it solves many other problems in industrial organization.

For illustration, consider going to Tali's Video Arcade. You put a five-dollar bill in the token dispensing machine, and out come five plastic Tali Tokens. These tokens have no financial value per se. You cannot take them to the corner store and exchange them for a pack of gum. But you can insert one into a ski ball machine and get the opportunity to play that game. And the end of the night, a Tali employee retrieves all the Tali tokens from all the video game machines and puts them back into the dispensing machine. In this simple example, the Tali token can only be spent once because it returns to a central authority before being re-issued. The dispensing machine acts like a mint. This is fine so long as the mint works, but it is not a robust solution,

because the mint is a bottleneck. If the dispensing machine breaks down, the entire video arcade ceases to function until it is replaced. The dispensing machine is also vulnerable to attack because it is a centralized store of value. It could be literally "hacked" open with a hacksaw. Is there another way to track these tokens?

Instead of using physical tokens that are stored in a central location, we could use digital tokens. While we could still task a central mint to track the ownership of all those tokens, we have also unlocked a new solution by going digital. Digital token can be recorded in infinitely many places at once at virtually no additional cost. The record of who owns what tokens is called a ledger, and such a record that exists in many places at once is called a distributed ledger. For example, both the ski ball machine and the air hockey machine could have a copy of the distributed ledger. When you sign away your digital Tali Token by agreeing to play a game of ski ball, you should no longer own that token to play a game of air hockey. But the Internet does not transmit information instantaneously. Nothing can travel faster than the speed of light, so the message that you spent you token on a game of ski ball could take several seconds to reach an air hockey machine on the other side of the world. An enterprising American fraudster could partner with a comrade in China so they both hit "play" on their video game machines at the same time. The transaction at the air hockey table is not transmitted (or "published") to the ski ball table until the balls have been dispensed, and our fraudster will get to enjoy a free game. In other words, your Tali Token has been double spent.

Double spending seems like a trivial matter when it relates to video games, but what if that token represents one million dollars? Obviously, a solution to the double-spend problem is necessary if distributed ledgers are to be useful, and digital signature are not enough. Blockchain thus adds two features, a timestamp server and proof-of-work, that solve the double spending problem.

A timestamp server widely publishes all the transaction that occurred in a prior period of time. Each publication constitutes one block. For example, this Tali Block will show two transactions: the spending of one Tali Token to play a ski ball game in America, and the spending of the same Tali Token to play an air hockey game in China. Blockchain technology is programed to invalidate double-spend transactions, so neither video game machine will accept the token, and our fraudster will be thwarted. However, our timestamp solution has created a new problem: we cannot validate a transaction until a block is published. That makes instantaneous

transactions impossible. While our fraudster is thwarted, Tali's legitimate customers will be frustrated by waiting ten minutes or more to play a game of ski ball.

But our technologically savvy fraudster is not done yet. In a last-ditch effort to get one free play, the fraudster attempts to publish a false block that erroneously shows ownership of two tokens. Proof-of-work is a cryptographic solution to this problem. Digital information of any length can be converted into a fixed-length hexadecimal code by a process called "hashing."[5] It is very easy to create a hash value based on any given set of input data.[6] But it is very hard to determine the input data given only the hash value output.[7] Blockchain technology is programmed only to accept published blocks whose hash value begins with several zeros. This requires block publishers to add an arbitrary number (a "nonce") to each block until the block returns a hash value starting with the specified number of zeros. Scanning for a nonce that returns an acceptable hash value for the block takes a huge amount of computing power. It would be cheaper for our fraudster to simply buy a second Tali Token legitimately than to spend more money on computer hardware and electricity. However, this also creates a new problem: block publishers have to spend huge amounts of money on electricity to solve the blockchain hash problem, which is bad for the environment.

To summarize, blockchain technology uses proof-of-work to prevent double spending on a peer-to-peer network of digital signatures (Nakamoto 2008, 8). Blockchain has the advantage of a decentralized system that is inefficient to hack. But it has the disadvantage of being too slow for some applications and of being extremely energy intensive. Technologists are working on solutions to these and other problems with blockchain, but even in our current state of affairs, the blockchain can be used for a new application that may transform the nature of the firm: smart contracts.

Smart contracts are computer programs that can automatically execute their own terms when a preconfigured condition occurs. This can solve many problems in contracting that currently need intermediation. For instance, consider problems that can occur in traditional

---

[5] For example, the input data "fox" results in the output hash value "776cb326ab0cd5f0a974c1b9606044d8485201f2db19cf8e3749bdee5f36e200" when put through the SHA256 has algorithm. The input data "The quick brown fox jumps over the lazy dog." Results in the hash value "ef537f25c895bfa782526529a9b63d97aa631564d5d789c2b765448c8635fb6c". Note that the hash values are exactly the same length even though the input data are very different lengths.

[6] http://www.unit-conversion.info/texttools/sha/#data

[7] This feature of "one-wayness" is more technically described as "preimage resistance." Peters, G.W., Panayi, E. (2015) Understanding Modern Business Banking Ledgers through Blockchain Technologies: Future of Transaction Processing and Smart Contracts on the Internet of Money, at 4.

requirements contracts. A requirements contract is an agreement to purchase as much as you need from a certain seller. Requirements contracts are commercially necessary, but they can be abused. Consider a case of purchasing heating oil for a factory.[8] In a traditional economy, Buyer agreed to buy all its heating oil from Seller for a fixed price of $2.14 per barrel. Buyer initially purchased about 1.5 million barrels per year. But when the market price for oil exceeded $4.30 per barrel, Buyer increased its "requirements" order by about 63%. Seller refused to deliver to oil, claiming that Buyer was "not acting in good faith." It took the court system seven (7) years to resolve this dispute in favor of Seller. Obviously, the uncertainty and potential legal costs significantly increases the transaction cost of requirements contracts. Are smart contracts better?

Perhaps smart contracts can be more efficient in this case. For example, instead of selling as much as the buyer claims to need and relying on courts to determine good-faith need in the event of a dispute, a smart contract can be programmed to sell as much oil as is truly needed. If a factory wants to maintain a temperature of 68 F from the hours of 9 am to 5 pm, the amount of heating oil required to do this can be calculated based on external weather conditions. If the winter is especially cold, the smart contract will automatically debit additional funds from the buyer and require the seller to supply additional oil. If the weather is mild, less oil will be sold. Other factors, such as decisions to operate the factory after hours, can also be factored into the smart contract. In this automated contracting system, parties do not have to rely on the good faith of the other, and courts do not need to get involved. Discrepancies are resolved as fast as the blockchain operates, which could be as little as ten minutes, as opposed to resolving disputes at the speed of the judicial system, which could take ten years.

Section 4.1: Theory of the Firm and Smart Contracts

While the illustration above contemplates the use of smart contracts between traditional firms, blockchain smart contracts could also be used to replace firms (or create entirely 'platform forms') in the sharing economy by reducing transaction costs to zero or near zero. For example, consider Uber, the ride-sharing platform. Someone who wants to make money by giving people rides (a "driver") downloads the Uber app and follows steps to be approved by the platform. Someone else who wants to get a ride (a "rider") does the same. The rider then uses the app to request a ride, and the app pings a driver to perform this service. The transactions are centralized

[8] See Orange and Rockland Utilities, Inc. v. Amerada Hess Corp., 397 N.Y.S. 2d 814 (App. Div. 1977).

in that Uber makes decisions about who can be a driver or rider and which driver should pick up which rider. But smart contracts make it possible for drivers and riders to match without a central firm doing the matching.

Smart contracts are the killer application of the cryptocurrency world (Crosby et al. 2016). They are already being used to match buyers and sellers of private equity securities.[9] They can verify ownership, authenticate documents, protect digital rights, make investments, store data, prevent counterfeiting, and tally votes. This could obviate firms' needs for recording services, notaries, copyright, stock brokers, and even some government functions (Atzori 2015). The potential reduction in transaction costs using smart contracts will likely encourage firms to go to the market for immediate needs instead of increasing the size of the firm. In other words, smart contracts may be the efficient contract-at-will solution that Professor Richard Epstein vigorously defended over 30 years ago (Epstein 1984).

Contract at will means that the judiciary and the executive will generally not disturb a private arrangement between two competent parties. The priors of this normative positive may be set forth as follows:

> [People] must be left, without interference to buy and sell where they please, and to discharge or retain employees at will for good cause or for no cause, or even for bad cause without thereby being guilty of an unlawful act per se. It is a right which an employee may exercise in the same way, to the same extent, for the same cause or want of cause as the employer.[10]

We do not opine on whether the contract at will is normatively better or worse than a set of regulations and statutes that are designed to redress perceived imbalances between firms or between individuals and firms, as Professor Epstein and many others have already laid out the arguments on both sides.[11] Instead, we focus on whether smart contracts will tend to bring about

[9] See Orange and Rockland Utilities, Inc. v. Amerada Hess Corp., 397 N.Y.S. 2d 814 (App. Div. 1977). (NASDAQ Private Equity).

[10] Richard Epstein (1984, 947) is quoting Payne v. Western & Atl. R.R., 81 Tenn. 507, 518-19 (1984).

[11] For contemporary perspectives disfavoring the contract at will, see, e.g., Blackburn, Restricted Employer Discharge Rights: A Changing Concept of Employment at Will, 17 AM. Bus. L.J. 467, 491-92 (1980); Blades, Employment at Will v. Individual Freedom: On Limiting the Abusive Exercise of Employer Power, 67 COLUM. L. Rev. 1404, 1405-06, 1413-14, 1435 (1967); Blumrosen, Employer Discipline: United States Report, 18 Rutgers L. REV. 428, 428-34 (1964); Feinman, The Development of the Employment at Will Rule, 20 Am. J. LEGAL HIST. 118, 131-35 (1976); Murg, G.E. and Scharman, C., Employment at Will: Do the Exceptions Overwhelm the Rule?, 23 B.C.L. REV. 329, 338-40, 383-84 (1982); Peck, Unjust Discharges from Employment: A Necessary Change in the Law, 40 Omo ST. L.J. 1, 1-10 (1979); Summers, Individual Protection Against Unjust Dismissal: Time for a Statute, 62 VA. L. Rev. 481, 484 (1976); Weynard, Present Status of Individual Employee Rights, PROC. N.Y.U. 22D ANN. CON. ON LAB. 171, 214-16 (1970); Note, Guidelines for a Public Policy Exception to the Employment at Will Rule, 13 CONN. L. REV. 617, 641-42 (1980); Note, Protecting Employees at Will Against Wrongful Discharge: The Public

the contract at will by solving some of the perceived problem with it. For present purposes, we only consider smart contracts in labor arrangements, as this is probably the thorniest problem to solve. Future work may extend the discussion to the relatively efficiency of smart contracts in other arenas.

Section 4.2: Transaction Costs, Monitoring, and Smart Contracts

The TCE scholars recognized that people sometimes behave opportunistically: an employee may take advantage of an employer, given the opportunity. Opportunistic behavior can be blatant, like stealing from the money till, or less obvious, such shirking and dereliction of duties. These agency costs result from the mismatch in incentives of capital and labor. Put simply, capital wants to maximize return on capital, which means getting as much efforts from a worker for as little salary as possible. Labor wants to maximize on labor, which means getting as much salary as possible for as little work as possible. A firm will only exist to the extent that these internal agency costs can be minimized, "and the persistence of firms shows that this can be done" (Epstein 1984, 964).

The common law of agency imposes duties on employees that provide legal recourse when an employee shirks or usurps a corporate opportunity for himself. But leveraging the legal resources are costly for employers, who must engage in monitoring and discipline activities. Monitoring is costly because the firm has to hire someone to perform the monitoring – and then who will monitor the monitorer?[12] Moreover, if an employee commits an infraction, it may be costly for the employer to impose discipline. Firing a worker means spending efforts to hire and train another, and statutory rights to employment maintenance raise the risk that firing an employee will result in legal costs. As a result, statutory worker protection laws increase agency costs and thereby decrease the incentives of firms to hire employees in the first place. Empirically, we can see that the workforce is increasingly becoming more contractor-based.

Blockchains and the smart contracts that operate on them are trustless system. A computer program is different form a human agent because the computer will not shirk or self-

---

Policy Exception, 96 Harv. L. Rev. 1931, 1931-35 (1983); Note, Protecting At Will Employees Against Wrongful Discharge: The Duty to Terminate Only in Good Faith, 93 HARV. L. Rev. 1816, 1824-28 (1980); Note, A Common Law Action for the Abusively Discharged Employee, 26 Hastings L.J. 1435, 1443-46 (1975); Note, Implied Contract Rights to Job Security, 26 Stan. L. Rev. 335, 337-40 (1974); Note, California's Controls on Employer Abuse of Employee Political Rights, 22 Stan. L. Rev. 1015, 1015-20 (1970).

[12] Professor M. Todd Henderson refers to this as the "bee-watcher-watcher problem." See generally, Dr. Seuss, Oh the Places You'll Go.

deal. To be sure, the computer program has to be tested for bugs and errors, and secured from hacking and malware, but if it is set up properly and securely it does not have to be monitored as an agent does. Moreover, discipline can be coded into the program. For example, consider a smart contract to pick up a rider on Main Street and drive her to the airport. The smart contract could automatically verify that the driver took the most efficient route based on extrinsic evidence such as traffic data. It could also verify that the pickup and drop-off happened timely by using the GPS on the rider's smart phone. More systemically, the blockchain could keep a record of which drivers are the safest, most efficient, receive the best rider ratings, or whatever that system wants to maximize, and then can reward the drivers who meet those objectives with a higher rating that will encourage more riders to select that driver.

It seems quite likely that blockchain technology will be used to made ad-hoc work agreement like the ride-sharing illustration above. This raises serious questions about what is the firm. Under current law, it is already unclear as to whether a driver for Uber is an employee of that firm. What happens when Uber is not a corporate entity but instead of a decentralized network that can perform any ad-hoc function that can be coded into a smart contract?

Even for traditional firms, the use of blockchain technology to manage labor relations with employees has massive implications. On the one hand, blockchain makes it cheaper to monitor and discipline employees. This reduction in agency costs should incentivize firms to hire more employees. But that presumes that employment relationships could be governed by smart contracts. However, the present legal regime presents a number of legal and statutory barriers to doing so. Meanwhile, the cost of a firm contracting with the marketplace will also go down thanks to the relative efficiency of smart contracts – and these at-market transactions are not so strictly regulated by labor law. Firms therefore will be incentivized to contract with the market instead of growing the firm. It is for these reasons that smart contract may accelerate the shrinking of the firm and the move from employment to independent contract relationships unless and until the labor laws and liberalized to permit firms to engage with employees on a more at-will basis.

Section 5: Conclusion

In the Spring 1988 special edition of the *Journal of Law, Economics, and Organization* celebrating 50 years of Coase's "Nature of the Firm," Sherwin Rosen posits that if factors such

as monitoring costs, joint production, or transport costs did not exist, then it would be "difficult to imagine why complete decentralization of labor markets would fail to achieve efficient allocations. Most workers would be, in some sense, self-employed" (1988, 53). Thirty years after that publication, we are beginning to see the onset of just that type of decentralized world created by the broader reduction in transactions costs, which we believe will continue to fall with blockchain and smart contracts.

We do not claim that firms will dissipate completely, as there are number of countervailing factors. We have argued in this paper that technology powering the gig economy (platforms) and, perhaps to an even great extent, blockchain technology (smart contracts) have reduced and will continue to reduce specific transaction costs and create more contractor labor and self-employed work. The nature of the firm as first articulated by Coase and built on by the TCE scholars predict that factors such as lower monitoring and enforcement costs and greater definability and measurability of worker performance will lead to greater utilization of market arrangements (i.e. contracting out). We discussed the specific technologies that are leading to these changes, and thus creating more contract work and greater "decentralization of labor."

Of course, there are other reasons why firms are contracting out instead of staffing up. Richard Epstein in particular has extensively elaborated on the regulatory costs of employment (1983; 1984; 1985; 2015; 2017). The legal risks associated with terminating an employee, the mandatory benefits that must be provided to employees, and the statutory rights of employees to collectively bargain are all costs that firms must bear when then staff up instead of contracting out. The decision to contract out may thus be understood a type of regulatory arbitrage.

Furthermore, there may be sociological factors why the nature of work is changing. Richard Florida's work points to the "rise of the creative class," and how individuals are beginning to act as "creative," types, which in part means preferring greater flexibility and moving away from 9-5pm employment (Florida 2002). Survey data show that single mothers and semi-retired individuals strongly prefer flexible work because traditional work tends to interfere with their family obligations or leisure activities (Hyperwallet 2017).

For all these reasons, we should expect to see an expansion of the labor contract-at-will in this new economy. While some scholars thus focus on ways for the government to stymie this development through laws and police powers, the authors of this paper believe that such regulatory efforts will more likely result in market distortions and more regulatory arbitrage.

Instead, the legal focus must be on developing a regime that works for the workers who are voluntarily deciding to participate in this new economy. In other work, we have suggested a flexible approach to labor unions (Oranburg and Palagashvili 2018) and a new classification of shared worker that unbundles the rights and responsibilities of employment (Oranburg 2018). Here, our main effort was to show how economic theory predicts that the need for such solutions will increase based on market forces. However, we also wish to offer an additional solution that merits further research: portable benefits.

Currently, many if not all of the benefits associated with work are tied to a specific employer. This is problematic because as human asset specificity binds an employer to a particular employee, non-portable benefits bind an employee to the employer who provides them. Workers may feel as though they cannot leave their companies because they will lose their health insurance or retirement benefits. Furthermore, there are resulting inefficiencies as employers partner with a variety of different financial companies to determine retirement benefits for their employees. Moreover, if all employers must provide all benefits to all employees, then people who work two or more jobs received redundant benefits that are of declining or zero marginal value but which have positive marginal cost.

Coupling these problems with the fact that employee-employer relationships are decoupling and becoming more contract-based, we believe that reform in labor regulations needs to follow more in terms of portable-benefits plans. These portable-benefits are already beginning to arise in retirement benefits. Companies such as Honest Dollar and Nestana are providing competitive individualized 401K benefits plans to contractors and freelancers. Health insurance should also be reformed to follow in this manner. For these reasons, benefits must both be unbundled *and* portable. In future work, we plan to outline the specifics of how a portable benefits regime can be implemented for the benefit of workers in the new economy.

Works Cited

Abraham, K. and Taylor, S. (1996). "Firms' Use of Outside Contractors: Theory and Evidence," *Journal of Labor Economics*, 14 (3), July 1996: 394-424.

Alchian, A. and Demsetz, H. (1972). "Production, Information Costs, and Economic Organization." American Economic Review 62: 777-95.

Atzori, Marcella. (2017). "Blockchain Technology and Decentralized Governance: Is the State Still Necessary?" available at http://nzz-files-prod.s3-website-eu-west-1.amazonaws.com/files/9/3/1/blockchain+Is+the+State+Still+Necessary_1.18689931.pdf

Coase, Ronald. (1937). "The Nature of the Firm," *Economica* 4(16): 386–405.

Cohen, Y. and Haberfeld, Y. (1993). "THS workers: Employment characteristics and wage determination." Industrial Relations, 32: 272-287.

Crosby, M.A., Pattanayak, P., Verma, S., Kalyanaraman, V. (2016), BlockChain Technology: Beyond Bitcoin, Applied Innovation, No. 2, at 8.

Davis-Blake, A., & Uzzi, B. (1993). "Determinants of employment externalization: A study of temporary workers and independent contractors." Administrative Science Quarterly, 38: 195-223.

Dourado, E. and Koopman, C. (2015). "Evaluating the Growth of the 1099 Workforce." *Mercatus Center Policy Report.*

Epstein, R.A. (1984). "In Defense of the Contract-at-Will." *University of Chicago Law Review* 51: 947-982.

Epstein, R.A. (1992). Forbidden Grounds: The Case Against Employment Discrimination Laws (Harvard University Press).

Epstein, R.A. (forthcoming 2017). The Misconceived Modern Attack on Right to Work Laws, Volume 2017 U. Chi. Legal Forum.

Epstein, R.A. (2015). Contractual Solutions for Employment Law Problems, 38 Harv. J. Law & Pub. Pol. 789.

Epstein, R.A. (1985). Agency Costs, Employment Contracts and Labor Unions, in Principals and Agents: The Structure of Business (J. Pratt & R. Zeckhauser eds).

Epstein, R.A. (1984). In Defense of the Contract at Will, 51 U. Chi. L. Rev. 947, reprinted in Labor Law and the Employment Market 3 (eds. R. Epstein & J. Paul 1985).

Epstein, R.A. (1983). A Common Law for Labor Relations: A Critique of the New Deal Legislation, 92 Yale L.J. 1357.

Epstein, R.A. (1983). Common Law, Labor Law, and Reality: A Rejoinder to Professors Getman and Kohler, 92 Yale L.J. 1435.

Epstein, R.A. (1982). The Historical Origins and Economic Structure of Workers' Compensation, 16 Ga. L. Rev. 775.

Grossman, S. and Hart, O. (1986). "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94: 691-719.

Hart, O. (1988). "Incomplete Contracts and The Theory of the Firm." *Journal of Law, Economics, and Organization* 4(1): 119-139.

Hart, O. and Holmstrom. (1987). "The Theory of Contracts." In, T. Bewley, (ed.), *Advances in Economic Theory, Fifth World Congress.* Cambridge: Cambridge University Press.

Howe, W. J. (1986). "Temporary help workers: Who they are, what jobs they hold." *Monthly Labor Review*, November: 45-47.

Hyper Wallet. 2017. "The Future of Gig Work is Female."

Florida, R. (2002). *The Rise of the Creative Class.* New York, NY: Basic Books.

"Freelancing in America: 2017" (FIA) (2017). Upwork and Freelancers Union 2017 Report.
Kalleberg, A. L., & Schmidt, K. (1996). "Contingent employment in organizations." In A. L. Kalleberg, D. Knoke, P. Marsden, & J. Spaeth (Eds.), Organizations in America: Analyzing their structures and processes: 253-275. New York: Sage.
Katz, L. and Krueger, A. (2016). "The Rise and Nature of Alternative Work Arrangements in the United States, 1995-2015." NBER Working Paper.
Mangum, G., Mayall, D., & Nelson, K. (1985). "The temporary help industry: A response to the dual internal labor market." *Industrial and Labor Relations Review*, 38: 599-611
Masters, J. and Miles, G. (2002). "Predicting the Use of External Labor Arrangements: A Test of the Transaction Costs Perspective." The Academy of Management Journal 45(2): 431-442.
Munger, M. (2016). "Tomorrow 3.0: The Sharing Economy." *Independent Institute* 20(3): 391-395.
Munger, M. (2015). "Coase and the 'Sharing economy'." In, C. Veljanovski, *Forever Contemporary: The economics of Ronald Coase.* London, UK: Institute for Economic Affairs.
Nakamoto, S. (2008). "Bitcoin: A Peer-to-Peer Electronic Cash System," available at www.bitcoin.com.
Oranburg, S. and Palagashvili, L. (2018). "Balancing Rigidity and Flexibility: Do Unions Make Sense in the On-Demand Economy?" In, R. Bales and C. Hess, *Reviving Labor Law for the 21st Century Economy,* Cambridge University Press, forthcoming.
Oranburg, S. (2018). "Unbundling the Benefits of Employment: A New Labor Classification for the Sharing Economy," 11 Drexel L. Rev. 1, forthcoming.
Palagashvili, L. (2017). "Disrupting Employee and Contractor Laws." *University of Chicago Legal Forum.*
Rosen, S. (1988). "Transaction Costs and Internal Labor Markets." *Journal of Law, Economics, and Organization* 4(1): 49-64
Uzzi, B., & Barsness, Z. I. (1998). "Contingent employment in British establishments: Organizational determinants of fixed-term hires and part-time workers." *Social Forces,* 76: 967-1007.
Weil, D. (2014). *The Fissured Workplace*. Harvard University Press.
Williams, H. B. (1989). "What temporary workers earn: Findings from the new BLS survey." *Monthly Labor Review*, March: 3-6.
Williamson, O. E. (1981). "The economics of organization: The transaction cost approach." *American Journal of Sociology*, 87: 548-577.
Williamson, O. E. (1973). "Markets and Hierarchies: Some Elementary Considerations." *American Economic Review* 63(2): 316-325.
Williamson, O. E., & Ouchi, W. G. (1981). "The markets and hierarchies program of research: Origins, implications, and prospects." In A. H. Van de Ven & W. F. Joyce (Eds.), Perspectives on organization design and behavior.