A Novel Justification for Legal Restrictions on Non-Compete Clauses

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Abstract

This analyzes the use of non-compete clauses that deter a worker from using what she has learned with the firm to start a new firm. It shows, first, that such clauses are only likely to be used when the worker is subject to liquidity constraints. Second, when the worker is sufficiently liquidity constrained, legal restrictions on the length of the non-compete clause can increase the joint welfare of the worker and the firm. The model does not, however, justify a complete ban on non-compete clauses.

1 Introduction

Non-compete clauses are becoming increasingly controversial. While legal scholars have long debated the merits of enforcing non-compete agreements, these clauses are now being used more frequently, and policy makers are now becoming concerned. In Massachusetts, the governor has proposed legislation that would greatly restrict the use of these agreements (Greenhouse 2014). California also has long refused to enforce non-compete clauses. In most states, however, they are governed by the principles of the Restatement of Contracts which provides that non-competes are enforced to protect the legitimate interests of the employers as long as they do not impose an undue hardship on the employee. If the burden is too severe, then the courts will scale back the non-compete (in terms of breadth or time) (Posner et al. 2004).

Because non-competes are imposed as part of a contractual relationship, however, any hardship on the employee is presumably part of a negotiated agreement. That is, if non-competes are prohibited or legally limited, the other terms of the contract are also likely to change, presumably in ways that will disadvantage the employee. In fact, typically one thinks that freely negotiated contracts are likely to maximize the joint surplus of the contracting parties. To justify legal restrictions on non-competes, then, one must do more than simply point to ex post hardship on employees.

There are two such arguments that are commonly made. First, in some cases, employees may not realize they are subject to a non-compete agreement (Greenhouse 2014). But, this is unlikely to justify restricting non-competes in employment contracts with highly paid employees or in industries where they are commonplace, such as high-technology. Second, there may be negative externalities on third parties. In this type of argument, while both the firm and worker ex ante prefer there to be no legal restrictions on non-competes, they still reduce social welfare because of how they affect others. The most obvious example is a negative externality on consumers that occur when a non-compete agreement prevents an employee from leaving the firm to form a new firm that competes with the existing firm in some product market. Another example is where a non-compete agreement is used to raise the cost of a rival firm that wants to hire a firm's employees. This argument is essentially like the Aghion and Bolton (1987) argument against exclusive dealing.

In this paper, however, I examine a different reason for justifying legal restrictions on non-compete clauses. Even if parties are sophisticated and there are no negative externalities, if the employee is subject to liquidity constraints, then the firm may not be able to offer a joint surplus maximizing contract that also maximizes the firm's payoff. I show this in the context of a two period model in which the employee's liquidity constraint puts a minimum on her first period wage. After the employee is hired, the firm makes a non-contractible investment in the employee that increases the firm's profit while the employee works for the firm and also increases the employee's profit should she decide to leave and start her own firm.[1] After the first period, the employee learns how profitable a new startup firm will be (this is private information) and decides whether or not to leave the firm and start her own firm. If she does leave, then she must wait to start her own firm until the non-compete clause runs out.

When the employee's liquidity constraint binds (which I show is often a necessary condition for a contract to contain a non-compete), then the firm has

[1] Because the employee's choices are to stay or start her own firm, in this model non-competes cannot be used to transfer wealth from third parties.

only two contractual instruments, the second period wage and the length of the non-compete clause, to control three targets, the employee's total payoff, the employee's decision to leave, and its investment incentive. If there is no restriction on the length of the non-compete, the firm chooses the second period wage to meet the employee's participation constraint at equality and then chooses the length of the non-compete to tradeoff investment incentives and the decision to leave.

Because the participation constraint binds, the firm does choose the length of the non-compete to maximize joint surplus given the binding participation constraint. So, a legal restriction on the non-compete can only increase joint surplus if it forces the firm off the participation constraint. I show that if the employee's liquidity constraint is severe enough, then this is possible when there is a legal maximum on the non-compete. In this situation, the maximal non-compete does not do enough to deter the worker from inefficiently leaving the firm, so the firm raises the second period wage above what is necessary to meet the worker's participation constraint. Further, I show that in this situation, there does exist a binding legal constraint on the length of the non-compete that increase joint surplus. It is important to note, however, that this binding constraint need not be zero. Non-compete's do serve a useful role in the model in inducing firm investment in the worker. So, while the model may justify some legal restrictions on non-competes, it does not necessarily justify prohibiting them entirely.

While there are many papers that have modeled non-compete clauses, their models do not address the major question in this paper, under what circumstances can the joint surplus of the worker and the firm be improved by a legal restriction on non-competes. In addition, almost all of this literature focues only on binary non-competes, while in this paper I analyze the optimal length of a non-compete and whether judicial intervention to impose a maximimum length can ever make contracting parties better off.

Franco and Mitchell (2008), building on a early model of labor mobility by Pakes and Nitzan (1984) that did not consider non-competes, consider the effect of non-competes on the optimal contracting problem between a worker and firm. They do not allow for long-term contracts nor do they consider firm investment in the worker which affects the worker's profitability as an independent firm. Because they do not allow for long-term contracting, the firm does not have to internalize the worker's loss from having a non-compete in the form of higher wages. Because they do not consider firm investment in workers, that paper cannot capture a prominently touted benefit from non-compete agreements, that they give firms the incentive to invest in workers. They do, however, use this model to trace how covenants not to compete affect industry dynamics. Fosfuri and Ronde (2004) develop a similar model to examine firm clustering. There model also does not consider whether firms might inefficiently use non-competes when they have to compensate workers for it with higher pay. Cooper (2001) presents another model without long-term contracting in a model of competitive firms. Contrary to the results below, in his model the worker's participation constraint is always met with equality whether or not their are non-competes.

Mukherjee and Vasconcelos (2012) consider the effects of non-compete clauses when firms can collude on wages. They find these clauses can make collusion more difficult. Krakel and Sliwka (2009) analyze how the absence of a non-compete can help a firm provide effort incentives to employees, potentially making refraining from using non-competes optimal. Filson and Gretz (2004) argue that non-competes can impede spin-outs that have beneficial welfare effects.

Burguet et al. (2002) show that non-competes can be used to maximize the joint payoff of a firm and worker by helping them extract rents from future employers of the worker. Posner et al. (2004) compare non-compete clauses to other remedies for breach of contract in terms of their ability to induce efficient investments. Because they have symmetric information across all parties (other than courts), in their model renegotiation guarantees ex post efficiency, so contracts need only guarantee ex ante investment incentives. As a result, a worker and her existing employer always negotiate a non-compete that maximizes their joint payoff, although it could not maximize total surplus because, as in Burguet et al (2002), it might be used to extract surplus from a later employer.

The legal literature on non-competes is too extensive to review in detail here. Two of the most prominent papers are those by Gilson (1999) who argues that differences in the legal treatment of non-competes can explain the evolution of the high-technology industry along Route 128 in Massachusetts and in Silicon Valley. Lobel (2013) also argues that non-competes impede innovation.

The next section describes the model. Section three discusses the optimal contracting problem when there is no legal constraints on the length of the non-compete, both in the case in which the worker's liquidity constraint is binding and when it is not. Section four discuss what happens when the there is a legally binding maximum on the length of the non-compete. This section contains the main result of the paper. Section five concludes. All proofs not in the text are in the Appendix.

2 Model

In period -1, a firm hires a worker, offers her a wage, w_1 and w_2, for periods 1 and 2, respectively. Because of liquidity constraints, $w_1 \geq \underline{w_1}$. The contract also includes a non-compete clause of length $\delta \in [0, 1]$ ($\delta = 0$ means no non-compete, $\delta = 1$ means the non-compete lasts forever). In period 0, the firm chooses how much, i, to invest in its worker. An investment of i means that in period 1, the worker produces a product for the firm of value $\pi_m + g(i)$; $g' > 0$, $g'' < 0$.

In this period, the worker also gets an idea for a new project. The new project will allow the worker to enter the market as a new firm and earn profits of $\pi_e + g_e(i)$. π_e is a random variable with a cumulative distribution function F and associated density function f with support $[\underline{\pi_e}, \overline{\pi_e}]$. I assume $\underline{\pi_e} \geq 0$ since the worker can always quit and do nothing. I assume $f' \leq 0$, smaller profit realizations are more likely than larger ones. g_e is deterministic with $g_e' > 0$, $g_e'' < 0$. The worker observes the realized value of π_e at the end of period 1, but the firm does not.

At this time, the worker dedices whether or not to use her new project to start a new firm. If she does, then the firm hires a new worker at a wage w_n. For simplicity, I will ignore the training process for the new worker (one can think of it as subsumed into the wage cost) and assume that this new worker produces a product that can earn profits of π_n as a monopoly and $\pi_d(\pi_e + g_e(i))$ as a duopoly in period 2; $\pi_d' \in [0, 1]$, the firm's duopoly profit is decreasing in the profit of worker's new firm, but total profits increase the more profitable the new firm is. $\pi_m \geq \pi_n \geq \pi_d(0)$. In the first part of analysis, I allow for product market competition. When considering legal maximums on the non-compete, I restrict the analysis to the case where there is no product market competion: $\pi_d' = 0$ and $\pi_n = \pi_d(.)$.

In period 2, the active firms produce and sell their products. Because of the non-compete clause, the new firm's payoffs are discounted by $(1-\delta)$; δ represents the portion of the second period in which the non-compete is operative. If the new firm is active, the old firm's payoff is a weighted average of its monopoly payoff and duopoly payoff where the weight on the monopoly payoff is δ.

The weight on period 2 projects relative to period 1 is given by γ. γ reflects the combined effects of discounting and differential period length, so it could be greater or smaller than unity. (Note, I will assume w_2 and all period 2 profits are measured per unit of period 1 time, so the worker receives γw_2 if she continues to work for the firm in period 2.)

I do not allow the firm to bargain with the worker at the end of period 1 to pay her to stay. Since the firm has no new information at this point, w_2 can be thought of as equivalent to a screening offer made at the end of period 1. I also do not allow renegotiation over the length of the non-compete. If the worker is liquidity constrained, she will not have cash at the end of period 1 to pay the firm to reduce the length of the non-compete. If the worker did make such a payment, this would be equivalent to a contract with a lower first period wage and a higher second period wage, which is only feasible if the worker's liquidity constraint is not binding.

Given w_2 and δ, the worker will leave if and only if $(1-\delta)(\pi_e + g_e(i)) \geq w_2$. That is, the worker leaves if and only if $\pi_e \geq \frac{w_2}{1-\delta} - g_e(i)$. Thus, the worker's expected payoff from taking the job with the firm is:

$$U = w_1 + \gamma\{F(\frac{w_2}{1-\delta} - g_e(i^E))w_2 + (1-\delta)\int_{\frac{w_2}{1-\delta}-g_e(i^E)}^{\overline{\pi_e}} (\pi_e + g_e(i^E))f(\pi_e)d\pi_e\} \quad (1)$$

Because the worker's participation constraint must be met in period -1, before the worker knows the actual level of investment, (1) uses the expected level of investment, i^E, instead of the actual level of investment, i.

The firm's expected payoff when the worker accepts a contract of $\{w_1, w_2, \delta\}$ and the firm invests i in the worker is:

$$\pi_m + g(i) - i - w_1 + \gamma\{F(\frac{w_2}{1-\delta} - g_e(i))(\pi_m + g(i) - w_2) + \quad (2)$$
$$\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}} [\delta(\pi_n - w_n) + (1-\delta)(\pi_d(\pi_e + g_e(i)) - w_n)]f(\pi_e)d\pi_e\}$$

If the worker's participation constraint is binding at $U = \bar{U}$, then the firm's profit can be written as:

$$\pi_m + g(i) - i - \bar{U} + \gamma\{F(\frac{w_2}{1-\delta} - g_e(i))(\pi_m + g(i)) + \tag{3}$$
$$\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}} [\delta(\pi_n - w_n) + (1-\delta)(\pi_d(\pi_e + g_e(i)) - w_n)]f(\pi_e)d\pi_e + \int_{\frac{w_2}{1-\delta}-g_e(i^E)}^{\overline{\pi_e}} (1-\delta)(\pi_e + g_e(i^E))]f(\pi_e)d\pi_e\}$$

Notice that this expression explicitly distinguishes between the terms that directly reflect the incumbent's profit, which depend on i, the actual level of investment, and those that affect the incumbent's profit through the participation constraint, which depend on i^E, the expected level of investment given the contract terms. It is also important to notice that when the participation constraint is binding, the firm is effectively maximizing joint surplus because raising the worker's payoff allows the firm to lower the worker's wages.

First, let's examine the firm's optimal choice of i. To do so, we differentiate (2) with respect to i to obtain the following first order condition:

$$[1 + \gamma F(\frac{w_2}{1-\delta} - g_e(i))]g'(i) + \gamma\{\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}} [(1-\delta)\pi'_d(\pi_e + g_e(i))g'_e(i)]f(\pi_e)d\pi_e +$$
$$\tag{4}$$
$$g'_e(i)[\delta(\pi_n - w_n) + (1-\delta)(\pi_d(\frac{w_2}{1-\delta}) - w_n) - (\pi_m + g(i) - w_2)]f(\frac{w_2}{1-\delta} - g_e(i))\} = 1$$

The left hand side of (4) represents the firm's marginal benefit from investing in the worker. The first term is the added profit the firm receives from the worker being more productive when she is with the firm. The second term represents the reduction on the firm's profit that comes from the worker's firm being a better competitor when the worker leaves to start her own firm. The third line represents how additional investment causes the worker to leave more and how that affects (reduces) firm profits. This first order condition makes clear that the firm will systematically invest too little in the worker, from the point of maximizing joint surplus.

3 No legal constraints on the length of the non-compete

We first analyze what happens when there are no legal constraints on δ, the length of the non-compete clause in the contract. In this situation, the worker's participation constraint is always binding. To see that, imagine that it is not. Then the firm could set $\delta = 1$ to ensure that the worker never leaves and set $w_2$very low. As long as $\underline{w_1}<\bar{U}$, the particpation constraint would have to bind at this optimum.

If $\underline{w_1}$ is sufficiently small, the firm can optimize over both w_2 and δ and then set w_1 to meet the participation constraint. On the other hand, if $\underline{w_1}$ is larger, so that the constraint $w_1 \geq \underline{w_1}$ binds, then w_2 must be set to satisfy the participation constraint and the firm can only optimize over δ. I will consider each case in turn.

3.1 $\underline{w_1}$ not binding

The firm can choose both w_2 and δ to maximize (3). Both w_2 and δ affect the firm's optimal choice of i, how much it invests in the worker. The direct effect of this on the firm's profit can be ignored because of the envelope theorem. But, because when the firm chooses i in period 0, it cannot directly influence the worker's decision of whether to accept the contract in period -1, the firm will not consider the effect of i on the worker's expected payoff when choosing i. As a result, the optimal choice of w_2 and δ must take into account how they affect i^E, the worker's expectations of the i the firm will choose in period 0.

The first order condition for w_2 is:

$$\frac{\gamma}{1-\delta} f(\frac{w_2}{1-\delta} - g_e(i))\{\pi_m + g(i) - [w_2 + \delta\pi_n + (1-\delta)\pi_d(\frac{w_2}{1-\delta}) - w_n]\} + \tag{5}$$
$$\gamma\{(1-\delta)[1 - F(\frac{w_2}{1-\delta} - g_e(i))] + w_2 f(\frac{w_2}{1-\delta} - g_e(i))\}\frac{di}{dw_2} g_e'(i) = 0$$

The term in curly braces on the first line is the difference in combined profits when the worker stays with the firm and when she leaves at the point where the worker is just indifferent to leaving. When she stays, the firm earns monopoly profits with the existing worker. When she leaves, the firm earns its monopoly profits with the new worker during the non-compete period. After the non-compete expires, the firm earns duopoly profits given that the firm's per-period profits are $\frac{w_2}{1-\delta}$. The worker's entrant firm earns $\frac{w_2}{1-\delta}$ per period profits for the $1-\delta$ remaining in the period, for a net profit of w_2.

The second line is the effect of the second period wage on the entrant's profits via increased investment due to the greater probability that the worker stays with the firm. The worker obtains these increased profits after the expiration of the non-compete if she decides to leave. The increased profit from leaving also induces the worker to leave more, which allows her to earn w_2 in profits when she does (rather than from direct payment from the firm). The first lemma establishes what this means for the effect of the worker's decision to leave on ex post profits.

Lemma 1 *If the worker's liquidity constraint is not binding, then* $\pi_m + g(i) - [w_2 + \delta\pi_n + (1-\delta)\pi_d(\frac{w_2}{1-\delta}) - w_n] < 0$ *or* $w_2 = (1-\delta)(\overline{\pi_e} + g_e(i))$. *Combined profits strictly increase at the value of* π_e *for which the worker just leaves or the worker never leaves.*

Proof. See Appendix. ■

This lemma says that in the optimal, unconstrained contract, the worker stays with the firm too much from the perspective of maximizing ex post profits. This occurs because the firm sets second period wages a little too high to balance the benefits of greater investment with the cost of the worker staying a little too much.

The first order condition for δ is:

$$\frac{\pi_m + g(i) - [w_2 + \delta\pi_n + (1-\delta)\pi_d(\frac{w_2}{1-\delta}) - w_n]}{(1-\delta)^2} w_2 f(\frac{w_2}{1-\delta} - g_e(i)) +$$
$$\int_{\frac{w_2}{1-\delta} - g_e(i)}^{\overline{\pi_e}} [\pi_n - \pi_d(\pi_e + g_e(i)) - (\pi_e + g_e(i)))] f(\pi_e) d\pi_e + \tag{6}$$
$$\{(1-\delta)[1 - F(\frac{w_2}{1-\delta} - g_e(i))] + w_2 f(\frac{w_2}{1-\delta} - g_e(i))\} \frac{di}{d\delta} g_e'(i) = 0$$

The first line is the effect of increasing delta on reducing the probability that the worker leaves times the combined profit when she does leave. The second line is the combined profit gain (or loss) per period from having the non-compete in place compared to no non-compete (this is always negative if there is no product market competition, but it could be positive if that competition is intense). The third line is the effect of the non-compete on the entrant's profits via increased investment from a longer non-compete (which benefit the firm through relaxing the participation constraint). The worker obtains these increased profits after the expiration of the non-compete if she decides to leave. The increased profit from leaving also induces the worker to leave more, which allows her to earn w_2 in profits when she does (rather than from direct payment from the firm).

One can use (5) to simplify this condition to:

$$\int_{\frac{w_2}{1-\delta} - g_e(i)}^{\overline{\pi_e}} [\pi_n - \pi_d(\pi_e + g_e(i)) - (\pi_e + g_e(i)))] f(\pi_e) d\pi_e +$$
$$\{(1-\delta)[1 - F(\frac{w_2}{1-\delta} - g_e(i))] + w_2 f(\frac{w_2}{1-\delta} - g_e(i))\}(\frac{di}{d\delta} - \frac{di}{dw_2}\frac{w_2}{(1-\delta)}) g_e'(i) \tag{7}$$

The following lemma establishes that, under fairly plausible conditions, the optimal contract when the worker's liquidity constraint is not binding does not contain a non-compete.

Lemma 2 *If worker's liquidity constraint is not binding, then, if* $\pi_m + g(i) - (\pi_n - w_n) > (1-\delta)[\pi_d(\frac{w_2}{1-\delta}) - \pi_d(\overline{\pi_e} + g_e(i))]$, *the optimal* $\delta = 0$ *.*

Proof. See Appendix. ■

This lemma says that one should rarely expect to see a non-compete agreement unless there worker is subject to liquidity constraints. That is, while the liquidity constraint conditions in the next section might seem strong, if we do see non-competes, we should expect them to hold. So, it is very important to analyze the effect of non-competes when there are binding liquidity constraints.

The intuitioin behind the lemma is that it is almost always the case that, in the absence of liquidity constraints, it is more profitable for the firm to commit to invest more in the worker through a higher second period wage than through a longer non-compete. Both induce greater investment through increasing the probability that the worker stays with the firm in the second period. Increased investment, though, also increases the probability that the worker will leave by making her outside venture more profitable. This limits the firm's incentive to invest in the worker. This limiting effect, however, is smaller when the second period wage is larger because now the firm does not lose as much when the worker leaves. This makes increasing the second period wage more effective at inducing investment.

On the other hand, when the worker's new firm will compete with the existing firm, then using a non-compete to induce investment has the added benefit of reducing the extent of that competition. If there is no product market competition, of course, then this effect does not exist. Notice that the condition in the lemma always holds in this case since duopoly profits will not depend on the entrant's profitability. Similarly, however, if product market competiton is very intense, the right hand side will be very small because $\pi_d(\frac{w_2}{1-\delta})$ must be close to zero given that Lemma 1 implies that the worker's new project must be superior to the existing firm's at the point at which the worker leaves.

3.2 $\underline{w_1}$ binding

The last section assumed that the worker could accept a low enough first period wage to allow w_2 to be set as high as was optimal. If the worker is liquidity constrained, however, the worker may need to have a higher first period wage. We capture that by assuming there is a minimum first period wage the worker must receive. In this section, we assume that this constraint is binding, so that the firm must then set w_2 to meet the worker's participation constraint. That is, w_2 is implicitly determined by:

$$U = \underline{w_1} + \gamma\{F(\frac{w_2}{1-\delta} - g_e(i^E))w_2 + (1-\delta)\int_{\frac{w_2}{1-\delta}-g_e(i^E)}^{\overline{\pi_e}} (\pi_e + g_e(i^E))f(\pi_e)d\pi_e\} \quad (8)$$

This means that the firm only optimizes over δ in period -1. In so doing, it recognizes (8) implies that:

$$\frac{dw_2}{d\delta} = \frac{\int_{\frac{w_2}{1-\delta}-g_e(i^E)}^{\overline{\pi_e}} (\pi_e + g_e(i^E) - (1-\delta)\frac{di^E}{d\delta} g_e'(i^E)) f(\pi_e) d\pi_e}{F(\frac{w_2}{1-\delta} - g_e(i^E))} \tag{9}$$

Notice that while this could be non-positive for some values of δ, it cannot be non-positive at the optimum. If it were, that would mean that the firm could lengthen the non-compete without reducing its wage payments, which would strictly increase its expected profits.

The firm's first order condition for δ in this case is:

$$\frac{\pi_m + g(i) - [w_2 + \delta\pi_n + (1-\delta)\pi_d(\frac{w_2}{1-\delta}) - w_n]}{(1-\delta)^2}(w_2 + (1-\delta)\frac{dw_2}{d\delta}) f(\frac{w_2}{1-\delta} - g_e(i)) +$$

$$\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}} [\pi_n - \pi_d(\pi_e + g_e(i)) - (\pi_e + g_e(i)))] f(\pi_e) d\pi_e + \tag{10}$$

$$\{(1-\delta)[1 - F(\frac{w_2}{1-\delta} - g_e(i))] + w_2 f(\frac{w_2}{1-\delta} - g_e(i))\}(\frac{di}{d\delta} + \frac{di}{dw_2}\frac{dw_2}{d\delta}) g_e'(i) = 0$$

This leads us to the following result.

Lemma 3 *If $w_1 \geq \underline{w_1}$ is a binding constraint, then, if there is a non-compete, at the optimal non-compete, joint profits are greater after the non-compete expires than while it is in effect.*

Proof. See Appendix. ■

This result says that, assuming there is a non-compete, it is ex post inefficient: joint profits would be greater with competition from the entrant than without. Notice, this holds no matter how intense the competition, meaning that if the competition is very intense, the worker must only leave when her product will be substantially superior to that of the existing firm.

The lemma does not, however, establish that there necessarily will be a non-compete. The next lemma does that provided the worker's liquidity constraint is constraining enough for the case of no product market competition.

Lemma 4 *Consider the case in* $\pi_n = \pi_d(.)$ *(A)If* $U - \underline{w_1}$ *is sufficiently small, then for any* $\delta < 1$, *the profit-maximizing* w_2 *is such that the worker's participation constraint is not binding. (B)If* $f'' \leq 0$, *the maximum value of* $U - \underline{w_1}$ *for this to be the case is decreasing in* δ *if* $U - \underline{w_1}$ *small enough that* $\pi_m + g(i) - (3/2)w_2 - (\pi_n - w_n) \geq 0$.

Proof. See Appendix. ■

This lemma says that when the worker's liquidity constraint severe enough, then the firm will not want to choose w_2 to satisfy the participation constraint if it has anything less than a complete non-compete. The reason is that it would be worth it to the firm to pay a little more to get the worker to stay with the firm in a few more states of the world. But, we know that if the firm can choose a complete non-compete, then this concern does not exist, so the firm will always want to meet the participation constraint at equality. This means that the optimal non-compete cannot be zero in these instances. That is, while we should not expect to see non-compete's when the worker is not sufficiently liquidity constrained, we should if she is.

4 Legal maximum on non-compete

Having shown that examining non-compete clauses is most relevant if the worker is sufficiently liquidity constrained, we know examine the effects of legal restrictions on non-competes. If there are no constraints on the length of the non-compete, we know the participation constraint is binding. But, Lemma 4 shows this is not the case if the firm cannot use as long a non-compete as possible. It tells us that if worker's minimum first period wage is close enough to its overall reservation utility, then the firm will choose a second period wage that will give the worker a strictly greater payoff than its reservation utility if there is a legal maximum on the length of the non-compete. This suggests that it is possible that the legal maximum on the length of a non-compete could raise welfare in this instance because, even though it must necessarily hurt the firm, it can raise the worker's overall payoff.

Now we compare welfare when there is a legal maximum versus when there is not under the case of no product market competition ($\pi_n = \pi_d(.)$). The socially optimal w_2 is given by the same first order condition as when the constraint on first period wages is not binding:

$$\frac{\gamma}{1-\delta} f(-g_e(i))\{\pi_m + g(i) - [w_2 + \pi_n - w_n]\}+ \tag{11}$$
$$\gamma\{(1-\delta)[1 - F(\frac{w_2}{1-\delta} - g_e(i))] + w_2 f(\frac{w_2}{1-\delta} - g_e(i))\}\frac{di}{dw_2} g_e'(i) = 0$$

The first order condition for w_2 for the firm when the participation constraint is not binding is:

$$\gamma\{\frac{1}{1-\delta}f(\frac{w_2}{1-\delta}-g_e(i))[\pi_m+g(i)-(w_2+\pi_n-w_n)]-F(\frac{w_2}{1-\delta}-g_e(i))\} \quad (12)$$

Comparing these two it is clear that the firm will choose w_2 below the socially optimal level for any given δ if the participation constraint is not binding. But, this level of w_2 must be strictly greater than the w_2 when the participation constraint is binding (for any given δ). This leads us to the main result of the paper.

Proposition 5 *Consider the case in $\pi_n = \pi_d(.)$. If $U - \underline{w_1}$ is sufficiently small, then joint profits are strictly larger for some binding legal maximum for δ than if δ is unconstrained.*

Proof. See Appendix. ■

This proposition says that if worker's have sufficiently strong liquidity constraints such that their pay cannot be backloaded too much, then legal restrictions on non-compete agreements can increase the joint payoffs of the firm and worker. The reason is that restricting the non-compete forces the firm to use the second period wage rather than a long non-compete to manage the worker's incentive to leave the firm. This then makes the participation constraint non-binding, so the restrictions on the non-compete help the worker and hurt the firm. Using the non-compete is inefficient because it prevents the worker from operating her new firm in states when she is leaving no matter what. Thus, joint surplus can actually increase when the firm must use the second period wage to manage this tradeoff in addition to the non-compete even though, in so doing, it no longer manages this tradeoff to maximize joint surplus.

This result shows that even in cases where there are no externalities on third parties, some legal restrictions on the length of non-compete clauses can be optimal. As is clear from the proof, it is not likely to be optimal to only marginally reduce the length of the unrestrained non-compete clause. In that case, the firm is not likely to deviate from the participation constraint. It will simply reduce wages to get back on this constraint. If so, then joint profits necessarily fall. What is necessary is a drastic enough reduction in the allowable non-compete to induce the firm to leave the participation constraint.

5 Conclusion

This paper shows two main things. First, it shows that the relevant case for anlayzing non-compete clauses is when worker's are liquidity constrained. If they are not liquidity constrained, then it is unlikely that a non-compete clause will be part of the optimal contract between the worker and the firm. Even if the worker's competing firm would compete very intensely with the existing firm, that firm will prefer to manage the worker's leaving decision through its second period wage. It is only when it cannot do this without paying the worker more than necessary because the worker's first period wage cannot be reduced far enough that we should expect to see a non-compete clause.

Second, it shows that when this is the case, the worker is sufficiently liquidity constrained, legal restrictions on the non-compete clause can raise the joint profits of the worker and the firm. It is important to note, however, that this does not suggest that a complete ban on non-compete's is necessarily optimal. Even under conditions in which legal restrictions on the non-compete are optimal, the optimal restriction is not necessarily down to zero. There are two factors that tend to support non-zero non-competes. When the firm is choosing its second period wage without considering the participation constraint, it sets it below the level that induces the efficient leaving decision and the efficient level of investment because of the private cost of paying more when the worker stays. Thus, a non-zero non-compete will both make the firm's investment choice closer to optimal and the worker's leaving decision closer to optimal. On the other hand, the cost of the non-compete, the inefficient delay in the new firm's entry, remains. Moreover, the marginal cost of this inefficiency does not go to zero as the non-compete goes to zero. So, it is conceivable that the optimal non-compete could be zero. It is just important to point out that it isn't necessarily zero.

Lastly, recall that the proposition holds in the case in which the worker's new firm does not affect the profits of the existing firm. If, instead, one allows for competition between the firms, then there are additional arguments for legal restrictions on non-competes. In such cases, one can easily imagine that there are non-competes that increase joint payoffs but lower social welfare because restricting competiton has a negative externality on consumers. In addition to this standard argument, however, is a counter-veiling consideration. Competition between the existing and new firms reduces the firm's incentive to invest in the worker because that investment will actually lower the firm's profit if the worker leaves. This further reduces the firm's incentive to invest below the socially optimal level. A non-compete will reduce this distortion somewhat. While it seems unlikely that this investment effect will override the direct loss of consumer surplus from reduced competition, it is possible that in special cases (such as when demand is extremely inelastic, so there is very little deadweight loss from monopoly) it could be the case. On the whole, however, my strong conjecture is that the arguments for legal restrictions on non-competes are stronger the more competitive the worker's firm will be with the existing firm.

6 Appendix

Proof. Of Lemma 1. Recall that the first order condition for w_2 is:

$$\frac{\gamma}{1-\delta} f(\frac{w_2}{1-\delta} - g_e(i))\{\pi_m + g(i) - [w_2 + \delta\pi_n + (1-\delta)\pi_d(\frac{w_2}{1-\delta}) - w_n]\} + \tag{13}$$
$$\gamma\{(1-\delta)[1 - F(\frac{w_2}{1-\delta} - g_e(i))] + w_2 f(\frac{w_2}{1-\delta} - g_e(i))\}\frac{di}{dw_2} g'_e(i) = 0$$

If $\frac{di}{dw_2}$ is positive, then this implies that $\pi_m + g(i) - [w_2 + \delta\pi_n + (1-\delta)\pi_d(\frac{w_2}{1-\delta}) - w_n] < 0$. $\frac{di}{dw_2} > 0$ if and only if the derivative of the firm's first order condition for i (the left hand side of (4), with respect to w_2 is positive. This derivative is:

$$\frac{\gamma}{1-\delta}\{f(\frac{w_2}{1-\delta}-g_e(i))[g'(i)+(1-\delta)g_e'(i)]- \tag{14}$$

$$g_e'(i)[\pi_m+g(i)-(w_2+\delta\pi_n+(1-\delta)\pi_d(\frac{w_2}{1-\delta})-w_n)]f'(\frac{w_2}{1-\delta}-g_e(i))\}$$

Since $f'<0$, this implies that if $\pi_m+g(i)-(w_2+\delta\pi_n+(1-\delta)\pi_d(\frac{w_2}{1-\delta})-w_n)>0$, then $\frac{di}{dw_2}>0$, which we noted above implies that $\pi_m+g(i)-(w_2+\delta\pi_n+(1-\delta)\pi_d(\frac{w_2}{1-\delta})-w_n)<0$, a contradiction. So, $\pi_m+g(i)-(w_2+\delta\pi_n+(1-\delta)\pi_d(\frac{w_2}{1-\delta})-w_n)<0$. Q.E.D. ■

Proof. Of Lemma 2. Lemma 1 says that either $\pi_m+g(i)-[w_2+\delta\pi_n+(1-\delta)\pi_d(\frac{w_2}{1-\delta})-w_n]<0$ or the worker nevere leaves. If the worker never leaves, then the first line of (7) is zero. Otherwise, it can only be positive if $\pi_n-\pi_d(\frac{w_2}{1-\delta})-\frac{w_2}{1-\delta}>0$. This implies that $(1-\delta)\pi_n-(1-\delta)\pi_d(\frac{w_2}{1-\delta})>w_2$. Then $\pi_m+g(i)-[w_2+\delta\pi_n+(1-\delta)\pi_d(\frac{w_2}{1-\delta})-w_n]>\pi_m+g(i)-[\pi_n-w_n]>0$. So, I have proved the first line of is non-positive.

Now, I show that the second line is negative by proving that $\frac{di}{d\delta}-\frac{di}{dw_2}\frac{w_2}{(1-\delta)}>0$. To do so, it is suffiicient to show one obtains a negative expression when subtracting the derivative of the firm's first order condition for i (the left hand side of (4), with respect to w_2 times $\frac{w_2}{(1-\delta)}$ from the deriviative of this first order condition with respect to δ. This expression is:

$$-\gamma\{\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}}\pi_d'(\pi_e+g_e(i))g_e'(i)f(\pi_e)d\pi_e+(\frac{w_2}{1-\delta}+\pi_d(\frac{w_2}{1-\delta})-\pi_n)g_e'(i)f(\frac{w_2}{1-\delta}-g_e(i))\} \tag{15}$$

Using (4) to substitute in for integral term, this becomes:

$$\frac{-(1-g'(i))-\gamma(\pi_m+g(i)-\pi_n+w_n)g_e'(i)f(\frac{w_2}{1-\delta}-g_e(i))\}}{1-\delta} \tag{16}$$

Now rewrite (4) as follows:

$$\gamma\{\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}}[(1-\delta)\pi_d'(\pi_e+g_e(i))g_e'(i)]f(\pi_e)d\pi_e+ \tag{17}$$

$$g_e'(i)[w_2+\delta\pi_n+(1-\delta)\pi_d(\frac{w_2}{1-\delta})-(\pi_m+g(i)+w_n)]f(\frac{w_2}{1-\delta}-g_e(i))+F(\frac{w_2}{1-\delta}-g_e(i))g'(i)\}=1-g'(i)$$

Using the left hand side for $1-g'(i)$ in (16) makes it:

$$-\gamma\{g_e'(i)\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}}\pi_d'(\pi_e+g_e(i))f(\pi_e)d\pi_e+$$
$$\frac{F(\frac{w_2}{1-\delta}-g_e(i))g'(i)+(w_2-(1-\delta)(\pi_n-\pi_d(\frac{w_2}{1-\delta}))g_e'(i)f(\frac{w_2}{1-\delta}-g_e(i))\}}{1-\delta}\}$$

Because $f'<0$ and $\pi_d'<0$, $\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}}\pi_d'(\pi_e+g_e(i))f(\pi_e)d\pi_e > f(\frac{w_2}{1-\delta}-g_e(i))[\pi_d(\overline{\pi_e}+g_e(i))-\pi_d(\frac{w_2}{1-\delta})]$. This means the entire expression is smaller than:

$$-\gamma\{\frac{F(\frac{w_2}{1-\delta}-g_e(i))g'(i)+(w_2-(1-\delta)(\pi_n-\pi_d(\overline{\pi_e}+g_e(i)))g_e'(i)f(\frac{w_2}{1-\delta}-g_e(i))\}}{1-\delta}\}$$

The first term in the numerator is positive and, because $\pi_m+g(i)-[w_2+\delta\pi_n+(1-\delta)\pi_d(\frac{w_2}{1-\delta})-w_n]<0$, the second term is positive if $\pi_m+g(i)-(\pi_n-w_n)>(1-\delta)[\pi_d(\frac{w_2}{1-\delta})-\pi_d(\overline{\pi_e}+g_e(i))]$. Q.E.D. ■

Proof. Of Lemma 3. The lemma says that $\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}}[\pi_n-\pi_d(\pi_e+g_e(i))-$

$(\pi_e + g_e(i)))]f(\pi_e)d\pi_e < 0$. This is always true if $\pi_d(\frac{w_2}{1-\delta}) + \frac{w_2}{1-\delta} \geq \pi_n$. If $\pi_d(\frac{w_2}{1-\delta})+\frac{w_2}{1-\delta} < \pi_n$, then we have: $\pi_m+g(i)-[w_2+\delta\pi_n+(1-\delta)\pi_d(\frac{w_2}{1-\delta})-w_n] > \pi_m + g(i) - [\pi_n - w_n] > 0$. If $\pi_m + g(i) - [w_2 + \delta\pi_n + (1-\delta)\pi_d(\frac{w_2}{1-\delta}) - w_n] > 0$, then since the third line of (10) is positive, $\int_{\frac{w_2}{1-\delta}-g_e(i)}^{\overline{\pi_e}}[\pi_n - \pi_d(\pi_e + g_e(i)) - (\pi_e + g_e(i)))]f(\pi_e)d\pi_e < 0$. Q.E.D. ■

Proof. Of 4. (A) Differentiate the firm's profit function without the participation constraint with respect to w_2 assuming $w_1 = \underline{w_1}$:

$$\gamma\{\frac{1}{1-\delta}f(\frac{w_2}{1-\delta} - g_e(i))[\pi_m + g(i) - w_2 - (\pi_n - w_n)] - F(\frac{w_2}{1-\delta} - g_e(i))\} \quad (18)$$

If $U - \underline{w_1} = \gamma(1-\delta)\int_{\underline{\pi_e}}^{\overline{\pi_e}}(\pi_e + g_e(i^E))f(\pi_e)d\pi_e$, then $w_2 = 0$ satisfies the participation constraint at equality. At $w_2 = 0$, (18) is:

$$\gamma\{\frac{1}{1-\delta}f(\underline{\pi_e})[\pi_m + g(i) - (\pi_n - w_n)]\} > 0 \quad (19)$$

This is positive since the firm has higher gross profits with the existing worker than with the new worker. Thus, for $U - \underline{w_1}$ small enough, the firm's profits are increasing in w_2 at the level of w_2 that satisfies the participation constraint.

(B) First, we show that (18) is decreasing in w_2 if $U - \underline{w_1}$ is small enough that the participation constraint is not binding by taking the derivative of (18) with respect to w_2:

$$\frac{-\gamma}{(1-\delta)^2}\{2(1-\delta)f(\frac{w_2}{1-\delta} - g_e(i)) - [\pi_m + g(i) - w_2 - (\pi_n - w_n)]f'(\frac{w_2}{1-\delta} - g_e(i))\} < 0$$

This is negative because $f' \leq 0$ and $\pi_m + g(i) - w_2 - (\pi_n - w_n) > 0$ whenever $U - \underline{w_1}$ is small enough that the participation constraint is not binding. This means that (18) is easier to be positive at lower w_2. Notice that larger δ means a larger w_2 to meet the participation constriant, which would tend to make it harder make (18) positive. This is the indirect effect of δ. To capture the direct effect, we differentiate (18) with respect to δ. Because we are only interested in how δ affects the value of w_2 for which (18) is zero, we can determine this by differentiating (18) times $\frac{1-\delta}{\gamma}$,. This expression has the sign of:

$$(1-\delta)^2 F(\frac{w_2}{1-\delta} - g_e(i)) + w_2\{-(1-\delta) f(\frac{w_2}{1-\delta} - g_e(i)) + [\pi_m + g(i) - w_2 - (\pi_n - w_n)] f'(\frac{w_2}{1-\delta} - g_e(i))\}$$

If we do a Taylor's series approximation of $F(\frac{w_2}{1-\delta} - g_e(i))$ around $w_2 = 0$ and then do that again for the $f(-g_e(i))$ around $\frac{w_2}{1-\delta} - g_e(i)$, $f'' \leq 0$ implies that this is less than $w_2[\pi_m + g(i) - (3/2)w_2 - (\pi_n - w_n)] f'(-g_e(i))$, which non-positive if $\pi_m + g(i) - (3/2)w_2 - (\pi_n - w_n) \geq 0$. Q.E.D. ∎

Proof. Of Proposition. Consider (δ^f, w_2^f) that firm optimal values of δ and w_2 that lie on the participation constraint. Let $(\hat{\delta}, \hat{w}_2)$ be implicitly defined by setting (18) equal to zero and:

$$\frac{\pi_m + g(i) - [w_2 + \pi_n - w_n]}{(1-\delta)^2} w_2 f(\frac{w_2}{1-\delta} - g_e(i)) - \int_{\frac{w_2}{1-\delta} - g_e(i)}^{\overline{\pi_e}} (\pi_e + g_e(i))) f(\pi_e) d\pi_e +$$

$$\{(1-\delta)[1 - F(\frac{w_2}{1-\delta} - g_e(i))] + w_2 f(\frac{w_2}{1-\delta} - g_e(i))\} \frac{di}{d\delta} g_e'(i) = 0 \tag{20}$$

Note that this is just (6) with $\pi_n = \pi_d(.)$.

Since w_2^f satisfies the participation constraint at equality, for $U - \underline{w_1} = 0$, we know that $\delta^f = 1$ and $w_2^f = 0$. As $U - \underline{w_1}$ increases, w_2^f must weakly increase. This implies that either $w_2^f < \hat{w}_2$ for all $\underline{w_1}$, or there exists a $\underline{\hat{w}_1}$ such that $\hat{w}_2 = w_2^f$. But, from (5) the w_2 that maximizes joint profits given δ is:

$$\frac{\gamma}{1-\delta} f(-g_e(i))\{\pi_m + g(i) - [w_2 + \pi_n - w_n]\} + \tag{21}$$
$$\gamma\{(1-\delta)[1 - F(\frac{w_2}{1-\delta} - g_e(i))] + w_2 f(\frac{w_2}{1-\delta} - g_e(i))\}\frac{di}{dw_2} g_e'(i) = 0$$

Comparing the left hand side of this to (18) reveals that the marginal effect on joint profits of w_2 is strictly greater than the marginal effect of w_2 in (18). So, if $U - \underline{w_1}$ is large enough, then the firm will choose w_2^f that satisfies (5) which implies that $w_2^f > \hat{w}_2$. Thus, there must be a $U - \underline{w_1}$ such that $\hat{w}_2 = w_2^f$. Let this occur at $\underline{\hat{w}_1}$.

If $\hat{w}_2 = w_2^f$, then joint profits must be weakly greater with $(\hat{\delta}, \hat{w}_2)$ than $(\delta^f, w_2^f) = (\delta^f, \hat{w}_2)$ since $\hat{\delta}$ is chosen to maximize joint profits given $\hat{w}_2$. If $U - \underline{w_1}$ is small enough, $\hat{\delta} < \delta^f$ since the participation constraint is not binding at $(\hat{\delta}, \hat{w}_2)$ by Lemma **??**, so we know joint profits are strictly larger at $(\hat{\delta}, \hat{w}_2)$. For any $\underline{w_1} > \underline{\hat{w}_1}$, joint profits are strictly lower under (δ^f, w_2^f) since the firm is still choosing (δ, w_2) to maximize joint profits subject to the binding participation constraint, but the constraint is stricter. Since $(\hat{\delta}, \hat{w}_2)$ is still feasible, joint profits are strictly higher under $(\hat{\delta}, \hat{w}_2)$ than (δ^f, w_2^f) for any $\underline{w_1} \geq \underline{\hat{w}_1}$. Q.E.D.

■

References

[1] Aghion, Phillipe and Patrick Bolton. 1987. "Contracts as a Barrier to Entry," 77 American Economic Review 388-401.

[2] Burguet, Roberto, Ramon Caminal and Carmen Matutes. 2002. "Golden Cages for Showy Birds: Optimal Switching Costs in Labor Contracts," 46 European Economic Review 1153–85.

[3] Cooper, David P. 2001. "Innovation and Reciprocal Externalities: Information Transmission via Job Mobility," 45 Journal of Economic Behavior and Organization 403–425.

[4] Fosfuri, A. and T. Ronde. 2004. "High-tech Clusters, Technology Spillovers, and Trade Secret Laws," 22 International Journal of Industrial Organization 45–65.

[5] Franco, April M. and Matthew F. Mitchell. 2008. "Covenants not to Compete, Labor Mobility and Industry Dynamics," 17 Journal of Economics and Mangement Strategy 581-606.

[6] Gilson, Ron. 1999. "The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley,Route 128, and Covenants not to Compete," 74 New York University Law Review 575–629.

[7] Greenhouse, Stephen. 2014. "Noncompete Clauses Increasingly pop up in an Array of Jobs," New York Times, June 8, available

at: http://www.nytimes.com/2014/06/09/business/noncompete-clauses-increasingly-pop-up-in-array-of-jobs.html

[8] Krakel, Matthias and Dirk Sliwka. 2009 “Should You Allow Your Agent to Become Your Competitor? On Non-compete Agreement in Employment Contracts,” 50 International Economic Review 117–41.

[9] Lobel, Orly. 2013. Talent Wants to be Free. Yale University Press, New Haven, CT.

[10] Mukherjee, Arijit and Luıs Vasconcelos. 2012. "Star Wars: Exclusive Talent and Collusive Outcomes in Labor Markets," 28 Journal of Law, Economics, and Organization 754-782.

[11] Pakes, Ariel and S. Nitzan. 1984. “Optimal Contracts for Research Personnel, Research Employment and Establishment of ‘Rival’ Enterprises,” 1 Journal of Labor Economics 345–365.

[12] Posner, Eric, George G. Triantis and Alexander J. Triantis. 2004. “Investing in Human Capital: The Efficiency of Covenants Not to Compete.” Olin Working Paper No. 137, University of Chicago Law & Economics.