Client-Based Entrepreneurship

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Client relationships create value, which employees may try to wrest from their employers by establishing their own firms. If an employer and worker cannot contract on the output and profits of the worker's prospective new firm, at the beginning of their relationship the employer induces the worker to sign a contract that prohibits him from competing or soliciting the current client in the event of termination of employment. The socially optimal level of entrepreneurship will nevertheless be achieved if clients, employers, and workers can renegotiate these restrictive employment contracts and make compensating transfers. If workers cannot finance transfers to employers, however, employers and workers will sign contracts that are too restrictive and produce too little entrepreneurship, and governments can increase welfare by limiting enforcement of these contracts. With or without liquidity constraints, locations where non-compete contracts are less enforced will attract more clients and have higher employment and output.

1. Introduction

Initially motivated by famous examples in the high-tech sector, the study of employee spinoffs has now broadened as their importance for entrepreneurship across all economic sectors has become recognized. Hvide (2009) studies employee entrepreneurs among Stanford MBAs concentrated in professional services. Muendler et al. (2012) find that employee spinoffs account for between one-sixth and one-third of all new firms in Brazil's private sector during the period 1995-2001. Klepper and Sleeper (2005) and Franco and Filson (2006) argue that even in high-tech industries (lasers and disk drives, respectively), employees may simply exploit knowledge they learned during their employment rather than their own technological innovations to become competitors with their former employers.

Part of the knowledge that entrepreneurs acquire when employed, especially in services, is knowledge of potential clients for their future businesses. Rauch and Watson (2002, Table 1) find that, when international trade intermediaries handling differentiated products started their firms, clients outside of the United States with whom they had experience from previous employment accounted for over half of their international business. Ruef (2002) reports that 52 percent of the MBA entrepreneurs he surveyed used discussions with customers or suppliers to develop their business ideas. Muendler and Rauch (2011) find that exporting spinoffs from exporting parents sell mainly to the same destinations as the parents at the time of spinoff, and continue to sell to those destinations even when the parents' export destinations change.[1]

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[1]Development of data sets that would allow us to track client-based entrepreneurship is still in its infancy. Phillips (2002: 500) regrets that "data on law firm clientele are sporadically and unreliably available. An ideal study of the parent-progeny transfer using law firms would follow the movement of the clients from the parents to the progeny."

"Theft" of clients from employers by employees is a sufficiently common issue that the former often include non-solicitation covenants in the employment contracts of the latter. These covenants are one of a number of restrictive clauses that an employer can include in an employee's contract in an attempt to restrict him from competing against the employer in the event of separation. The enforcement of such "non-competes" is controversial and varies widely from state to state within the United States and has even changed within states over time (Garmaise, 2011; Marx et al., 2009).[2] In deciding whether non-compete covenants are enforceable, Carnevale and Doran (2001) write that "courts generally consider whether the covenant protects 'trade secrets' to which an employee may have had access or whether the employee's services are 'unique or extraordinary'....With regard to customer relationships courts have found that employers have a legitimate interest in protecting the 'unique' relationship that an employee develops with the employer's clients or an interest in protecting 'customer relations'."[3]

Client-based entrepreneurship can thus be seen as part of a struggle between employers

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[2]Marx et al. find that an inadvertent change in Michigan state law from non-enforcement to enforcement of non-competes reduced the mobility of inventors as traced through their patent addresses.

[3]Enforcement of non-competes may, in fact, be used to substitute for or complement trade secret protection. Stone (2002: 747) writes, "The historical link between non-compete covenants and trade secrets is somewhat paradoxical because disclosure of trade secrets and confidential information can be restrained in the absence of a covenant. However, it has been argued that, for procedural reasons, it is difficult to obtain enforcement of a trade secret, so that a restrictive covenant provides employers with important additional protection. At the same time, some scholars have posited that courts are more likely to enjoin misappropriation of a trade secret or confidential information in the face of a covenant not to compete because the existence of a covenant permits the court to avoid the difficult legal issue of determining what constitutes a trade secret." This determination may be especially difficult in professional and business services, as opposed to high-tech manufacturing.

and employees over the value created by client relationships. Our objectives in this paper are to explore theoretically the efficiency consequences of this struggle and identify the relationship between the form of employment contracts, legal rules governing restrictive covenants, and the incidence of client-based entrepreneurship. We also extend our analysis to the impact on the allocation of clients across jurisdictions of differences in legal rules and in local government facilitation of startups.

In Section 2 we model the relationship between one employer ("firm"), one employee ("worker"), and one client. Key assumptions are that the firm and worker sign a contract before meeting the client, and that the output and profits of the worker's prospective new firm are not verifiable. The latter assumption leads to a need for monetary transfers between the parties when negotiating a possible separation of the worker and client from the firm (client-based entrepreneurship), and also to an unwillingness of banks to lend to the worker to make a transfer to the firm (to buy out his contract) if the worker does not have the cash on hand.

We show in Section 3 that the firm optimally forms a restrictive covenant with the worker, because it helps extract rent from the client by creating a favorable default point for later negotiation. If the worker is liquidity constrained, the worker and client fail to buy out the non-compete agreement when it is sometimes efficient to do so. Thus, the restrictive covenant leads to an inefficiently low level of separation and entrepreneurship.[4] Only a government decision not to enforce these contracts will avert inefficiently low separation. Our model thus suggests that welfare rises when courts emphasize the rights of clients to choose whom they will employ

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[4]One might think that the "deep pockets" of the client would stand in for the worker's lack of liquidity and facilitate separation, but we show that this is typically not the case.

over the rights of employers to restrict competition from their former workers.[5] We also show

that as the government weakens enforcement, the firm must pay the worker more to retain her

(and her client) when the three parties find it efficient to remain together. Furthermore, whether

or not the worker is liquidity constrained, clients are worse off when firms and workers agree to

restrictive covenants.

In Section 4 we extend our model to allow for many locations, each of which is endowed

with many firms. Each firm in turn can employ many workers, each serving one client. We

show that differences across locations in willingness to enforce non-competes become an

element of regional competitive advantage, leading to differences in numbers of clients and rates

of entrepreneurship across locations. Gilson (1999) has argued that covenants not to compete

are much less enforceable in California than in Massachusetts. Examining potential causes of

the success of Silicon Valley in California relative to Route 128 in Massachusetts, McMillan

(2002: 114) claims, citing the work of Gilson, "The post employment covenant lies at the root of

the differences between Silicon Valley and Route 128." McMillan is concerned with the ability

of restrictive covenants to prevent departing employees from taking with them technological

innovations rather than client relationships, but we conjecture that far more entrepreneurs start

their businesses on the basis of the latter than the former.

In Section 5, we extend the model by adding a phase in which the firm makes a human-

capital investment in the worker. The related literature suggests that a restrictive covenant

would allow the firm to protect its ability to extract the benefits of such an investment and

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[5]In the legal services industry, a strong bias towards the rights of clients to choose who will
represent them is reflected by the fact that, in general, courts will not enforce restrictive
covenants on lawyers (Hillman 1990 §2.3.2 and §2.3.3).

therefore should be enforced. However, we show that if the worker is liquidity constrained, the firm is unable to obtain part of the benefits of investment, and the optimal policy is characterized as in the basic model. In Section 6 we compare our model and results to those in the literature on employee spinoffs and non-competes. Section 7 concludes.

2. A Model of Client-Firm-Worker Interaction

We develop a model that most naturally fits providers of professional and business services and their clients. We focus on these services for two reasons. First, they are growing even more rapidly than overall services as a share of total output. Professional and business services increased from 8.7% of U.S. value added in 1987 to 12.7% of U.S. value added in 2008, raising their share of overall services from 20.8% to 24.7%.[6] Second, the clients of professional and business service providers are mainly businesses themselves, making professional and business service quality a key to the ability of locations to attract and retain business in general. For example, corporate headquarters locate where there is easy access to high quality accounting, advertising, consulting, financial, legal, and other related services. Klier and Testa (2002) find that the growth of large company headquarters between 1990 and 2000 across U.S. metropolitan areas is significantly associated only with the growth of metro area population and

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[6]The overall service share of U.S. value added, which includes NAICS 51-81, increased from 42.0% in 1987 to 51.2% in 2008. The U.S. Department of Commerce defines "Professional and business services" as NAICS 54-56, which includes "Professional, scientific, and technical services" (NAICS 54), "Management of companies and enterprises" (NAICS 55), and "Administrative and waste management services" (NAICS 56). All figures are from U.S. Department of Commerce, Bureau of Economic Analysis, Industry Economic Accounts, http://www.bea.gov/industry/gdpbyind_data.htm.

the 1990 share of metro area nonfarm earnings in professional and business services.[7]

We assume that each location is endowed with a mass of professional and business service providers ("firms") that have established reputations by successfully serving clients in the past.[8] New clients only approach firms with reputations, so professionals who have completed their schooling must affiliate with firms in order to get work, thereby becoming "workers." In any location the mass of firms is small relative to the mass of potential workers, so the former have all the bargaining power in initial contracting. In this section we model the interaction between one firm, one worker, and one client in a given location. We assume that a worker can serve only one client at a time. A firm can hire multiple workers, but negotiates separately with each worker and worker-client pair as described below. In Section 4, we expand the analysis to consider multiple locations, each with many firms and workers serving clients.

Our model of client-firm-worker interaction focuses on times when the parties negotiate over contractual terms. We analyze the negotiation using standard cooperative bargaining theory, which has the usual non-cooperative foundations.[9] Here is the basic structure of the

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[7]When explaining their results, Klier and Testa supply a quotation from Lichtenberg (1960) that underscores why relationships with outside professional and business service providers are so important for corporate clients: "Like producers of unstandardized products, the central office executives 'produce' answers to unstandardized problems, problems that change frequently, radically, and unpredictably.... These problems are solved quickly only by consultation with a succession of experts. But ... most central offices would find it inefficient if not impossible to staff themselves internally with all of the specialized personnel and services that they must call on from time to time to solve their problems.... All of these considerations dictate a concentration of central offices ... near their 'suppliers'."

[8]Our model is static. We leave evolution of the numbers of firms and their reputations to future research.

[9]We calculate the model's *contractual equilibrium*. See Watson (2013) for notes on the relation between cooperative and noncooperative approaches to modeling negotiation in a dynamic strategic setting.

model in the form of a time line:

Date 0: The firm forms a contract with a single worker selected from a population of workers. Their contract specifies a "non-restrictiveness" parameter $p \in [0, 1]$ that characterizes how likely the worker would be able to serve a client of the firm if the worker separates from the firm and becomes an entrepreneur. The value $p = 0$ represents a very restrictive covenant, whereas $p = 1$ is a completely non-restrictive one. Let p^0 denote the value of p that the worker and firm select.

Date 1: A single client arrives and the firm and worker provide a standard service for this client, which leads the worker to acquire knowledge for a specialized service opportunity. A random draw and location-specific parameters determine the worker's cost of becoming an entrepreneur (that is, starting his own firm), at which point he would be able to serve the client independently from the existing firm. Let $k \in [0, 1]$ denote the realization of the random draw and let μ be its distribution (c.d.f.). The cost of becoming an entrepreneur is increasing in k, so $k = 0$ means that the worker can easily become an entrepreneur (low cost) whereas $k = 1$ means that it would be very difficult for the worker to do so. The client, firm, and worker commonly observe k.

Date 2: The client, firm, and worker together negotiate over whether the firm and worker will stay together to provide the specialized service to the client and, if not, whether to renegotiate the firm and worker's initial contract in order to change p^0 to some new value p'. The disagreement point is separation of the worker from the firm (which the parties can each unilaterally compel) and $p' = p^0$.[10]

Date 3: If the firm and worker stayed together at Date 2, then they work together to provide the specialized service to the client. If the firm and worker had separated at Date 2 then the worker becomes an entrepreneur. Then, after some set-up period, the entrepreneur and the client arrange for the entrepreneur to provide the specialized service. Further, the firm takes legal action against the entrepreneur and, in the event that the entrepreneur is barred from providing the specialized service, the firm provides some generic version of the specialized service for the client.

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[10]The assumed disagreement point represents the idea that exogenous events would, with some probability, cause separation if the parties fail to reach an agreement in a given period of time when negotiation occurs. Thus, there is no way for the parties to fail to agree at Date 2 but nonetheless stay together. An alternative specification, in which separation occurs only if the parties actively choose it (some call this the "outside option principle"), would allow the parties to disagree and then stay together (if they individually choose not to separate). Adopting such a specification would change the effective disagreement point and lead to a slightly different outcome of the bargaining at Date 2. However, because the liquidity constraint we introduce below would have a similar effect in the alternative specification, our general conclusions would be unaltered. Also note that, if the parties were able to disagree and yet stay together at Date 2, their continuation values would not be directly affected by the Date 0 agreement because it stipulates only the non-restrictiveness parameter and possibly a transfer (if feasible).

Rather than model the details of the interaction and legal intervention at Date 3, we simply describe the resulting payoffs. We assume that if the firm and worker stay together to provide the specialized service, then this work is contractible and it creates a surplus of 1 unit. This surplus can be verified and arbitrarily divided between the parties as specified by their agreement at Date 2.[11]

On the other hand, if the firm and worker separate then the joint payoff of the client, firm, and worker is given by the function $X(p, k)$. The key assumption we make is that productive interaction occurring after the worker separates from the firm is *not* contractible prior to the separation. There may be various reasons for this lack of contractibility, including problems involving unverifiable investment and/or contracting costs. Rather than include the details in the model here, however, we refer to the conclusions of the well developed literature on specific investment and contracting costs.[12] Thus, we assume that the parties' continuation payoffs following separation are a function of p and k only, and the division of X cannot be determined earlier. Let $x_E(p, k)$, $x_C(p, k)$, and $x_F(p, k)$ denote the individual separation values for the entrepreneur, client, and firm, respectively. These are assumed to be twice continuously differentiable. We have

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[11]It does not matter whether the initial contract between the firm and worker covers aspects of this productive activity, given the renegotiation opportunity and disagreement point described above.

[12]Unverifiability is a particular problem in settings of cross (cooperative) investment and unified investment and trade actions (Buzard and Watson, 2012; building on Che and Hausch, 1999), or when trade involves "complexity/ambivalence" as described by Segal (1999), Hart and Moore (1999), and Reiche (2006). On costly contracting, see Dye (1985) and the literature that followed, including Anderlini and Felli (1994), Battigalli and Maggi (2002), and Schwartz and Watson (2004).

$$X(p, k) = x_E(p, k) + x_C(p, k) + x_F(p, k).$$

Importantly, note that if at Date 2 the client, firm, and worker want to split the joint value of separation in an arbitrary way, they would have to do so by agreeing to make lump-sum monetary transfers either at Date 2 or in the future.

To summarize, the model has explicit strategic elements at Dates 0 and 2, where negotiation takes place. We shall analyze the negotiation at these dates using standard bargaining theory. We assume that the mass of workers is large compared to the mass of firms, so the firm has all of the bargaining power at Date 0. The worker's outside option at Date 0 is normalized to 0, and so negotiation at Date 0 is resolved by maximizing the firm's payoff subject to the worker obtaining at least 0. We assume that negotiation at Date 2 is resolved according to the standard Nash bargaining solution, which maximizes the product of each player's payoff in excess of his/her disagreement value.[13]

We also incorporate a legal restriction on p by requiring that $p \geq \underline{p}$, where $\underline{p}$ represents a legal lower bound on the probability that the worker will be able to serve the client in the event of separation. If non-compete clauses are unenforceable in the given location, then $\underline{p}$ is close to one. We shall later consider the implications of variations in $\underline{p}$ across jurisdictions.

We make the following basic assumptions.

Assumption 1:
    (a) $X(p, k)$, $x_E(p, k)$, and $x_C(p, k)$ are all strictly increasing in p and strictly decreasing in k. That is, as the worker and firm's contract becomes less restrictive, the joint value of separation increases. Furthermore, as the cost of becoming an entrepreneur increases, the joint value of separation declines. Also, $x_F(p, k)$ is decreasing in p and increasing in k. Thus, the

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[13]The assumption of equal bargaining weights is not essential to the results but keeps the analysis simple.

firm's separation value rises with the restrictiveness of the covenant with the worker and with the worker's cost of becoming an entrepreneur, because this lowers the ability of the client and entrepreneur to work together (forcing the client to sometimes work with the firm).

(b) $X(1, 1) < 1$, and $X(1, 0) > 1$. In words, when the entrepreneur's cost is maximal then separation is inefficient, even under the least restrictive contract. On the other hand, if the contract does not restrict the entrepreneur at all and the start-up cost is minimal, then separation is efficient.

Note that Assumption 1(b) implies that it is sometimes more efficient for the worker to provide the specialized service to the client as an entrepreneur (in a new firm of his own) rather than in the context of his employer (the current firm). There are many reasons for this. The worker may have developed a client-specific innovation that is disruptive of the firm's way of doing business (Tushman and Anderson, 1986; Henderson and Clark, 1990), or the firm's project-management system or staff may be poorly suited for the client's needs. The firm cannot reconfigure itself to incorporate the innovation or change its personnel because this would lower the value it creates with all its other clients. The firm can start a free-standing unit to serve the client, but it may operate at a higher cost than the worker's own new firm, because of the need to retain compatibility with the incumbent firm's "headquarters services" (Ono, 2003) — accounting and reporting, marketing, R&D, etc.

Moreover, the quality of the effort that an employee makes on behalf of the client may not be verifiable and therefore not contractible, and the value of the specialized service itself may not be verifiable. As in standard models of hold up (see footnote 12 above), the worker's effort incentive in the provision of the specialized service is then linked to the share of returns that the worker can extract at the end of the production process. The worker is able to extract a larger share of these returns when serving the client on his own (splitting returns with the client)

then as an employee of the firm (splitting returns three ways). Thus, working on his own account as an entrepreneur, the worker has a greater incentive to exert effort and provides a more valuable service.[14]

For example, a client might ask an advertising firm to update a campaign for an existing product — a standard service. The employee who handles the client's account acquires knowledge of the client's preferences, capabilities, business strategy, etc., that allows him to develop a campaign to launch a new product for the client — a specialized service. The quality of the effort that the employee makes to provide this specialized service is not verifiable and therefore not contractible. Moreover, the value of the specialized service itself is not verifiable precisely because it cannot be assessed without the deep knowledge of the client's business that is acquired by working closely with it.

Our final assumption is that the worker is liquidity constrained, in particular at Date 2, when the parties are negotiating over whether to stay together and/or to revise the firm-worker contract. In reality, there are several barriers that limit the ability of the worker to make a monetary transfer to the firm. First, workers generally do not have the resources to internally (out of pocket) finance a large payment. Second, external financing generally is limited due to informational asymmetries between the worker and outside lending institutions. If future returns from the client are unverifiable, the entrepreneur/worker can hide his income and declare that his new firm has failed. Furthermore, if banks cannot easily distinguish between the workers in our model and other, high-risk agents, then the banks will not be willing to lend the worker the

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[14]Incorporating an explicit account of production (provision of the specialized service) into our model complicates it without adding much insight. Such a formulation of effort incentives appears in an earlier working paper, Rauch and Watson (2005).

money required to buy out his non-compete agreement.[15] The liquidity-constraint assumption is

also consistent with the stories that workers tell.[16]

Rather than adopt a single motivating story for the worker's liquidity constraint, we

simply assume that there is an upper bound on the amount of money that the worker can transfer

to the other parties at Date 2 and, for simplicity, we suppose that the bound is zero at Date 0.

Assumption 2 [Liquidity Constraint]: At Date 2 the worker can transfer at most m to the other
players, where $m \geq 0$ is a fixed number. Promises to transfer money later cannot be enforced. At
Date 0, the worker can transfer nothing to the firm.[17]

We can think of m as determined by the collateral against which the entrepreneur could borrow.

For a professional and business service enterprise, there is little in the way of tangible assets to

seize, so m should be small.

The liquidity constraint comes into play only in the event of separation, because when the

parties stay together they form a contract that commits them to an arbitrary division of the

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[15]Similar problems arise in loan arrangements with the client and firm. A loan from the client is
subject to hold-up, whereby, after the effort decision, the worker refuses to consummate trade
unless the loan is renegotiated. This implies that the entrepreneur's and client's continuation
payoffs from the time that they contract are independent of the sunk loan amount, meaning that
the client is merely making an immediate transfer to the firm through the worker. A loan from
the firm requires the same verification of returns as would a loan from a bank; the worker could
hide his returns from the firm and, anticipating that it cannot compel the worker to repay, the
firm will not issue the loan.

[16]Workers we have interviewed do not consider borrowing to buy out their non-compete
contracts to be a viable option. Several workers with a major international market research firm,
disgruntled with a change in management following a merger, told us they thought they could
better serve their clients by setting up their own firms but felt "trapped" by their non-competes
and "lacked the cash" to buy them out.

[17]The assumption of no liquidity at Date 0 simplifies the analysis of negotiation at Date 0 and
does not drive the basic results. In the case of m large, for instance, if we assume that the
worker's liquidity at Date 0 is also unconstrained, our results are unchanged.

surplus of 1 that is generated at Date 3. If at Date 2 the parties choose to revise the terms of the firm-worker contract (picking $p' \neq p^0$) and separate, then their continuation values are $x_E(p', k)$, $x_C(p', k)$, and $x_F(p', k)$, plus any transfers made at Date 2 (subject to the worker's liquidity constraint).

3. Analysis and Results

We begin by characterizing the outcome of bargaining at Date 2, for a given p^0 selected at Date 0 and k realized at Date 1. We suppose that negotiation is resolved according to the Nash bargaining solution, where the parties have equal bargaining weights and the bargaining set incorporates the worker's liquidity constraint. That is, the parties negotiate to achieve continuation payoffs of (v_W, v_C, v_F) with the objective of solving:
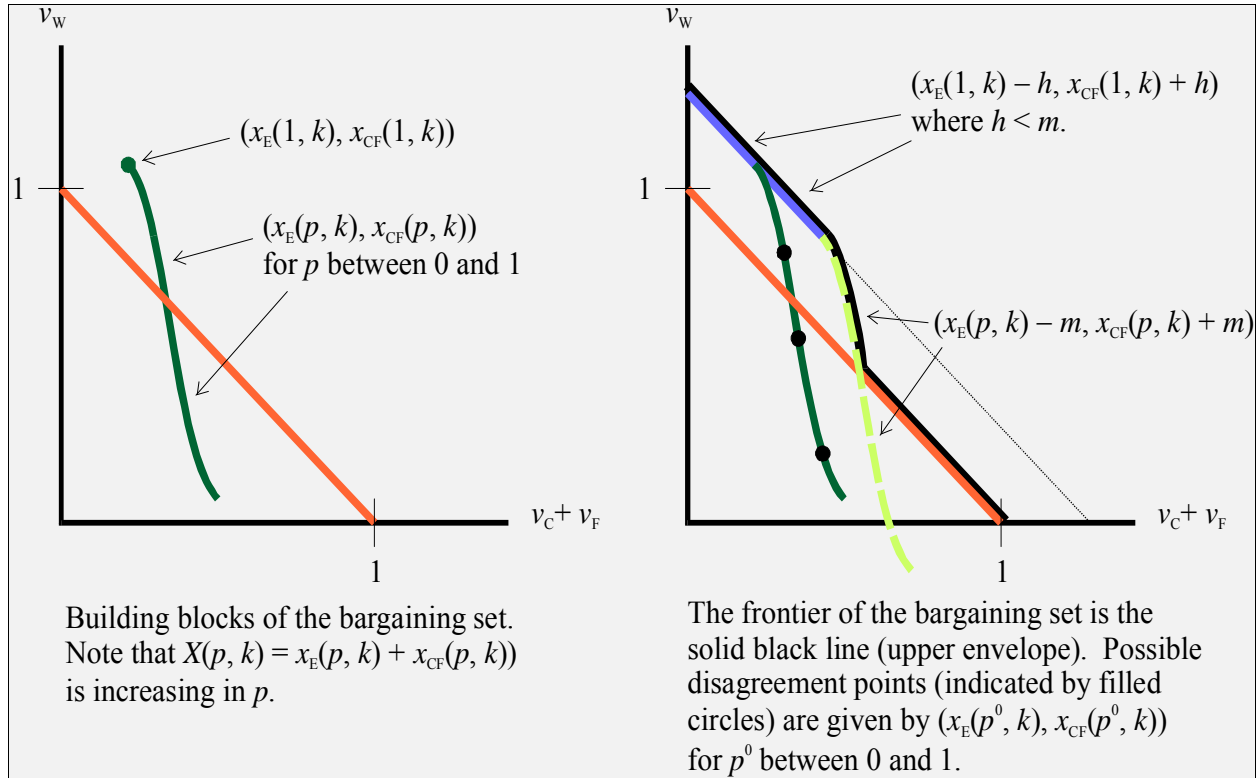
$$\max \ (v_W - x_E(p^0, k))(v_C - x_C(p^0, k))(v_F - x_F(p^0, k))$$

subject to: $v_W + v_C + v_F = 1$ (stay together) or $v_W + v_C + v_F = X(p', k)$ (separate);
p' is between $\underline{p}$ and 1; and
in the event of separation, $v_W \geq x_E(p', k) - m$.

Because of the liquidity constraint, the bargaining set is not generally convex, but the Nash solution still exists. Let $v_W^*(p^0, k)$, $v_C^*(p^0, k)$, and $v_F^*(p^0, k)$ be the values that solve this maximization problem. These are the continuation payoffs of the players from Date 2, given the terms of the contract between the firm and worker and given the realization k.

Next we provide a simplified expression of the bargaining solution. Because the client and firm can freely make transfers to each other, the solution of the bargaining problem will equate their surplus shares, meaning that

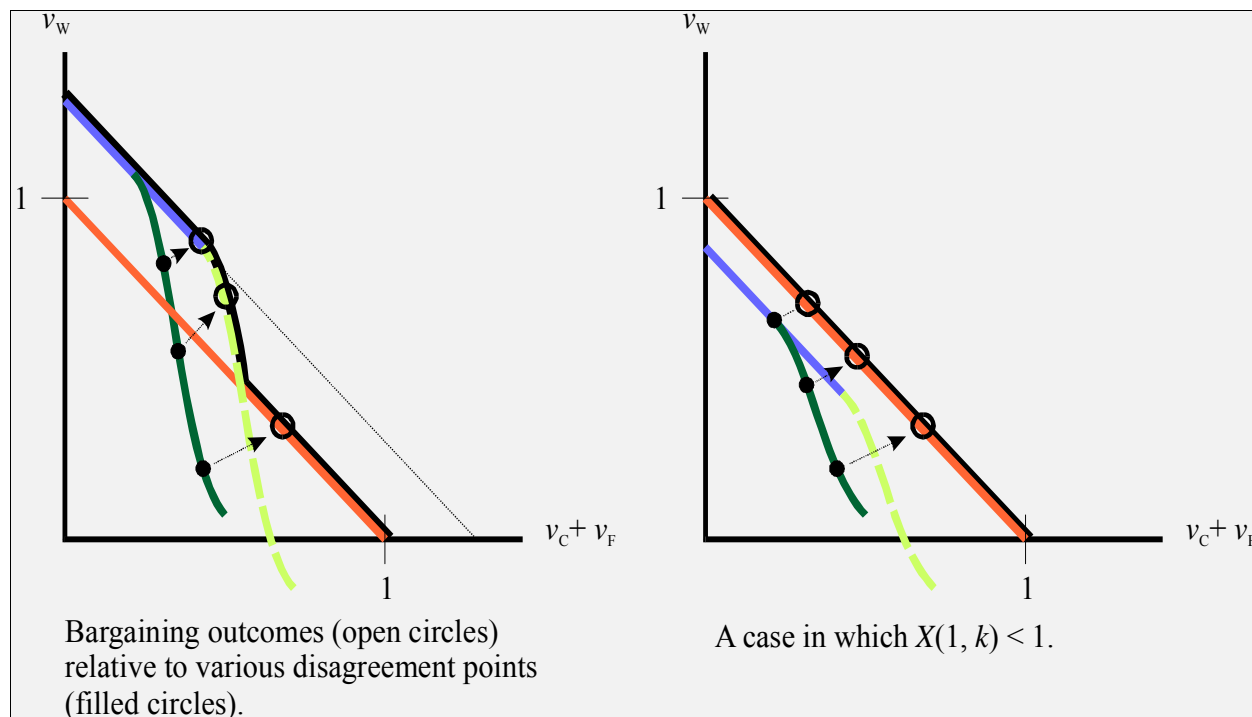$$v_C^*(p^0, k) - x_C(p^0, k) = v_F^*(p^0, k) - x_F(p^0, k).$$

Figure 1: The bargaining set at Date 2, given p^0 and k.

Thus, we can add the condition $v_C - x_C(p^0, k) = v_F - x_F(p^0, k)$ to the maximization problem,

allowing us to express the bargaining problem as one with two parties: the worker and (as a unit)

the client and firm. This problem is:

$$\max (v_W - x_E(p^0, k))(1/4)(v_C + v_F - x_C(p^0, k) - x_F(p^0, k))^2$$

subject to: $v_C - x_C(p^0, k) = v_F - x_F(p^0, k)$
$v_W + v_C + v_F = 1$ (stay together) or $v_W + v_C + v_F = X(p', k)$ (separate),
p' is between $\underline{p}$ and 1, and
in the event of separation, $v_W \geq x_E(p', k) - m$.

Note that it will not be optimal to choose $p' < p^0$, so the third constraint is really $p' \in [p^0, 1]$. The

components of the bargaining set are depicted in Figure 1. In the figure, we simplify the

notation by defining $x_{CF}(p, k) \equiv x_C(p, k) + x_F(p, k)$. The figure illustrates the setting in which

$x_C(p, k) + x_F(p, k)$ is decreasing in p, which is an assumption we make for several results below.

Bargaining outcomes (open circles) relative to various disagreement points (filled circles).

A case in which $X(1, k) < 1$.

Figure 2: Illustration of the solution to negotiation at Date 2.

This assumption implies that the firm loses more than the client gains by weakening its control over the worker in the event of separation.[18]

The left panel of Figure 1 shows the ways of dividing the joint value of staying together (the line of slope -1) as well as the separation payoffs for different values of p and no additional monetary transfers. The right panel of Figure 1 depicts also the feasible payoffs when monetary transfers are made. Note that points $(x_E(1, k) - h, x_{CF}(1, k) + h)$ are enforceable for all $h \leq m$ (including $h < 0$). These represent continuation payoffs achieved if the parties set $p' = 1$ and where the worker transfers h to the other parties. At $h = m$ the worker's liquidity constraint is met. For $h > m$, a payoff vector $(x_E(1, k) - h, x_{CF}(1, k) + h)$ is physically possible, and hence

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[18]With $p = 0$, the client loses the difference between the quality of service provided by the worker-turned-entrepreneur and that provided by the firm without the worker, whereas with $p = 1$ the firm loses all (expected) revenue from the client.

feasible in the economic environment, but it is not feasible in the bargaining problem because it requires a promise for the worker to transfer money in the future (which is not enforceable). Points on the curve $(x_E(p, k) - m, x_{CF}(p, k) + m)$ are feasible in the bargaining problem but they are inefficient outcomes. Points on the "stay together" line are also inefficient if $X(1, k) > 1$, as is depicted in Figure 1. The frontier of the bargaining set is given by the black line.

Figure 2 gives examples of disagreement points and their corresponding bargaining outcomes (agreement points). Note that, as shown in the right panel, if $X(1, k) < 1$ then the parties stay together and realize an efficient outcome. As the left panel makes clear, in some cases the bargaining solution leads to an inefficient outcome, where the parties fail to set $p' = 1$. In such cases, they would have been better off by setting $p' = 1$ and having the entrepreneur make a voluntary transfer to the other parties after he directly provides the specialized service to the client (yielding an arbitrary point on the faint black line in the figure). But a promise by the worker to transfer money later is unenforceable, so the liquidity constraint here leads to the inefficiency. If the worker is not liquidity constrained (so m is sufficiently large), then Date 2 renegotiation always leads to the efficient outcome:

Result 1: If m is sufficiently large then negotiation achieves the efficient outcome given k. That is, in the case of $X(1, k) < 1$, the parties stay together. In the event of $X(1, k) > 1$, the parties renegotiate to select $p' = 1$, there are some lump-sum transfers, and the worker and firm separate.

Proof: In this case, the frontier of the bargaining set is the set of all continuation payoff vectors that sum to the maximum of $X(1, k)$ and 1, so the result is obvious. ∎

More generally, the extent of inefficiency falls as the liquidity constraint is relaxed.

Result 2: The set of pairs (p^0, k) under which separation occurs is increasing in m. In other words, if $m' > m$ and if separation would occur for a given (p^0, k) and m, then separation also

would occur in the case of (p^0, k) and m'. Under the additional assumption that $x_E(p, k) - [x_C(p, k) + x_F(p, k)]$ is increasing in p, then, conditional on separation, the renegotiated p' is (weakly) increasing in m. Under the assumption that $x_C(p, k) + x_F(p, k)$ is decreasing in p, if $m = 0$ then p is not renegotiated, so $p' = p^0$.

Proof: The first part of this result is proved by noticing that increasing m relaxes the constraints of the maximization problem that characterizes the solution to the negotiation at Date 2, and it does so only for the separation choice. On the claim about p', one can easily show by comparing Nash products that if p'' is selected with m' whereas p' is selected with m, then it must be that $x_E(p'', k) - x_{CF}(p'', k) \geq x_E(p', k) - x_{CF}(p', k)$. The additional assumption in the statement of the result then implies that $p'' \geq p'$. On the final claim, if $x_C(p, k) + x_F(p, k)$ is decreasing in p and if $m = 0$, then the firm and client (jointly) strictly lose by raising p, so they will not allow p^0 to be renegotiated upward. Note, by the way, that the assumption of $x_C(p, k) + x_F(p, k)$ decreasing in p implies that $x_E(p, k) - [x_C(p, k) + x_F(p, k)]$ is increasing in p, given Assumption 1. ∎

Next we establish how the firm's payoff from Date 2, $v_F^*(p^0, k)$, depends on p^0. Let $\underline{k}$ be

the unique value of k that satisfies $X(1, \underline{k}) = 1$. Assumption 1 guarantees that $\underline{k}$ is well defined.

Result 3: Take any number $\varepsilon > 0$. There exists a number $\hat{p} < 1$ such that $v_F^*(\hat{p}, k) > v_F^*(1, k)$ for all $k \notin (\underline{k} - \varepsilon, \underline{k})$. Furthermore, if $x_C(p, k) + x_F(p, k)$ is decreasing in p, then $v_F^*(p^0, k)$ is everywhere strictly decreasing in p^0, for all k.

Proof: To prove the first statement, consider any $k \geq \underline{k}$. In this case, the frontier of the bargaining set is the unit simplex; it is efficient for the parties to stay together and so, regardless of p^0, they will stay together and split the benefit of 1. Lowering p^0 has the effect of strictly decreasing X and increasing x_F. Thus, the firm's disagreement point increases and the bargaining surplus strictly increases, which implies that v_F^* strictly rises.

Next consider values $k < \underline{k}$. Think of the bargaining problem in the form with the client and firm as one player. We shall use the following lemma, which is obvious for cases of transferrable utility but also easy to prove for general nonconvex bargaining sets:

Lemma 1: Consider any two-player bargaining set S that has a closed Pareto frontier but is not necessarily convex. Let the bargaining solution be the generalized Nash solution (which maximizes the Nash product), with positive bargaining weights α_1 and α_2 for players 1 and 2. Take two different disagreement points $d, d' \in S$ such that $d_1' \geq d_1$ and $d_2' \leq d_2$. Let b be the bargaining outcome under disagreement point d, and let b' be the bargaining outcome under disagreement point d'. Then $b_1' \geq b_1$ and $b_2' \leq b_2$. That is, each player's payoff is increasing in his own disagreement value and decreasing in the other player's disagreement value.

For p^0 sufficiently close to 1, the disagreement point $(x_E(p^0, k), x_{CF}(p^0, k))$ lies above the unit simplex (that is, $x_E(p^0, k) + x_{CF}(p^0, k) > 1$) and so all of the relevant points on the frontier of

the bargaining set involve separation. By continuity of x_E and x_{CF}, for any given $\varepsilon > 0$ we can find a number $\hat{p} < 1$ such that $x_E(\hat{p}, k) + x_{CF}(\hat{p}, k) > 1$ for every $k < \underline{k} - \varepsilon$. It is not difficult to verify that $v_F^*(\hat{p}, k) > v_F^*(1, k)$ for every $k < \underline{k} - \varepsilon$. To see this, note that $x_E(\hat{p}, k) < x_E(1, k)$. If $x_{CF}(\hat{p}, k) \geq x_{CF}(1, k)$ then clearly $v_F^*(\hat{p}, k) > v_F^*(1, k)$ because the disagreement point shifts in favor of the client and firm jointly, so they fare better jointly (by the Lemma), and furthermore the firm's disagreement point rises whereas the client's falls.

In fact, the result also holds if $x_{CF}(\hat{p}, k) < x_{CF}(1, k)$. To see this, note that $v_F^*(1, k) = x_F(1, k)$ and $v_C^*(1, k) = x_C(1, k)$. Then observe that
$$v_F^*(\hat{p}, k) + v_C^*(\hat{p}, k) \geq x_{CF}(\hat{p}, k),$$
which implies that
$$[v_F^*(1, k) + v_C^*(1, k)] - [v_F^*(\hat{p}, k) + v_C^*(\hat{p}, k)] \leq x_{CF}(1, k) - x_{CF}(\hat{p}, k),$$
and so
$$[v_F^*(1, k) + v_C^*(1, k)] - x_{CF}(1, k) \leq [v_F^*(\hat{p}, k) + v_C^*(\hat{p}, k)] - x_{CF}(\hat{p}, k).$$
That is, the surplus shared by the client and firm is smaller when $p^0 = 1$ than it is when $p^0 = \hat{p}$. Using the fact that the client and firm equally divide this surplus and that $x_C(\hat{p}, k) < x_C(1, k)$ and $x_F(\hat{p}, k) \geq x_F(1, k)$, we conclude that $v_F^*(\hat{p}, k) > v_F^*(1, k)$.

Under the assumption that $x_C(p, k) + x_F(p, k)$ is decreasing in p, we can apply the Lemma above to establish that $v_C^*(p^0, k) + v_F^*(p^0, k)$ is decreasing in p^0. This conclusion also uses the assumption that $x_E(p, k)$ is increasing in p. That is, considering the client and firm as a single player with twice the bargaining power of the worker, the disagreement point $(x_E(p^0, k), x_{CF}(p^0, k))$ shifts in favor of the worker as p^0 increases, and thus (from the Lemma) $v_C^*(p^0, k) + v_F^*(p^0, k)$ decreases.

Note that, from the bargaining solution, the firm's payoff can be written:
$$v_F^*(p^0, k) = x_F(p^0, k) + (1/2)[v_C^*(p^0, k) + v_F^*(p^0, k) - x_C(p^0, k) - x_F(p^0, k)].$$
Combining terms, we get:
$$v_F^*(p^0, k) = (1/2)x_F(p^0, k) - (1/2)x_C(p^0, k) + (1/2)[v_C^*(p^0, k) + v_F^*(p^0, k)].$$
We have established that the third term on the right of this equation is decreasing in p^0. The first two terms also are decreasing in p^0 from Assumption 1 (the second term strictly so). Therefore, we have that $v_F^*(p^0, k)$ is strictly decreasing in p^0. ■

Next we can establish properties of the contract made between the firm and worker at Date 0. Let y_W, y_C, and y_F denote the expected payoffs of the worker, client, and firm from the start of Date 1. Note that these are expectations over k and are functions of the choice of p^0 made earlier:

$$y_W(p^0) = E[v_W^*(p^0, k) \mid \mu], \;\; y_C(p^0) = E[v_C^*(p^0, k) \mid \mu], \text{ and } y_F(p^0) = E[v_F^*(p^0, k) \mid \mu].$$

Since the worker cannot make a monetary transfer to the firm at Date 0, and since the firm has all of the bargaining power at this time, contract negotiation is resolved by the selection of p^0

that maximizes $y_F(p^0)$. Because $v_F^*(p^0, k)$ is decreasing in p^0 for all k (at least for p^0 close to 1 in the general case, and for all p^0 with the added assumption on $x_C + x_F$), we know that $y_F(p^0)$ is also decreasing. This proves the following result.

Result 4: At Date 0, in the initial contract between the firm and worker, the parties form a restrictive covenant by setting $p^0 < 1$ if feasible (that is, if $\underline{p} < 1$). Under the assumption that $x_C(p, k) + x_F(p, k)$ is decreasing in p, the parties optimally set $p^0 = \underline{p}$. Thus, they use the most restrictive covenant allowed by law. In general, as $\underline{p}$ rises, the chosen value of p^0 also (weakly) rises.

The next result, which follows from Results 2 and 4 above, describes the outcome in more detail for a particularly simple class of environments.

Corollary 1: Suppose that $x_C(p, k) + x_F(p, k)$ is decreasing in p, and $m = 0$. Then the firm and worker set $p^0 = \underline{p}$ and this restrictive covenant is never renegotiated. At Date 2, the parties separate if and only if $X(\underline{p}, k) > 1$ for the realized k. When they separate, it is done on inefficient terms so long as $\underline{p} < 1$ (since $p' = p^0 = \underline{p}$). For some values of k — in particular, where $X(\underline{p}, k) < 1 < X(1, k)$ — the parties stay together when it would be efficient to separate.[19]

An implication of Corollary 1 is that a policy setting $\underline{p} = 1$ eliminates the possibility that the worker's liquidity constraint will lead to an inefficient outcome. It is perhaps surprising that, in the presence of a distortion induced by a liquidity constraint, a second-best policy (non-enforcement of non-competes) is able to fully restore the social optimum. This result is explained by the fact that the distortion only comes into play when it is efficient for the worker

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[19]We have used here the assumption that the firm has all of the bargaining power at Date 0. If the worker has some bargaining power, then the bargaining solution would involve a complicated comparison of v_W^* and v_F^*. We think such a consideration would not lead to substantially different results. For instance, if $v_W^* + v_F^*$ is decreasing in p^0 then the agreement would be as described in Result 4 and Corollary 1, but now it may include some compensation from the firm to the worker.

and client to separate from the firm.

The next issue to consider is how the client's payoff depends on p^0. Intuition suggests that the client would fare better as p^0 increases, because (a) this may decrease the likelihood that the worker fails to separate from the firm when it would be more efficient for the client and entrepreneur to work together, and also (b) it increases the client's disagreement payoff for negotiation at Date 2. The latter point interacts with the fact that the worker's disagreement payoff also increases as p^0 rises, and it is theoretically possible for the worker's disagreement payoff to increase much more than does the client's, such that the resulting decrease in bargaining surplus leads the client to be worse off. Also, because the bargaining set is not convex, the intuition suggested above does not generally hold at the margin for all values of p^0. However, we can establish that the client's payoff from Date 0 unambiguously increases in p^0 for some large classes of settings.

Result 5: Assume that $2x_C(p, k) - x_E(p, k) - x_F(p, k)$ is increasing in p, meaning that for all k the client's separation payoff is increasing in p at least as much as is the average of the entrepreneur's and firm's separation payoffs. Assume also that $x_C(p, k) + x_F(p, k)$ is decreasing in p. If $m = 0$ or if m is sufficiently large, then $v_C^*(p^0, k)$ is increasing in p^0 for all k. Furthermore, $y_C(p^0)$ is increasing in p^0.

Proof: Consider first a value of p^0 where the bargaining solution is at a point on the frontier with slope -1 (that is, either where the parties stay together and $v_W + v_C + v_F = 1$ or where they separate with $p' = 1$). Suppose p^0 is increased by a small amount. By the first assumption in the statement of the result, this change in p^0 has the effect of moving the disagreement point in a direction that favors the client relative to the other two parties. Because the total value that they achieve does not change, we conclude that the client's share increases. Thus, $v_C^*(p^0, k)$ rises.

In the case in which m is large, the liquidity constraint never binds and, regardless of k, the bargaining solution is always at a point on the frontier with slope -1. This proves the result for the case of m large. In the case in which $m = 0$, the conclusion continues to hold for values of k in which the parties stay together and so $v_W + v_C + v_F = 1$. For other values of k, at Date 2 the parties will separate with $p' = p^0$ because, under the assumption that $x_C(p, k) + x_F(p, k)$ is decreasing in p, the firm and client refuse to renegotiate. In this case, we have

$$v_C^*(p^0, k) = x_C(p^0, k),$$

and result follows from the fact that $x_C(p, k)$ is increasing in p. ∎

Remark on the liquidity-constrained case: In Corollary 1 and Result 5, we singled out the extreme case of constrained liquidity, where $m = 0$, because the analysis is particularly clean in this case. In fact, these results continue to hold with only minor modifications for values of m that are close to zero. To see this, note that the frontier of the bargaining set varies continuously in m. (As m increases, the point $(x_{CF}(p^0, k) + m, x_E(p^0, k) - m)$ shifts in the direction $(1, -1)$.) Thus, for m close to zero, and except for a small set of k, the renegotiated point p' is close to its counterpart with $m = 0$. The main technical issue is that this conclusion may not hold for all k, due to non-convexity of the bargaining set, but the set of k values for which the conclusion does not hold must be small as m converges to zero. Also, we have to modify Corollary 1's statement that, with $m = 0$, p^0 is never renegotiated. When m is close to zero, the parties will renegotiate any $p^0 < 1$ but, for most k, p' will be close to p^0. With these notes in mind, when we speak of the liquidity constrained case hereinafter, we shall focus on $m = 0$.

In summarizing and discussing our results, it is useful to distinguish between those results that hold regardless of whether workers are liquidity constrained and those that do not. In the following discussion we maintain the assumptions of Result 5, which are restated here:

Assumption 3: For all k, $x_C(p, k) + x_F(p, k)$ is decreasing in p and $2x_C(p, k) - x_E(p, k) - x_F(p, k)$ is increasing in p.

Whether or not the worker is liquidity constrained, in their initial contract the firm and the worker agree to the most restrictive covenant that the courts will enforce ($p^0 = \underline{p}$, Result 4). This puts the firm and worker in a strong bargaining position with the client when the latter

enters the picture.[20] Not surprisingly, then, the payoff to the client increases as the covenant

weakens ($v_C^*(p^0, k)$ is increasing in p^0, Result 5). Combining these two results, we see that client

payoffs increase with $\underline{p}$, which will be important in the next section of this paper when we

consider the allocation of clients across jurisdictions.

When the worker is not liquidity constrained, the client, firm, and worker stay together or

the client and worker separate from the firm when it is efficient to do so (Result 1). Moreover,

in the latter case the firm agrees to give up its right to pursue the worker in court to force him not

to serve the client.[21] Note that separation (entrepreneurship) is not affected by the initial contract

between the firm and worker and therefore not affected by jurisdictional policy regarding

enforcement of non-competes. We can interpret this result in terms of Coase (1960). Think of

$\underline{p} = 0$ as assigning property rights in the client relationship to the firm and $\underline{p} = 1$ as assigning

property rights in the client relationship to the worker. It follows from Result 1 that the same,

efficient economic outcome is obtained regardless of this assignment of property rights.

On the other hand, when the worker is liquidity constrained, the firm and worker never

renegotiate their initial contract (Corollary 1): the worker is unable to buy property rights in the

client relationship from the firm.[22] Consequently, unless $\underline{p} = 1$, the parties sometimes stay

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[20]We conjecture that this logic would also apply to the choice of initial contract by the firm and worker when the third party is another firm attempting to "poach" the worker rather than a client the worker may serve as an entrepreneur.

[21]In an influential law-review article favoring enforcement of restrictive covenants, Sterk (1993, p. 406) argues that, "nothing prevents the employee from bargaining with his employer for release from the covenant. If either the employee himself or other prospective employers value the employee's services more than his current employer does, the employee should be willing to pay the employer to release him from the contract."

[22]If the assumption that $x_C(p, k) + x_F(p, k)$ is decreasing in p were not to hold, the client might be willing to pay the firm to release the worker from his restrictive covenant. Since industries may

together when it would be efficient to separate. There is an inefficiently low level of entrepreneurship.[23] Moreover, when clients and workers do separate from firms, it is on inefficient terms: there are disputes that are handled by the courts. Both forms of inefficiency decrease as the liquidity constraint is relaxed (Result 2).

As $\underline{p}$ increases, jurisdictions increasingly neutralize the "stick" employers can use to discourage their employees from taking away clients. We can then expect employers to rely more heavily on the "carrot" of bribing employees to stay with their firms. We conclude the discussion of our results with the following lemma, which confirms this intuition:

Lemma 2: Regardless of the liquidity constraint, conditional on values of k for which the parties elect to stay together at Date 2, the compensation paid to the worker is increasing in $p^0 = \underline{p}$.

Proof: Consider a value of k for which the parties decide to stay together at Date 2. From the bargaining solution, the worker obtains a payoff of $x_E(p^0, k) + (1/3)[1 - X(p^0, k)]$, which equals $(1/3)[2x_E(p^0, k) - x_C(p^0, k) - x_F(p^0, k) + 1]$. This expression is increasing in p^0, given Assumptions 1 and 3. ∎

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differ in the impact of p on this joint client-firm payoff, our conclusion that $\underline{p} = 1$ is needed to attain the efficient level of entrepreneurship when the worker is liquidity constrained may be more robust for some industries than others. The key is how much the firm loses if it gives up the client after separation. For example, our conclusion might apply more strongly in financial services, where the firm may be able to quickly analyze the client's portfolio after the worker's departure, than in engineering consulting, where the worker may have mastered intricate technical details of the client's project through site visits.

[23]It follows that, unless $\underline{p} = 1$, relaxing the liquidity constraint will increase the level of entrepreneurship. For the empirical relationship between liquidity constraints and entrepreneurship, see Evans and Jovanovic (1989) and the vast literature that followed it.

4. Choice of Jurisdictions by Clients

In this section we consider multiple locations indexed by i. These locations can have different policies p_i regarding enforcement of non-competes, so we refer to them as jurisdictions. They can also vary by the distribution μ_i of the cost of becoming an entrepreneur. We think of this variation as arising from differences in bureaucratic efficiency rather than differences in out-of-pocket costs to entrepreneurs.[24] We maintain Assumption 3 throughout this section.

We assume that at the beginning of the period of interaction that we analyze, a fixed measure (quantity) of clients Q is allocated over a fixed number n of jurisdictions. Clients may differ in terms of needs and preferences, but they do not differ in productivity. Each client inelastically demands one unit of commercial space. Commercial rent in a given jurisdiction is increasing in the quantity of clients Q_i located there:

$$r_i = r(Q_i), \ r' > 0.$$

The producer surplus associated with this upward-sloping supply curve is part of local income. After the clients have arrived, the N identical firms in each jurisdiction hire workers in anticipation of serving clients. To maintain the simplicity of the bargaining problem between any firm and worker, we assume that each firm correctly anticipates serving $q_i \equiv Q_i/N$ clients and interviews q_i workers, without either firms or workers having a second chance to match.[25] As before, the firm negotiates with each worker a contract that specifies $p^0 = p_i$.[26] After

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[24]Djankov et al. (2002) find that the monetary cost of satisfying government regulatory requirements to establish a new business in the United States is less than one-half of one percent of per capita GDP.

[25]We assume away integer problems.

[26]Here we have simply applied Result 4. In doing so, we have not allowed for the possibility that firms might compete for clients by raising p^0 above p_i. Recall, however, that by Result 3 we

completing its hiring, each firm accepts q_i clients. Every client-firm-worker relationship then unfolds as before.

Each client chooses the jurisdiction that maximizes her expected net income $y_{Ci} - r_i$, where y_{Ci} is the expectation of $v_C^*(p_i, k)$ taken over the distribution μ_i of k. In equilibrium, therefore, it must be that

$$y_{Cj} - r(Q_j) = y_{Ci} - r(Q_i), \ j \neq i; \ \sum_{i=1}^{n} Q_i = Q.$$

Using this equilibrium condition, we see that $y_{Ci} > y_{Cj}$, implies $Q_i > Q_j$. From Result 5, we also see that if $p_i > p_j$, then $y_{Ci} > y_{Cj}$ for a given μ. This yields

Result 6: Comparing jurisdictions that differ only in their enforcement of non-competes, the number of clients will be higher where these agreements are less enforced (that is, where p_i is higher).

It follows that jurisdictions with higher p_i will have greater employment in professional and business services and greater total output of professional and business services. The next result implies that greater efficiency in processing business startups brings about the same outcome:

Result 7: Assume that $2x_E(p, k) - x_C(p, k) - x_F(p, k)$ is decreasing in k. Suppose that, for two otherwise identical jurisdictions i and j, μ_j favors higher values of k than does μ_i, by first-order stochastic dominance. Then $y_{Ci} \geq y_{Cj}$.

Proof: To prove this result, it is sufficient to show that $v_C^*(p^0, k)$ is decreasing in k. This is

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have $v_F^*(p^0, k)$ everywhere strictly decreasing in p^0, for all k. If the elasticity of the number of firm clients with respect to p^0 is low, the firm is worse off for any $p^0 > p_i$ even though it attracts more clients. A low elasticity could be justified in a richer model in which services are differentiated across firms and clients have heterogeneous preferences over services.

demonstrated using essentially the same steps described in the proof of Result 5, but considering k instead of p^0. ∎

If workers are liquidity constrained, variation in p_i leads to additional differences between jurisdictions. In particular, the following Corollary can be derived directly from Corollary 1:

Corollary 2: Suppose that $m = 0$. Then the expected number of entrepreneurs per client and the expected value of output per client increases with p_i:

Since employment in professional and business services equals the number of clients, the rate of client-based entrepreneurship (ratio of entrepreneurs to workers) in professional and business services is higher in jurisdictions with weaker enforcement of non-competes. Similarly, productivity (output per worker) in professional and business services is also higher in these jurisdictions. Note that greater efficiency in processing business startups also produces these differences across jurisdictions, whether or not workers are liquidity constrained.

We conclude this section with the implications of our analysis for government policy. Denote the sum of expected payoffs to the three parties to a client-firm-worker relationship in jurisdiction i by y_i. We have seen that the efficient level of y_i (and the efficient rate of entrepreneurship) is achieved for any p_i if workers are not liquidity constrained, and for $p_i = 1$ when workers are liquidity constrained. We can now also consider the efficient allocation of clients across jurisdictions. Consider in particular the simple case where μ_i is the same across jurisdictions, so that the efficient level of y_i is equal across jurisdictions. It is then easily shown that, when this efficient level of y_i prevails, total expected income from all client-firm-worker relationships plus total producer surplus of all landlords that rent to clients is maximized when

clients are allocated equally across all jurisdictions (hence $Q_i = Q/n$).[27] This in turn only

happens when p_i is equal across all jurisdictions:

Result 8: Let $\mu_i = \mu$ for all i. The necessary and sufficient condition to maximize total expected income from all client-firm-worker relationships plus total producer surplus of all landlords that rent to clients is $p_j = p_i$, for all $j \neq i$, when workers are not liquidity constrained, and $p_i = 1$ for all i when workers are liquidity constrained.

To achieve efficiency, policies regarding enforcement of non-competes must be

harmonized across jurisdictions even when workers are not liquidity constrained, because these

policies affect the location decisions of clients through their effects on the distribution of

expected payoffs from client-firm-worker relationships. Clients do not internalize all of the

benefits of the decision to locate in a particular jurisdiction, because this includes benefits to

firms and workers who, in our model, do not contract with clients until location choices are

made.

5. Extension with Human Capital Investment

Our model shows how contractual distortions (namely limited liquidity) and ex ante

incentives to impose restrictive employment covenants lead to inefficient outcomes after

renegotiation. Our results support reducing the enforcement of restrictive covenants such as

non-competes. The opposite conclusion follows from common intuition about the firm's

incentives to invest in the worker's human capital (Becker, 1964; Mincer, 1974). In the familiar

story, a restrictive covenant may enhance a firm's incentive to make a general human capital

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[27]This follows from the fact that the supply curve for commercial space is upward sloping ($r' > 0$).

investment in a worker, because otherwise part of the return of its investment will accrue to other firms to which the worker may be joined in the future. One could therefore expect a trade-off, where enforcement of restrictive covenants is warranted if the human capital consideration clearly dominates. However, the problem of human capital investment itself interacts with the worker's liquidity constraint. In fact, the liquidity constraint can interfere with the firm's ability to recover the benefits of its investment in the event of separation, in which case the policy indications from our basic model continue to hold in the setting in which the firm has an investment choice. We next develop a version of the model with human capital investment to demonstrate these points.

We expand the model to add an additional productive task that the worker takes at Date 3. Its benefit is determined by an investment that the firm makes at Date 1/2, occurring between Date 0 and Date 1. For simplicity, we assume that this task is independent of the standard and specialized services described in the basic model. Also, we assume that the benefit of this additional task is received by the worker's employer. This is the firm in the event that the parties stay together, and it is the entrepreneur herself in the event that the parties separate. Thus, the additional task is not necessarily a service to the client.[28] Let the firm's Date 1/2 investment choice be denoted $I \geq 0$. The cost of investment is $g(I)$ and the benefit of the investment is I.

Assume that $g(I)$ is increasing and convex, with $g(0) = 0$, $1/3 > g'(0) > 0$, and $g'(I) > 1$ for I sufficiently large. Clearly the socially optimal investment I^* solves $g'(I^*) = 1$. Given the worker's threat to separate at Date 2, it will not be possible for the firm to extract the full

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[28]The logic to follow does not depend on the additional task being unconnected to the client, but this assumption keeps the extension simple.

marginal benefit of its investment. In fact, the most that the firm will capture is one-third of the marginal benefit, because the firm anticipates receiving one-third of the surplus from negotiation in Date 2. (The disagreement point is separation, in which case the firm obtains none of the benefit.) Thus, investment will surely be below the efficient level. The question is how to enhance the firm's investment incentives within this region.

We suppose that a restrictive covenant binds the entrepreneur's ability to perform the additional task just as it binds the entrepreneur's ability to serve the client. To capture this effect, we assume that the entrepreneur will obtain at Date 3 a benefit of $p'I$ from the additional task in the event that the parties separate with contract p' in place. Separation then yields the following values to the entrepreneur, client, and firm, respectively: $x_E(p', k) + p'I$, $x_C(p', k)$, and $x_F(p', k)$. If the parties stay together then they divide the value $1 + I$.

Analysis of the extended model proceeds as it did in the basic model, starting with the outcome of bargaining at Date 2 for a given p^0 and k. Applying the Nash bargaining solution, the parties negotiate to achieve continuation payoffs of (v_W, v_C, v_F) with the objective of solving:

$$\max\ (v_W - x_E(p^0, k) - p^0 I)(v_C - x_C(p^0, k))(v_F - x_F(p^0, k))$$

subject to: $\quad v_W + v_C + v_F = 1 + I$ (together) or $v_W + v_C + v_F = X(p', k) + p'I$ (separate);
p' is between $\underline{p}$ and 1; and
in the event of separation, $v_W \geq x_E(p', k) + p'I - m$.

Let $v_W^*(p^0, k, I)$, $v_C^*(p^0, k, I)$, and $v_F^*(p^0, k, I)$ be the values that solve this maximization problem, and let $y_W(p^0, I)$, $y_C(p^0, I)$, and $y_F(p^0, I)$ be the expected values over k.

Equating the firm's and client's surplus shares leads to the simplified expression of the bargaining problem between the worker and (as a unit) the client and firm, where the objective function is

$$(v_W - x_E(p^0, k) - p^0 I)(1/4)(v_C + v_F - x_C(p^0, k) - x_F(p^0, k))^2$$

and we have the additional constraint $v_C - x_C(p^0, k) = v_F - x_F(p^0, k)$.

Note that $y_W(p^0, I)$, $y_C(p^0, I)$, and $y_F(p^0, I)$ are the parties' expected continuation values from the beginning of Date 1. At Date 1/2, the firm chooses I to maximize $y_F(p^0, I) - I$. At Date 0, the firm and worker agree to a value of p^0 that maximizes the firm's expected continuation value from this date, because the firm has all of the bargaining power then. Because essentially the firm selects both p^0 and I, we can proceed with the analysis as though the selections of p^0 and I are simultaneous, chosen to maximize $y_F(p^0, I) - I$.

The logic of the basic model carries over to this extension. In fact, with suitable adjustments to incorporate the investment level I as an argument in the various value functions, Results 1-4 continue to hold. Result 1 applies as stated before, except efficiency is now achieved conditional on any given level of I. The only modifications required for Results 2 and 3 are that the statements apply for any fixed I and that $\underline{k}$ is redefined to be the function $\underline{k}(I)$ given by the identity

$$X(1, \underline{k}(I)) + p^0 I = 1 + I.$$

The proofs proceed as before, but with $x_E(p^0, k) + p^0 I$ now in place of $x_E(p^0, k)$. Result 4 is unchanged, but its proof now entails the extra step of noting that comparisons across values of p^0 hold for every I. For instance, under the assumption that $x_C(p, k) + x_F(p, k)$ is decreasing in p, we know from Result 3 that $y_F(p^0, I)$ is decreasing in p^0 for every I, and so maximizing $y_F(p^0, I) - I$ requires choosing $p^0 = \underline{p}$ regardless of what turns out to be the optimal investment I. Corollary 1 holds without modification.

In the key cases of $m = 0$ and m large, the firm and worker optimally use the most

restrictive covenant by setting $p^0 = \underline{p}$. Therefore the firm's optimal investment choice is that which maximizes $y_F(\underline{p}, I) - I$. We next show that this restrictive covenant provides the greatest inducement for investment and so, if we consider the investment choice in isolation, then it is socially optimal to enforce restrictive covenants (setting $\underline{p}$ as low as is possible).

Result 9: For the cases of $m = 0$ and m large, $y_F(p^0, I)$ is submodular, meaning that lowering p^0 has the effect of increasing the marginal value of I to the firm and therefore increasing the firm's optimal investment. Furthermore, the marginal value of I to the firm is less than 1, so society wants at least as high an investment as does the firm.

Proof: The result follows from the calculations of the cross partial derivative of $y_F(p^0, I)$ in the different cases of Date 2 interaction across the values of k. ∎

Result 9 states that the socially optimal investment level exceeds what the firm will select, and that the firm's investment choice increases as p^0 goes down. We have established already that the firm and worker will choose $p^0 = \underline{p}$, because this allows the firm to extract the greatest value from the worker and client. The added benefit is that this most restrictive covenant induces greater investment than would any less restrictive covenant. A policymaker interested only in the investment problem would optimally set $\underline{p} = 0$. This conclusion relates to the familiar intuition regarding investments in general human capital.

However, social welfare depends not just on induced investment but also on separation decisions and the clients' location choices. The trade off between providing incentives for investment and providing conditions for efficient separation is highly sensitive to whether the worker is liquidity constrained. Suppose, for instance, that m is large so there is no liquidity constraint. In this case, parties at Date 2 will separate if and only if it is efficient to do so. Optimal policy requires equal enforcement standards across jurisdictions, as discussed in the

previous section (Result 8), but the shared enforcement standard is no longer indeterminate because of the effect on the firms' investment choices. The optimal policy sets $p_i = 0$ for all i.

Next take the liquidity constrained case, where $m = 0$. It might at first seem optimal to set $p = 0$ because this gives the greatest incentive for the firm to invest. However, such an enforcement standard also causes inefficiencies in the separation choice. These inefficiencies feed back on the investment decision in two ways. First, parties will not renegotiate restrictive covenants when they separate (because the worker cannot pay to the firm his benefit of being released from the restrictive covenant, which includes the value I), and so in such a contingency the firm obtains no returns on its investment. Second, parties will sometimes fail to separate when it would have been efficient to do so, and in such a contingency the firm gets a third of the investment benefit in the negotiation to stay together. If the first consideration dominates the second, then the positive effect of restrictive covenants on investment is small and the best policy favors achieving efficient separation ($p_i = 1$ for all i). A sufficient condition for the first consideration to dominate is that, with sufficiently high probability, $X(0, k)$ is large enough to induce separation.

The following result summarizes the conclusions reached in this section. Let $\overline{I}$ solve $g'(\overline{I}) = 1/3$.

Result 10: Suppose the distribution of k is the same across jurisdictions. If m is sufficiently large, then the optimal policy sets $p_i = 0$ for all i. Firms invest at level $\overline{I}$ and parties separate if and only if it is efficient to do so. If $m = 0$ then the optimal policy balances the effects on investment and separation choices. A sufficient condition for the latter to dominate, so the optimal policy specifies $p_i = 1$ for all i, is $\text{Prob}_\mu[X(0, k) \leq 1 + \overline{I}] < 3g'(0)$.

Proof: Logic for both conclusions is presented above. Regarding the sufficient condition, note that $X(0, k) > 1 + \overline{I}$ implies that the parties will separate at Date 2, whatever are the actual values of p^0 and I. This is because we know that $I \leq \overline{I}$, X is increasing in p, and the parties must

separate when $X(p^0, k) + p^0 I > 1 + I$. Thus, $\text{Prob}_\mu[X(0, k) \leq 1 + \overline{I}]$ is an upper bound on the probability that the parties will negotiate to stay together. The firm gets one-third of the investment benefit in such a contingency, and so the firm prefers not to make a positive investment if $\text{Prob}_\mu[X(0, k) \leq 1 + \overline{I}] < 3g'(0)$. In this case, the optimal policy is that which leads to efficient separation decisions, which is $\underline{p}_i = 1$ for all i. $\blacksquare$

The sufficient condition in Result 10 is essentially that the joint value of separation, even with a very restrictive covenant, is likely large relative to the joint value of staying together. We have already described (see Section 2 above) why separation can be more productive than staying together when there are no legal obstacles blocking the worker-turned-entrepreneur from serving the client. To consider under what circumstances separation might be more productive than staying together, even when a non-compete covenant is very restrictive, we note that even when courts always choose to enforce non-compete covenants, they typically insist that the covenants "must be reasonable in duration and geographic scope" (Stone 2002, p. 741). The sufficient condition in Result 10 is therefore more likely to hold for categories of business and professional services in which productivity is less harmed by delay and spatial separation. Services for which technology is not rapidly changing and that can be delivered electronically, such as accounting, advertising, and finance, are the best candidates.

6. Restrictive Covenants in Related Models

In considering an investment by the firm in the worker, we chose in the previous section the extension of our model that is most likely to change our conclusions regarding enforcement of restrictive employment covenants. In contrast, Kräkel and Sliwka (2009) argue that it benefits the firm not to impose a non-compete agreement on its employee because the latter then has better incentives to innovate, or more generally to make investments of his own (see also Motta

and Roende, 2002; Baccara and Razin, 2009; and Garmaise, 2011).[29] Thus one cannot presume

that investment or effort decisions necessarily change in any particular direction our conclusions

regarding the merits of enforcing non-compete covenants.[30]

Franco and Mitchell (2008) consider enforcement of non-compete agreements in an

environment in which a firm and worker contract under asymmetric information without

liquidity constraints. In contrast to our results, there is too much separation when non-competes

cannot be enforced, reflecting the inefficiency that typifies bargaining subject to asymmetric

information, whereas when non-competes can be enforced the efficient outcome is always

achieved. The key to the latter result is that enforcement of non-competes is perfect so that

workers have identical outside options (zero) regardless of the realization of their private

information. If enforcement of non-competes were incomplete or less than perfectly certain then

efficiency would not obtain because the different realizations are no longer equivalent.

The kind of liquidity constraint that we posit is present in the work of Lewis and Yao

(2001), who look at restrictions on the "openness" of a workplace as a substitute for monetary

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[29]In our model, the worker's innovation is a byproduct of his interaction with the client, and the firm can neither encourage nor discourage the worker's innovative activity short of preventing him from serving the client. We feel that this is, to a first approximation, an accurate depiction of the situation that exists in most professional and business service activities. For an alternative view, see Rebitzer and Taylor (2007).

[30]Posner, Triantis, and Triantis (2003) examine a model of employment in which the firm makes a general-human-capital investment in the worker. They study a class of contractual forms for which there is a tension between (a) the firm and worker's incentive to expropriate value from outside firms that may employ the worker in the future, and (b) the firm's incentive to invest. They show that the firm and worker may optimally pick a contract that leads to inefficient investment. However, it is not clear whether the tension between (a) and (b), and their results, would disappear if all feasible contracts were considered.

transfers from a worker to a firm.[31] Lewis and Yao focus on the working environment within a firm and how the liquidity constraint causes a distortion in the initial contracting between workers and firms. In contrast, we analyze contractual restrictions that bind entrepreneurial activity by workers after they have departed from firms, and we analyze the renegotiation of restrictive covenants by workers, firms, and clients. We demonstrate how the worker's liquidity constraint distorts the outcome of renegotiation.

Our conclusion that less enforcement of restrictive employment covenants positively affects regional output is in partial agreement with Fallick, Fleishman, and Rebitzer (2003). They emphasize the positive impact on local high-tech industrial output of diffusion of ideas through interfirm worker mobility, following Gilson (1999). They are not concerned with entrepreneurial activity or with endogenizing the choice of restrictiveness of employment contracts by employers and workers, and do not see their mechanism as relevant for determination of regional output outside of high-tech industry.

Further analysis suggests a potential caveat to our sanguine conclusions regarding the impact of lack of enforcement of non-competes on regional competitive advantage. By taking the number of firms in each jurisdiction as given, we abstract from any potential negative impact resulting from the fact that the expected payoffs to firms are decreasing in $\underline{p}_i$. Glaeser et al.

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[31]Lewis and Yao use the term "openness" to refer to the ability of engineers to freely communicate with peers in other firms, as they participate in research and development. In Lewis and Yao's model, engineers value openness because it allows them to identify profitable opportunities to put their knowledge to work in other firms. Firms dislike openness because it implies higher worker turnover and discontinued projects internally. Lewis and Yao argue that, although openness is efficient, it is actively reduced by firms as a way of compensating the firms when engineers cannot make up front transfers due to liquidity constraints. Firms offer more open environments when engineers have a great deal of bargaining power.

(2009) find that metro area employment growth is strongly predicted by smaller average establishment size, and in our model establishment size (clients/workers per firm) would rise if higher $\underline{p}_i$ drove firms away. In the presence of worker liquidity constraints, however, higher $\underline{p}_i$ increases the rate of entrepreneurship and therefore reduces establishment size. The conclusion of Glaeser et al. (2009) that variation in local costs of becoming entrepreneurs is more important than variation in local returns to becoming entrepreneurs in determining establishment size suggests that the latter effect might be stronger, but they do not directly examine regional variation in enforcement of non-competes. Clearly there is a need for additional empirical work in this area.

Finally, the literature also discusses ways to restrain employee mobility that are potential alternatives to non-compete agreements, such as deferred employee compensation (Rebitzer and Taylor 2007).[32] To compare with our model, a complete analysis of any of these potential alternatives would need to address how it functions to (i) extract rents from the client by setting a favorable disagreement point for later renegotiation, (ii) possibly distort the renegotiation process in the case of limited liquidity, and (iii) possibly promote human capital investments as in the previous section. Here we simply note that instruments to restrain employee mobility other than non-competes would also have their limitations. Too large an amount of deferred compensation, for example, would cause the firm to induce separation to avoid paying it, so the utility of deferred compensation depends on being able to distinguish between worker-induced separation and firm-induced separation. A second problem is that a large amount of deferred

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[32]Rebitzer and Taylor (2007) argue that these alternatives are especially heavily used in legal services, where the rights of clients to choose their attorneys effectively bar enforcement of non-competes (see note 5 above).

compensation essentially shifts the liquidity problem from the renegotiation phase (Date 2) to the initial contracting phase (Date 0). That is, the firm might be willing to offer deferred compensation only in conjunction with a payment from the worker at Date 0, but this may be infeasible due to the worker's liquidity constraint.[33]

7. Conclusions

We analyzed a model of professional and business service provision in which clients can choose between locations that differ in enforcement of restrictive employment covenants between firms and workers and in the efficiency with which they process business startups. In this context we focused on the relationship between one firm, one worker, and one client. The worker would like to wrest the value of the client relationship from his employer by setting up his own firm. If, when an employer and worker establish a relationship, they cannot contract on the output and profits of the worker's prospective new firm, the employer counters by inducing the worker to sign a contract that prohibits him from competing or soliciting the current client in the event of termination of employment. The socially optimal level of entrepreneurship will nevertheless be achieved if clients, employers, and workers can renegotiate these restrictive employment contracts and make compensating transfers. If workers cannot finance transfers to employers, however, employers and workers will sign contracts that are too restrictive and produce too little entrepreneurship, and governments can increase welfare by limiting enforcement of these contracts.

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[33]The possible benefit of deferred compensation relative to non-competes is that it may lessen the distortion during renegotiation at Date 2, because the firm's value of staying together is small.

Our paper thus adds to the literature showing that, if there are barriers to "complete contracting," then courts can sometimes improve welfare by not passively enforcing the will of the contracting parties.[34] Our results also contribute to an emerging policy consensus that non-enforcement of non-competes is a way to stimulate entrepreneurship (Acs et al., 2008). The evidence supporting this consensus, however, remains thin and pertains to high-tech manufacturing. Empirical investigation of the relationship between non-compete enforcement and entrepreneurship in professional and business services is clearly needed. A suggestive starting point is the observation we made about current practice in the legal services industry, which our results support.

Many of our results turn out to be robust to whether or not workers are liquidity-constrained. First, firms and workers will agree to make non-compete or non-solicitation covenants as strict as they can. Second, weaker enforcement of these covenants leads firms to pay workers more when the parties stay together. Third, weaker enforcement also attracts clients to locations, generating greater employment and output in their professional and business service sectors. Fourth, locations that more efficiently process business startups not only attract more clients but also have higher rates of entrepreneurship and higher productivity in professional and business services.

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[34]In the models of Aghion and Hermalin (1990) and Anderlini et al. (2011), for instance, distortions arise in contracting because of asymmetric information between the parties. These models show that restrictions on enforceability, by removing some contractual alternatives, can enhance efficiency by changing the manner in which the parties may use contract offers to signal information (removing a pooling or separating opportunity). In our model, verifiability problems disrupt the parties' ability to divide the value of separation, and a lack-of-direct-links externality (Watson, 2012) causes the firm and worker to pick an extremely restrictive contract in order to extract from the client to come.

There are, however, two important differences between our results with and without liquidity constraints. Without liquidity constraints, the decision by a worker and a client to separate from a firm was always accompanied by renegotiation of the worker's contract to assign property rights in the client to him, whereas when the worker is liquidity-constrained renegotiation often fails, leading to (i) the parties staying together when separation would have been efficient, or (ii) the firm taking the worker to court to try to stop him from serving the client as an entrepreneur. The failure of renegotiation leads to the second important difference, which is that by limiting enforcement of restrictive employment covenants, local governments can generate more entrepreneurship and increase the total value generated by each client-firm-worker relationship.

A broader aim of this paper is to integrate the value created by client relationships into economists' thinking regarding determination of income and social welfare. This will only become more important as the service share of GDP continues to grow. Because of conflicting claims to the value created by client relationships that may interact with market failures, (1) the market outcome may not be optimal; (2) the government cannot avoid intervention through the legal system (because of its role in resolving disputes); therefore (3) we need to seek guidelines for that intervention.

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