Employee Poaching, Predatory Hiring, and Covenants Not to Compete

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Abstract

Poaching key employees from close competitors has become a prevalent and controversial issue. This paper examines the condition under which employee poaching can be either predatory or competitive, and discusses its implications for the enforcement of post-employment non-compete agreements. When poaching sufficiently injures the entrant's ability to compete, predatory hiring can occur in the sense that the incumbent would have been unprofitable in the absence of the entrant's exit. Some antitrust implications are discussed.

Keywords: employee poaching, non-compete covenants, predation.

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1 Introduction

"Employee poaching" or "employee raiding" refers to the situation in which a firm targets and hires the key employee(s) of a close competitor. Such employee defection has been a popular concern in a variety of occupations and industries from Silicon Valley to Wall Street. Besides the high-profile cases in the media spotlight, the case law shows that recruiting wars between competitors has become prevalent.[1] In post-employment lawsuits, some anti-competitive concerns have been raised regarding this type of job-hopping as the following quote indicates:

> The SAP lawsuit against the leading front office software maker was filed in a Pennsylvania state court last November. SAP alleged that Siebel engaged in "predatory hiring practices directed at SAP and unfair competition designed to injure SAP's business and damage SAP's ability to compete with Siebel," according to a statement released at the time of the filing. SAP alleged that Siebel unfairly hired 27 of its key employees, including the president [and CEO] of SAP [America], the company's senior vice president of Latin American sales, the vice president for corporate communications, and a host of others from the sales, product and technology units. (*CNET News*, March 17, 2000)[2]

[1] Stone (2001) and Whitmore (1990) show that the number of court decisions involving post-employment non-compete agreements has increased over the last few decades.

[2] To name a few more cases, in 1997 Microsoft raided Borland by luring away 34 key development personnel; in 1999 Amazon hired away Wal-Mart's executives as its chief information and logistics officers; in 2001 and 2005, respectively, Microsoft sued when its executives were hired away as CEO of Crossgain and the head of Google's Chinese operation; and in 2007 Amvescap sued when Deutsche Bank lifted out a team of bond managers and analysts.

Key employees often enter into employment contracts with non-compete clauses or covenants not to compete (henceforth CNC). An employee with this type of contract cannot be hired by a firm that competes with his previous firm based on criteria such as geographical area or a certain period of time after the employment relationship is terminated.[3] Thus, if another firm hires away its key employees, the employer can pursue litigation against defecting employees. In some cases, the parties settle out of court, but in others the courts issue or deny an injunction that prevents the former employee from taking the new job or working on specific tasks.

The courts' aim is to find the optimal enforcement that balances the legitimate business interests of the employer, such as the protection of confidential information, and the economic freedom of the employee, such as the right to choose employers. In most states, the courts have adopted the "rule of reason" approach based on common law to determine the enforceability of CNCs.[4] However, states tend to enforce CNCs differently. For example, California has legislated a public policy that nullifies CNCs with only a few exceptions, and this has caused raiding firms to use the California court as a shield.[5]

From an economic perspective, poaching a rival's high-level executives or highly trained specialists poses a serious threat to the original employer because the defection of key employees not only benefits the poaching firm, it also inflicts substantial damage to the initial

[3]Even if an employee has never signed a non-compete agreement, the 'inevitable disclosure doctrine' can serve as a *de facto* CNC. That is, the court can enjoin the former employee from competing for the reason that he would inevitably use the proprietary knowledge gained at the previous employment for the benefit of the competitor.

[4]The courts usually require reasonable terms both in time and space in order for such covenants to be considered. Covenants are typically no longer than two years, however, this is considered enough time to make the employee's cutting-edge skills obsolete in high-tech industries (Gilson 1999).

[5]California Business and Professions Code 16600 says that "every contract by which anyone is restrained from engaging in a lawful profession, trade, or business of any kind is to that extent void."

employer. That is, when the supply of top talent is scarce, job turnover can directly affect market competition between firms. Thus, in an oligopoly poaching can be used as a strategic tool to injure a competitor's business. This paper addresses how the courts should consider the CNC enforcement issue in light of these implications.

More specifically, we show that poaching can indeed drive a rival from the market. We first present the basic argument in a perfect information model along the lines of "raising the rival's costs" argument. We then extend the model into an uncertain environment, which is a variant of signaling models of predation. The key concept in our approach is the worker-firm match quality, which has been extensively used in the labor economics literature to explain non-strategic turnover in general. The idea in its simplest form is that workers may move to a better-matched firm absent any costs associated with the searching and matching process.

The incumbent's poaching can raise the entrant's costs because the entrant is left with a replacement worker who is second best. If the entrant incurs additional costs due to less efficient personnel, then this has an important implication for the incumbent's strategic poaching decision. That is, the entrant can be forced out of the market due to inefficiencies even though the poaching action would have been unprofitable for the incumbent were it not for the entrant's exit. Under imperfect information, the problem becomes exacerbated because a less well-matched incumbent can pretend to be a high type, so that the entrant is driven out of the market more often.

The claim that companies poach key employees in order to injure or drive out competitors has been put forth in various court cases, but surprisingly the courts have been very conservative on such claims in the case development. Since predatory hiring as well as competitive poaching incentives coexist, enforcement of non-compete covenants may help reduce

the parameter range in which predation occurs. We find that monetary awards are irrelevant to this range as long as firms internalize this transfer into wage bidding. An injunction, however, restricts the new match, thus, *selective* enforcement can reduce the range of predatory hiring.

The remainder of this paper is organized as follows. We discuss the relevant literature in the next section. Section 3 presents and analyzes the model. Section 4 discusses the CNC enforcement issue. Section 5 concludes.

2 Related Literature

The literature on labor turnover or job mobility is extensive. Most research has used job matching models of the sort found in Jovanovic (1979). There is a subset of this literature that specifically deals with employee poaching. Poaching is more relevant in the market for highly skilled workers, where the workers are courted away by outside firms. This process is different from a random-search model in that the labor pool is heterogeneous and in short supply. Also, this market is unlikely to suffer from the "lemons" problem as in the second-hand labor market (Greenwald 1986) because the workers are targeted and sought after.

Lazear (1986) explains why the best workers are stolen away by rivals. In essence, employee poaching occurs when the worker is more valuable to the raiding firm. This occurs when the worker's firm-specific skills have a negative value at the current place of employment. When the two firms are both informed about the worker's productivity, the outside firm is willing to offer a higher wage, and the current employer chooses not to match the

offer. In our model, however, it is also possible that a less well-matched firm poaches the rival's key employees due to the strategic incentive to induce exit.

More recently, Boschmans and Bouckaert (2004) use the distribution of the workers' switching costs to explain poaching. In their model, workers are equally productive at both firms, but the outside firm can profitably poach those with relatively low switching costs. Banerjee and Gaston (2004) assume that the external labor market receives a noisy signal of the worker's productivity, and show that, when making counteroffers is costly, the employer adopts a pooling wage and thus exposes some of its better workers to the risk of being hired away by the outside firm.

Despite popular concerns over predatory hiring, strategic models in labor markets have not received much attention in the literature. Bernhardt and Scoones (1993) examine the related issue of employee preemption.[6] They show that an employer can offer its better-matched workers a preemptively high wage that deters others from bidding wages. This is because the outside firm must incur a fixed cost to assess its match quality with the potential employee, which is not worthwhile when the current employer signals a high match.[7] Our model does not involve any fixed costs and highlights the outside firm's strategic incentive.

There is law and economics literature on non-compete agreements. However, its focus tends to be on the human capital aspects rather than strategic incentives. Rubin and Shedd (1981) argue that CNCs should be enforced to protect the employer's trade secrets but not the general training investment. Posner and Triantis (2001) point out that, when renegotiation

[6] The idea is originally due to Fishman (1988), who shows in a corporate takeover setting that the first bidder can deter the second bidder by offering a preemptivly high bid when its valuation of the target exceeds a certain threshold.

[7] The result is that turnover occurs only in the intermediate range of match quality. This seems, however, difficult to apply to the high-end labor market where the targets are usually well-known, so outside firms are not likely to be deterred from poaching due to some fixed evaluation costs.

is possible, CNCs allow the employer to pass general training costs to the new employer, so that there is an over-investment incentive. In a competitive search model, Moen and Rosén (2004) show that poaching can reduce the general training provision, but it is constrained efficient.

Our analysis builds on Lazear (1986) in that we consider a game between two firms and one worker, and the wage-setting process is modelled as an ascending-price auction. Our contribution is that we set up a model that links employee movement and product-market competition and introduce the insights learned from the strategic entry deterrence and exit literature into this issue (see Ordover and Saloner 1989, and Bolton et al. 2000 for surveys). The basic argument follows the raising of the rival's costs literature, and the model under uncertainty is related to the logic of signaling models of predation.

3 Predatory versus Competitive Hiring

3.1 Full Information

In an oligopoly, poaching a key employee, or a group of them, from a close competitor is likely to have an impact on firm-level profits beyond individual productivity. For example, hiring a top manager can boost the profitability of the new employer, whereas it can also damage the original employer's ability to compete. Consider a key employee of an entrant firm (E), where the worker plays a vital role in maintaining the competitive advantage. There is an incumbent firm (I) competing against the entrant in the product market. The incumbent can potentially hire away the worker from the entrant.

Let $\theta_E \in [\theta_L, \theta_H]$ measure the worker's current match with the entrant, and let $\theta_I \in$

$[\theta_L, \theta_H]$ denote the incumbent's potential match with this poaching target. When the entrant hires a replacement, the new match is denoted as $\theta'_E = \theta_E - \Delta$, where $\Delta \geq 0$ represents the quality depreciation. A higher value of θ means a better worker-firm match, which implies a higher profit other things being equal. In this section, we assume a perfect information environment where all θ's are observable. This can be due to the high visibility of the top talents in the industry with whom employers can easily assess their match.

Without poaching of personnel, each firm expects to receive a gross profit of Π_E^d and Π_I^d, respectively, where d denotes the default payoffs. Each firm employs only one worker and initially pays a wage, w°, which is the market-clearing wage of the relevant labor pool. However, the incumbent can start a bidding war to poach the entrant's worker. The wage-setting process is as follows. The incumbent offers a wage, w_I, which the entrant has the opportunity to match with w_E. The worker is simply assumed to choose whichever firm offers a higher wage.

If the incumbent successfully hires the worker, then the entrant has two options. One is to exit the market, and the other is to stay in.[8] If the entrant exits, then it receives a zero payoff, whereas the incumbent receives a gross monopoly profit, $\Pi_I^m(\theta_I)$, where $\Pi_I^m(\theta_I)' > 0$, that is, the profitability of the monopoly depends positively on its match quality, θ_I. We assume that $\Pi_I^m(\theta_I) > \Pi_I^d$ for all θ_I, that is, even when the worker is a worst match for the incumbent, the monopoly profit is larger then the incumbent's default profit if the wages were zero.

[8] Typically, it is claimed that local or smaller companies are driven out of a particular sub-market, defined either geographically or by the products. For example, "James Pilger lost his full-service salon in Plainview, N.Y., virtually overnight when his top employees went to work for a competitor. Now he works as a stylist in another salon." (*New York Times*, May 5, 2005)

If the entrant stays, then it hires a replacement worker, and the two firms' profits depend on their match qualities with the respective workers. More specifically, the entrant's gross profit, $\Pi_E^s(\theta'_E, \theta_I)$, depends positively on its own match and negatively on the incumbent's match, and vice versa for $\Pi_I^s(\theta'_E, \theta_I)$. The monopoly profit is also larger than the incumbent's gross profit if the entrant stays, that is, $\Pi_I^m(\theta_I) \geq \Pi_I^s(\theta'_E, \theta_I)$ for all θ_I. Finally, we assume that for all θ'_E, $\Pi_E^s(\theta'_E, \theta_I) < 0$ at $\theta_I = \theta_H$.[9] This is necessary for the existence of predation in equilibrium.

The timing of the game is as follows. In the first period, nature determines θ_I, θ_E, and θ'_E. The incumbent decides whether and how much to offer to poach, and the then entrant decides whether to match the offer. If the incumbent fails to poach, then each gets the default payoffs. If the incumbent hires away the target, then the second period ensues with the entrant deciding whether to exit or stay. If the entrant stays, then it hires a replacement, and duopoly profits are realized. The firms pay their wages. In the later section, when non-compete agreements are considered, the entrant can sue the incumbent regardless of its exit decision.

Throughout this paper, we assume two tie-breaking rules to simplify the analysis. One is that the worker stays with the entrant if the entrant matches the outside offer. The other is that the entrant does not match the offer if it is indifferent between matching and exiting the market. Since we consider the full information model to present the basic argument, Subgame Perfect Nash Equilibrium is adopted as the solution concept. Essentially, the entrant has three choices: match the outside offer, exit the market, or replace the worker.

[9] We are deliberately vague about the particular type of oligopolistic competition. However, the properties of these profit functions can be justifiable by a large set of models, such as the Cournot model (see the appendix).

With perfect foresight about future moves, the incumbent makes an optimal wage offer in equilibrium.

The purpose of considering this benchmark is to establish the following two results: First, under perfect information, predation generally exists, but it decreases with the replacement quality depreciation. Second, even when predation does not occur under full information, it can drastically occur under imperfect information, which follows in the next section. Here the predation, or "predatory hiring," is defined as when the poaching would have been unprofitable were the entrant to remain viable, that is, $\Pi_I^s - w_I < \Pi_I^d - w^\circ$.[10] Otherwise, it is called a "competitive poaching."

Proposition 1. For any θ_E and Δ, there exist values, $\bar{\theta}$ and θ', $\bar{\theta} \leq \theta'$, such that in equilibrium the following holds true:

(a) For $\theta_I \in [\theta_L, \bar{\theta}]$, either the incumbent does not poach, or the incumbent poaches and the entrant stays.

(b) For $\theta_I \in [\bar{\theta}, \theta']$, the incumbent does not poach.

(c) For $\theta_I \in [\theta', \theta_H]$, the incumbent poaches and the entrant exits.

Proof of Proposition 1. Consider the subgame starting at the second period. The entrant's profit if it stays is $\Pi_E^s(\theta'_E, \theta_I) - w^\circ$. Since Π_E^s is decreasing in θ_I, for any given θ_E and Δ, the entrant decides to exit if and only if $\theta_I \geq \bar{\theta}$, where $\bar{\theta}$ satisfies $\Pi_E^s(\theta'_E, \bar{\theta}) = w^\circ$. Working backward, at the node where the incumbent has made an offer, w_I, the entrant chooses whether to match this offer, $w_E = w_I$. Given its future move, the entrant's optimal

[10] This is the standard definition in the literature, that is, "a practice is predatory only if the practice would not be profitable without the additional monopoly power resulting from the exit" (Ordover and Willig 1981).

decision is to match any offer up to $w_I < \Pi_E^d$ if $\theta_I \geq \bar{\theta}$ and up to $w_I < \Pi_E^d - (\Pi_E^s(\theta'_E, \theta_I) - w^\circ)$ if $\theta_I < \bar{\theta}$.

Knowing this entrant's decision rule, the incumbent moves first by offering w_I. First, consider the case of $\theta_I \geq \bar{\theta}$. The incumbent would not offer anything more than Π_E^d because by offering $w_I = \Pi_E^d$, the entrant would not match. Let θ' be where $\Pi_I^m(\theta') = \Pi_E^d + \Pi_I^d - w^\circ$. Then the incumbent would be better off by offering $w_I = \Pi_E^d$ and driving the entrant out if $\theta_I \geq \theta'$ since $\Pi_I^m(\theta_I) - w_I > \Pi_I^d - w^\circ$. If $\theta_I < \theta'$, then the incumbent would not be able to profitably poach because the payoff would be smaller than $\Pi_I^d - w^\circ$ if $w_I = \Pi_E^d$, and the entrant would match any offer below Π_E^d.

Second, consider the case of $\theta_I < \bar{\theta}$. The incumbent would not offer anything more than $\Pi_E^d - (\Pi_E^s(\theta'_E, \theta_I) - w^\circ)$ since the entrant would not match $w_I = \Pi_E^d - (\Pi_E^s(\theta'_E, \theta_I) - w^\circ)$. Define a set $P = \{\theta_I \in [\theta_L, \bar{\theta}] | \Pi_I^s(\theta'_E, \theta_I) + \Pi_E^s(\theta'_E, \theta_I) > \Pi_I^d + \Pi_E^d\}$. Then if $\theta_I \in P$, then the incumbent would be better off by poaching since by construction $\Pi_I^s(\theta'_E, \theta_I) - \Pi_E^d + \Pi_E^s(\theta'_E, \theta_I) - w^\circ = \Pi_I^s(\theta'_E, \theta_I) - w_I \geq \Pi_I^d - w^\circ$. If $\theta_I \in [\theta_L, \bar{\theta}] \backslash P$, then the incumbent would not be able to profitably poach because the payoff would be smaller than $\Pi_I^d - w^\circ$ at any offer $w_I \geq \Pi_E^d - (\Pi_E^s(\theta'_E, \theta_I) - w^\circ)$. ■

The above proposition shows that under perfect information the equilibrium can be characterized by the intervals of θ_I, given any values of θ_E and Δ. When θ_I is smaller than a certain threshold, then the entrant stays in the market even if the incumbent hires away the worker. If θ_I is sufficiently high, then the entrant is better off by exiting and at the same time the incumbent's profit increases more than enough to compensate for the higher poaching wage. If θ_I is in the intermediate range, then, although it can drive out the entrant

if it poaches, the poaching wage is too high to profit from the monopolization.

That the incumbent does not poach has two interpretations. One is that the incumbent abstains from making an offer at all, and the other is that the incumbent makes an offer, but it is always matched by the entrant's counteroffer. The incumbent would be indifferent between the two strategies, but in any case the worker will stay with the entrant. Another issue is whether it is competitive or predatory when the worker does leave the entrant. The following proposition says that the entrant's exit is a necessary condition for predatory hiring, but if the entrant stays after poaching, then it must be a competitive hiring.

Proposition 2. For any θ_E and Δ, there exist a value θ'', $\theta'' \geq \theta'$, such that predatory hiring occurs if $\theta_I \in [\theta', \theta'']$. Both θ' and θ'' are non-increasing in Δ.

Proof of Proposition 2. By definition, predation occurs when the incumbent poaches and $\Pi_I^s(\theta'_E, \theta_I) - w_I < \Pi_I^d - w^\circ$. First, suppose $\theta_I < \bar{\theta}$. Then from proposition 1 the incumbent would be better off by poaching if $\theta_I \in P$, where it satisfies $\Pi_I^s(\theta'_E, \theta_I) - w_I > \Pi_I^d - w^\circ$. Thus, if $\theta_I < \bar{\theta}$, then poaching must be competitive. Second, suppose $\theta_I \geq \bar{\theta}$. From proposition 1 the incumbent would be better off by poaching if $\theta_I \geq \theta'$, where θ' satisfies $\Pi_I^m(\theta') - \Pi_E^d = \Pi_I^d - w^\circ$. Since $\Pi_I^m(\theta_I) \geq \Pi_I^s(\theta'_E, \theta_I)$ for all θ_I, $\Pi_I^s(\theta'_E, \theta') - \Pi_E^d \leq \Pi_I^d - w^\circ$. Because $\Pi_I^s(\theta'_E, \theta_I)$ is increasing in θ_I, there exist a value θ'', $\theta'' \geq \theta'$, such that $\Pi_I^s(\theta'_E, \theta'') - \Pi_E^d = \Pi_I^d - w^\circ$. Thus, predatory hiring occurs if $\theta_I \in [\theta', \theta'']$ and competitive poaching occurs if $\theta_I \in (\theta'', \theta_H]$.

Suppose that Δ increases, then the entrant's new match, $\theta'_E = \theta_E - \Delta$, decreases. Note that $\Pi_I^s(\theta'_E, \theta_I)$ is decreasing in θ'_E and increasing in θ_I. The equation $\Pi_E^s(\theta'_E, \bar{\theta}) = w^\circ$ defines the value $\bar{\theta}$, and if θ'_E decreases, the new $\bar{\theta}$ value must fall. The equation $\Pi_I^s(\theta'_E, \theta'') - \Pi_E^d = \Pi_I^d - w^\circ$ defines the value θ'', and if θ'_E decreases, the new θ'' value must also fall. The

equation $\Pi_I^m(\xi) = \Pi_E^d + \Pi_I^d - w^\circ$ defines the value ξ, on which θ'_E has no effect. First, if $\bar{\theta} \leq \xi$ before Δ changes, then it must be $\bar{\theta} < \xi$ after Δ changes, so that $\theta' = \xi$, which is invariant to Δ. Second, if $\xi < \bar{\theta}$ before Δ changes, then there exists small enough value Δ such that $\xi < \bar{\theta}$ after Δ changes. This means $\theta' = \bar{\theta}$, which is decreasing in Δ. ■

Since θ' is greater than or equal to $\bar{\theta}$, which is the threshold for the entrant's exit, predatory hiring must be followed by the entrant's exit. In particular, the values of θ_I for which predation occurs are relatively lower values (i.e., $\theta_I < \theta''$) conditional on the incumbent's poaching action. This is intuitive because if the incumbent's match is very high (i.e., $\theta_I > \theta''$), then the incumbent would still have preferred to poach even if the entrant were to stay in the market. On the other hand, since $\bar{\theta} \leq \theta'$, it follows that even if the incumbent poaches when $\theta_I \leq \bar{\theta}$, the entrant stays and hires a replacement, which by definition is competitive poaching.

However, the comparative statics result regarding the effect of Δ has a more subtle implication. Since both the lower and the upper bound for predatory hiring decreases as Δ increases, the range of θ_I values for which predation occurs may shrink or expand. In particular, this means that, when the entrant's replacement quality depreciates, predation could decrease. This is because, when θ'_E depreciates at the upper margin, θ'', poaching becomes competitive, and at the same time the entrant is driven out of the market at the lower margin, θ'. When the latter effect is smaller than the former, predation reduces when θ'_E depreciates.

This seems a little counterintuitive, but it can be explained by the logic of raising the rival's costs argument. That is, if the entrant's replacement is of lower quality, then poach-

ing tends to be more profitable even if the entrant survives and replaces the worker. The incumbent raises the entrant's costs of replacing the worker without necessarily causing more exit. When the replacement is relatively more competitive, poaching conditional on the exit can be more predatory in the sense that the incumbent would have fared less well were the entrant to stay in the market and hire the replacement.

3.2 Uncertainty

In this sub-section, we assume that the worker-firm match qualities are initially the firms' private information, but an employer's match quality is revealed to outside firms once the employment relationship is established. In terms of our model, the entrant's match θ_E with the worker is revealed to the incumbent, whereas the incumbent's match θ_I with the potential hire is unknown to the entrant. This may be because poaching targets by definition tend to be high-profile visible figures of the firm whom the outside firms already accumulated enough information about.

For the sake of simplicity, we assume that the entrant's replacement match θ'_E is still public information and only consider one-sided uncertainty on θ_I. This is because the incumbent moves first and then the entrant second, so that uncertain Δ does not fundamentally change the analysis.[11] That is, even if there is some uncertainty regarding Δ, no information is updated when the incumbent moves at the beginning. Rather, we assume that that θ_I is a random draw from a distribution F with support on $[\theta_l, \theta_h]$, which implies that the entrant

[11] More specifically, suppose that the players can make small mistakes in figuring out the exact value of Δ, so that the players' payoffs are perturbed and the equilibrium strategies are ε-constrained. Then by a well-known result, the extensive-form trembling hand perfect equilibrium is the unique subgame perfect equilibrium (Selten 1975).

updates its belief about the incumbent's type conditional on wage offer, w_I.

With uncertain θ_I, the entrant could decide to exit at a lower threshold than under perfect information. To illustrate the argument, Perfect Bayesian Equilibrium is adopted as the solution concept. The equilibria is of the following form: If the incumbent's match quality is above a certain threshold, θ^*, then the incumbent poaches the entrant's worker. If it is below the threshold, then the entrant either matches the offer or replaces the worker. That is, the information signaled by the incumbent's poaching wage offer leads the entrant to believe that it would be better off by exiting.

Proposition 3. There exist a threshold value θ^* and an associated wage offer w^* such that in equilibrium the incumbent offers w^* if $\theta_I \geq \theta^*$ and the entrant exits.

Proof of Proposition 3. The entrant's decision at the information set reached at the second period is characterized by its belief on the incumbent's type and its expected profit. In particular, the entrant's exit is a threshold rule on the equilibrium path where the entrant would be induced to exit by the belief that $\theta_I \in [\theta^*, \theta_H]$ and $\int_{\theta^*}^{\theta_H} \Pi_E^s(\theta'_E, \theta_I) \frac{f(\theta_I)}{1-F(\theta^*)} d\theta_I \leq 0$. This is because if there were two disjointed belief sets, $[\theta^*, \theta_1]$ and $[\theta_2, \theta_H]$, where the entrant exits, then it should also exit if $\theta_I \in [\theta^* + (\theta_2 - \theta_1), \theta_H]$, which increases the incumbent's payoff. Since the profit expectation is decreasing in θ^*, there exists a zero expected profit threshold $\dot{\theta}$, such that for any $\theta^* \geq \dot{\theta}$ the entrant will be induced to exit by the belief that $\theta_I \in [\theta^*, \theta_H]$.

For this to be an equilibrium strategy, the incumbent must make an offer that the entrant cannot match and also must be better off by inducing the entrant's exit. Since the entrant knows that it will exit if the incumbent offers w^*, the incumbent must offer at least Π_E^d to

outbid the entrant's counteroffer. However, it may have to bid more than Π_E^d. Let Θ denote where $\Pi_I^m(\Theta) - \Pi_E^d = \Pi_I^d - w^\circ$. There are two cases to consider. First, if $\dot{\theta} < \Theta$, then the incumbent will not want to offer $w^* = \Pi_E^d$ for $\theta_I \in [\dot{\theta}, \Theta]$; $\theta^* \geq \Theta$ in equilibrium. Second, if $\dot{\theta} > \Theta$, then the incumbent for which $\theta_I \in [\Theta, \dot{\theta}]$ must be discouraged from poaching, so that the equilibrium wage offer increases to $w^* = \Pi_I^m(\dot{\theta}) - \Pi_I^d + w^\circ$; $\theta^* \geq \dot{\theta}$ in equilibrium.

Then this is indeed profitable for the incumbent since for all $\theta_I \geq \theta^*$, $\Pi_I^m(\theta_I) - w^* \geq \Pi_I^m(\Theta) - \Pi_E^d = \Pi_I^d - w^\circ$ in the first case, and for all $\theta_I \geq \theta^*$, $\Pi_I^m(\theta_I) - w^* \geq \Pi_I^m(\dot{\theta}) - (\Pi_I^m(\dot{\theta}) - \Pi_I^d + w^\circ) = \Pi_I^d - w^\circ$ in the second case. Finally, for the entrant's off-the-equilibrium belief, there is no restriction, but it can be any belief such that the entrant exits if $w_I > w^*$ and stays if $w_I < w^*$. For example, for any off-the-equilibrium offer $w_I > w^*$, the entrant's belief is that $\theta_I \in [\theta^{*\prime}, \theta_H]$ where $\theta^{*\prime} > \theta^*$, and for any non-equilibrium $w_I < w^*$ the entrant's belief is that $\theta_I \in [\theta^{*\prime\prime}, \theta_H]$ where $\theta^{*\prime\prime} < \dot{\theta}$. ■

Thus, a threshold match quality, θ^*, and a poaching wage offer, w^*, characterize an equilibrium of the model with uncertainty. Since the equilibrium concept does not put any restrictions on the entrant's belief off the equilibrium path, there is a multiplicity of equilibrium threshold θ^*. However, a refinement may intuitively focus on the equilibrium that is most profitable for the incumbent. Since the incumbent first moves by making an offer, it seems reasonable that the entrant expects that the incumbent will poach in the most profitable manner whenever it can, so that the unique equilibrium selects the minimum threshold.

Grossman and Perry (1986)'s credible belief refinement does exactly this. Then the following result establishes that in this unique equilibrium predation can occur even when

it would not occur under perfect information other things being equal. The reason is that at the minimum threshold the entrant's profit would have been strictly positive if it were to stay. This implies that the incumbent's profit in such cases tends to be lower than its current payoff, making predation more likely. This widens the possibility of strategic poaching that a less well-matched rival poaches a better-matched employer to induce exit.

Proposition 4. The equilibrium with credible belief is the perfect equilibrium with the minimum threshold, $\dot{\theta}$. In that unique equilibrium, predation can occur even when it cannot under full information.

Proof of Proposition 4. According to Grossman and Perry's definition, the entrant's optimal strategy at the second-period information sets needs to be specified for any possible beliefs. Being the last one to move, the entrant's exit decision is to exit if and only if the belief is such that $\theta_I \in [\theta_3, \theta_H]$ where $\theta_3 \geq \dot{\theta}$. Suppose that the incumbent has made an offer w^*. For $\theta_I \in [\dot{\theta}, \theta_H]$, the incumbent would be better off to poach if the entrant exits. Consequently, the entrant puts zero weight on $\theta_I \in [\theta_L, \dot{\theta}]$ upon observing w^*. On the other hand, if this is the entrant's belief, then it would exit, and this choice indeed makes it profitable for the incumbent $\theta_I \in [\dot{\theta}, \theta_H]$ to poach.

It follows that the only consistent belief at the entrant's information set is to put zero weight on $\theta_I \in [\theta_L, \dot{\theta}]$. Hence, the entrant's only possible choice is to exit if it observes w^*. As for the incumbent's strategy, it must be a best response to the entrant's action. As the entrant's credible belief is as above, this establishes the minimum threshold as the unique equilibrium. If there is no predation under full information, then it suffices to consider $\bar{\theta} = \theta''$ from above. Suppose also $\Theta < \bar{\theta}$ from above. With uncertainty, one can take a threshold

θ^* such that $\Theta < \theta^* < \bar{\theta}$. Then by definition predation exists where $\theta_I \in [\theta^*, \theta'']$. Since the minimum threshold $\dot{\theta}$ is smaller than θ^*, it follows that the predation occurs with an even larger probability in the unique equilibrium. ■

4 Non-compete Enforcement

4.1 Analysis

Note that in our model, when the incumbent poaches the worker, its intention is either predatory or competitive. This means in particular that even if the entrant is driven out of the market, it is not necessarily a predation. The discussion in this section on antitrust claims is therefore mainly concerned with the range of θ_I values where predation occurs, and how the courts might be able to reduce this range. Since the above two models yield basically the same equilibrium characterization, except for the differences in the threshold level, the following results go through in both cases.

In the model under full information, consider the possibility that, if the incumbent hires away the worker, the entrant can sue the incumbent on the basis of non-compete agreements.[12] Non-compete clauses may or may not be enforceable, and we consider two types of legal enforcement of post-employment non-compete agreements. First, in the case of granting injunctive reliefs, the court can prevent the worker to a varying degree from assuming relevant duties at the new firm. We assume that in such a case the incumbent's match with the worker decreases by $\gamma \geq 0$.[13]

[12] The employer can also sue on the basis of business tort claims that the competitor used unfair or deceptive means to injure its business. However, the success of such claims often depends on the validity of the restrictive covenant itself (Anensonn 2005).

[13] An injunction cannot forbid the worker from leaving the employer. The doctrine of specific performance

Second, the courts can also award monetary damages, D, that the incumbent must pay to the entrant, with some commonly known probability q. For our purpose, only the expected penalty, $d \equiv qD$, would matter. This can also be a "pay-back" system designed to transfer d, or even the expected settlement through private negotiation.[14] The following result is intuitive. As long as both parties rationally take into account the expected transfer by internalizing it into their wage bid and counteroffer, there is no effect on the range of predation probability.

Proposition 5. Enforcement of CNC in the form of monetary damages does not affect the probability of predatory hiring.

Proof of Proposition 5. Regardless of its exit decision, the entrant expects to gain d additionally. For example, the exit decision is based on the zero-profit condition, $\Pi_E^s(\theta'_E, \theta_I) - w^\circ + d \leq d$, so the same threshold applies, $\bar{\theta}^d = \bar{\theta}$, where the superscript d means the case of damage awards. First, conditional on the entrant's exit, the incumbent poaches when $\Pi_I^m(\theta_I) - w_I^d - d > \Pi_I^d - w^\circ$. Note that the entrant's maximum willingness to match is $\Pi_E^d - d$, so that $w_I^d = \Pi_E^d - d$. Thus, the threshold $\theta'^d = \theta'$ remains unchanged. Second, poaching is predatory if $\Pi_I^s(\theta'_E, \theta_I) - w_I^d - d < \Pi_I^d - w^\circ$. For the same reason, the threshold $\theta''^d = \theta''$ remains unchanged. ■

The monetary sanction increases the original employer's profit by d conditional on poaching, thus, in a sense compensates the loss of the key employee to the competitor. However,

holds that the law will not force the worker to continue to work for the old employer in the case of breach of labor contract.

[14] Due to the courts' deep-rooted hostility towards the restraints of trade, some states (e.g., Colorado, Florida, and Louisiana) have proposed and statutorily authorized employers to require "pay-back" agreements that employees who depart within a certain duration of hire repay the cost of their training.

since, when the incumbent's offer decreases, the entrant's counteroffer also decreases, the payment is irrelevant to the decisions at the margin. Essentially, CNC in this case allows the incumbent to hire away the worker at a lower wage by committing to kick back the wedge to the entrant in the form of monetary awards. The entrant may benefit from such system, but it does not address the antitrust concerns.

Instead, the courts can consider issuing an injunction to reduce the range of predatory hiring. Let γ be the extent of such restrictions on tasks that can be performed, or information and skills that can be used at the new employment. Since the incumbent's match quality decreases to $\theta_I - \gamma$, this affects the threshold values, and to be specific it increases all thresholds by γ. This implies that *uniform* enforcement of CNC has no effect on the measure of preying firms, either. That is, if the courts enforce CNC in all cases, then this induces additional predatory hiring at the high margin although it also prevents some predation at the low margin.

Instead, a *selective* enforcement of CNC can be more useful. A selective enforcement is formally defined as $\gamma = 0$ if $\theta_I \in [\theta'', \theta_H]$, and $\gamma > 0$ otherwise. This can be implemented in a two-step process: First, conditional on exit, the court should discern between predatory versus competitive cases. Second, the court issues injunctions only in predatory cases. This procedure resembles the current legal practice, but it is different in substance as we explain below. In the case of uncertainty, the following result also goes through. The difference is that with uncertainty uniform enforcement may even increase the predation probability.

Proposition 6. Selective enforcement of CNC in the form of injunctive relief reduces the probability of predatory.

Proof of Proposition 6. Let $\theta_I^\gamma \equiv \theta_I - \gamma$ denote the incumbent's match, where the superscript γ means the case of injunctions. Then the threshold for the entrant's exit is based on the zero-profit condition, $\Pi_E^s(\theta'_E, \theta_I^\gamma) - w^\circ = 0$. Since $\theta_I^\gamma = \bar{\theta}$, the new exit threshold for θ_I^γ is $\bar{\theta}^\gamma = \bar{\theta} + \gamma$. Conditional on $\theta_I^\gamma > \bar{\theta}^\gamma$, γ does not affect the entrant's maximum willingness to match. Thus, the incumbent poaches when $\Pi_I^m(\theta_I^\gamma) - w_I^\gamma > \Pi_I^d - w^\circ$, where $w_I^\gamma = \Pi_E^d$. The new threshold is higher exactly by γ, i.e., $\theta'^\gamma = \theta' + \gamma$. Poaching is predatory if $\Pi_I^s(\theta'_E, \theta_I^\gamma) - w_I^\gamma < \Pi_I^d - w^\circ$. Since $w_I^\gamma = \Pi_E^d$, the new threshold is again higher exactly by γ, i.e., since $\theta_I^\gamma = \theta''$, $\theta''^\gamma = \theta'' + \gamma$. Then it is straightforward that the selective enforcement would increase $\bar{\theta}^\gamma$ and θ'^γ, while θ''^γ is held constant. ■

4.2 Antitrust Implications

Employers have brought claims against defecting employees and their new employers under both federal antitrust law and state common law, alleging that the former employee and the competing firm engaged in unfair competition with the intent to eliminate the competition. The most cited precedent is the *Pick-Barth* doctrine (1932), where the court found such conspiracy a per se violation of section 1 of the Sherman Act. Since then, however, antitrust claims have been considered only in limited circumstances where the elimination of the former employer was the primary intent of the poacher.

For example, in *duPont Walston, Inc. v. E. F. Hutton & Company, Inc.* (1973) and in *Tower Tire and Auto Center, Inc. v. Atlantic Richfield Co.* (1975), the courts found that a mere conspiracy to cripple the rival's business did not amount to a per se antitrust violation. That is, it is not enough that the poacher had a clear intent to injure the employer, but the plaintiffs must prove that the primary intent was to eliminate them completely. This had

a chilling effect on antitrust claims, but the claims have been used to subsequently achieve injunctions or favorable settlements (Janssen 1976).

In *Universal Analytics, Inc. v. MacNeal-Schwendler Corp.* (1990), the Ninth Circuit re-examined the predatory hiring claim, that is, that the competing firm aimed to destroy the employer's business by hiring away its key employees. The court strictly adhered to the 'sole-purpose test' again stating that as long as the employees are put to work, then it cannot be seen as having the sole purpose of gaining or maintaining the monopoly power but also recruiting skilled workers for itself (Bui-Eve 1997). Reflecting on our analysis, the current judicial standard seems to underestimate the strategic predation possibilities.

That is, poaching of key personnel not only injures the former employer due to the imperfect substitutes, but it can also lead the employer to leave the market because the initial employer sees that the poaching firm with its former employee would outperform them, so that it is better off by exiting. In practice, it might be easy to pass the sole-purpose test by simply putting the worker to some work, which is the case in our model. Such a test to refute antitrust claims can significantly downplay the predatory intent of the poaching firms.

The courts' injunction seemingly provides a clear-cut remedy for the original employer being preyed upon. However, the current judicial criteria for granting an injunction is basically that the former employee has some trade secrets of the initial employer, which if revealed would seriously damage its business. Thus, the courts' rationale of issuing an injunction is to protect the investment in valuable assets. This is substantively different from our analysis, which is mainly based on the worker-firm match qualities regardless of the possession of trade secret.

Possessing the former employer's confidential information does not necessarily mean that the new worker-firm match is bad, which makes predation more likely. Instead, our strategic model shows the possibility that conditional on exiting if the new match is bad, then it could be predation even without trade secrets. Hence, the focus or the judgement criteria in the first step of the selective enforcement should be on the relative matches. This suggest some additional evidence to look for when the courts try to discern predatory from competitive cases

As the Ninth Circuit held in *Eli Lilly & Co. v. Medtronic, Inc.* (1989), significant monetary rewards not commensurate to the employee's skills can be circumstantial evidence of predatory hiring, and there may be other set of facts that are more consistent with predatory hiring than competitive poaching. In our model, excessive compensation could occur because the firms are bidding on the worker's wages based on his leverage on firm-level profits rather than paying on the basis of individual merit. However, this behavior is consistent with both types of employee poaching.

Our analysis suggests that if the new match is substantially less than the previous match, then conditional on the entrant's exit, the incumbent is likely to have preyed. For example, if the entrant is driven out of the market and the incumbent is not doing great, for example, in terms of profits, then it is an indication of a poor match. Similarly, if the worker is put to work on unrelated tasks, demoted, or fired subsequent to the exit, then it could serve as evidence of predation. Thus, unless the incumbent has some clear reason to value the worker much more than the former employer, antitrust concerns should be given more consideration.

5 Conclusion

Employee poaching in highly skilled labor markets has been a growing concern for many industries. Society must not obstruct the efficient flow of workers to where their skills are most productive, but at the same time it should be concerned about the potential damages from predatory hiring. This goes beyond the traditional tradeoff between the freedom to change jobs and the protection of proprietary information. Just as the economic literature on predatory pricing has shed light on competition policy, the courts may benefit from strategic models of predatory hiring and post-employment restrictions.

This paper emphasizes the role of match qualities between the worker and his current and prospective employers. We have shown that a less well-matched incumbent can poach the key employees of the entrant in order to drive the entrant out of the market. This is because imperfect substitution of key personnel raises the entrant's costs, which induces the exit. This problem is exacerbated with the uncertainty over the potential match. Restrictive injunctions can reduce potential antitrust injuries provided that the courts put forth a reasonable effort to screen predatory from competitive hiring.

6 Appendix

Cournot Model. Suppose that two firms, A and B, are Cournot competitors, and a higher match quality represents a lower constant marginal cost of production, e.g., $c = \frac{1}{\theta}$. Let $\theta \in (1, \infty)$, so that $c \in (0, 1)$. Assuming the demand function, $P = 1 - Q$, it is straightforward to show $\pi_a = \left(\frac{1+c_b-2c_a}{3}\right)^2$ and $\pi_b = \left(\frac{1+c_a-2c_b}{3}\right)^2$ if $2c_a - 1 \leq c_b \leq \frac{1+c_a}{2}$; $\pi_a = \left(\frac{1-c_a}{2}\right)^2$ and $\pi_b = 0$ if $\frac{1+c_a}{2} < c_b$; and $\pi_a = 0$ and $\pi_b = \left(\frac{1-c_b}{2}\right)^2$ if $c_b < 2c_a - 1$. Thus, π_a is nondecreasing

in c_b, or nonincreasing in θ_b, and vice versa for π_b. Also, for an appropriately chosen range of avoidable fixed-cost parameter F, it must be that $\lim_{\theta_b \to \infty} \pi_a(\theta_b) < 0$ and $\lim_{\theta_b \to 1} \pi_a(\theta_b) > 0$.

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