# Employee Poaching: Why It Can Be Predatory

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# 1 Introduction

Over the past few decades, the battle for talent has become fierce. A Lexis-Nexis search reveals hundreds of lawsuits every year brought by the former employers against the new (hiring) employers. Much attention has been given to the phenomenon that has come to be known as predatory hiring. For instance, SAP AG, a software firm, sued its rival, Siebel, in 1999 alleging 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 the statement released at the time of the filing. The reason for the lawsuit was that Siebel hired 27 of SAP's key employees, including the president of SAP.

Another example is that in 2007 Amvescap sued Deutsche Bank accusing it of raiding 16 top managers of its fixed income team, which managed about 21 percent of the firm's total asset.[1] The lawsuit said Deutsche's scheme would "threaten to severely cripple" the fixed income group, and once other personnel had resigned "there would be virtually nothing left of the operation." Although anecdotal evidence suggests that predatory hiring is a hotly debated topic, it is a subject on which surprisingly little work has yet been done to clarify why hiring can be predatory. This paper aims to fill this gap by analyzing a simple model of labor poaching in a duopolistic market.

Building on the work of Lazear (1986), this paper presents a model of predatory hiring. I analyze a simple static model, in which two firms compete in the product market as well as in the primary labor market. Drawing on the industrial organization literature, hiring is

[1]Some of the earlier examples include Ernst & Young in 1996 and Microsoft in 1997. In 1996, Ernst & Young hired away over 90 key employees from Coopers & Lybrand; In 1997, Microsoft raided Borland by hiring away 34 key development personnel.

predatory if competitive reasons are not strong enough to explain the hiring decision. That is, predatory hiring is profitable only when the effects of decreased competition are taken into account. Hence, the basic argument is similar to the 'deep-pockets' theory of predation (see, e.g., McGee 1958; Telser 1966). The difference is that in this paper predation occurs through labor market poaching.

Predatory hiring works by making a sufficiently high wage offer that the current employer cannot match. Put simply, an outside firm may poach a rival's employee(s) even if the quality of the worker-employer match is not so good because the value of poaching includes the extra profits obtained should the rival chooses to exit the market. The equilibrium predation does not require incomplete information and signaling (e.g., Milgrom and Roberts 1982; Fudenberg and Tirole 1986). However, when the analysis is extended to the case of asymmetric information, the outside firm can induce the old employer to exit even with a lower match quality, in line with these literatures.

Predatory hiring can be thought of as an example of predatory buying, where a firm pays a higher price for inputs or buys up more units than it needs in order to put rivals at a disadvantage. For instance, in *Weyerhaeuser v. Ross-Simmons Hardwood Lumber Co.* (2007), the defendant allegedly drove Ross-Simmons out of business by bidding up the price of logs. In *United Mine Workers v. Pennington* (1965), large firm owners set a high minimum wage for workers in a clear effort to drive small coal mines out of business. Employee poaching is different in that a firm poaches an essential input specifically from the victim, and I focus on the circumstances in which poaching can have anticompetitive effects.

This paper contributes to the growing literature on competition for scarce resources (see, e.g., Eső et al. 2010; Marx and Shaffer 2010; Song et al. 2010). In particular, Song et al. (2010) consider a model where one firm's acquisition of essential input (pilots in their paper) from the other firm improves the former's marginal cost and also worsens the latter's marginal cost. They show that when the essential inputs are scarce the market evolves into a monopoly with the larger firm buying up the inputs from the smaller firm until the smaller firm has no pilots left. The difference is that in this paper, in contrast to those mentioned above, the possibility of the victim's exit (hence monopolization) is explicitly considered.

This paper is also related to Bernhardt and Scoones (1993) and McCannon (2008), where a preemptively high wage offer deters outside firms from bidding for the key employee. The reason is that outside firms must incur a cost to learn about the worker and its own match quality with the worker. Then the initial employer signals a high match by making a preemptively high wage offer. However, as Lazear (1986) points out, although for some jobs it is difficult for outsiders to learn about the rival's key employees, for others such as those in highly visible managerial positions this informational cost is greatly reduced by reputation and word-of-mouth communication, so that this cost is not prohibitively high.

The model presented in this paper is closest in spirit to that of Lazear (1986). In Lazear's model, poaching occurs only when the worker is better matched to the raiding firm. Therefore, when employers are informed about their match qualities, the outside firm offers a higher wage, which the current employer does not match. This paper extends Lazear's finding by showing that a relatively less well-matched firm can poach the rival's worker in order to damage the rival's ability to compete. The reason for different findings is that in this paper, in contrast to Lazear's model, a worker's worth at different employers are interdependent, so that a firm's own match as well as its rival's match with the worker matters.

Interfirm mobility has received much attention recently as a source of knowledge spillover, which Arrow (1962) also pointed out in his seminal paper. For instance, using patent citation data, a number of authors documented the importance of interfirm mobility in transferring knowledge (see, e.g., Almeida and Kogut 1999; Song et al. 2003; Singh and Agrawal 2011). What the current paper adds to this issue is that the incentives to acquire knowledge (including trade secrets) from the rival can sometimes lead to predatory poaching that causes an irreparable harm to the original employer. Thus, the pros and cons of interfirm mobility need to be considered carefully in practice although this tradeoff is not tackled in this paper.

The remainder of the paper is organized as follows. Section 2 presents the model. Section 3 and Section 4 show when predatory hiring occurs under perfect and asymmetric information, respectively. Section 5 discusses post-employment lawsuits, and Section 6 concludes.

# 2 The Model

Consider two firms, or business units of larger entities, competing in a market. I label one of them as an entrant ($E$) and the other as an incumbent ($I$). Each firm employs a worker essential to its operation. (Here, a worker may represent a group of key employees). Without loss of generality, suppose that one of the firms (i.e., the incumbent) tries to poach the other firm's (i.e., the entrant's) worker. Let $\theta_E$ denote the entrant's match with its worker, and $\theta_I$ denote the match between this worker and the incumbent should he get hired away. Further, let $\theta_I$ with a hat (i.e., $\hat{\theta}_I$) denote the incumbent's match with its current worker. Workers have a reservation wage $w^\circ$, and they choose whichever firm offers a higher wage.

Without poaching, the entrant's and the incumbent's (gross-of-wage) expected profits are $\pi_E^d(\theta_E, \hat{\theta}_I)$ and $\pi_I^d(\theta_E, \hat{\theta}_I)$, respectively. It is assumed that the firm's expected profits increase with its own match and decrease with the other firm's match. Here, as in Song et al. (2010), a higher match can be thought of as a lower marginal cost. If the incumbent successfully hires away the entrant's worker, however, the entrant has two options: It can exit the market, in which case the entrant earns a zero profit. If the entrant exits, the incumbent becomes a monopolist and its expected profits are given by $\pi_I^m(\theta_I)$, where $\pi_I^m(\theta_I) > \pi_I^d(\cdot, \hat{\theta}_I)$.[2] I further assume that $\pi_I^m(\theta_I)$ increases with the incumbent's match with the newly hired worker.

Alternatively, after the incumbent poaches the worker, the entrant may decide to stay in by hiring a replacement worker. The entrant's expected profits are $\pi_E^d(\hat{\theta}_E, \theta_I)$, where $\theta_E$ with a hat (i.e., $\hat{\theta}_E$) denote the entrant's match with the replacement worker. How good a replacement match is would depend on the depth of the entrant's pool of employees. That is, a large firm may easily identify another worker who is just as good as the former employee, whereas a small firm may find it very difficult to hire one. This is because key employees are scarce resources, and firm-specific human capital takes time to build.[3] Hence, I assume $\hat{\theta}_E < \theta_E$ and denote the difference between the old and new match by $\Delta = \theta_E - \hat{\theta}_E > 0$.

The sequence of the moves is as follows. At the beginning of the game, firms draw a match with their respective worker from a distribution $F(\theta)$ defined over $[\theta_L, \theta_H]$. Then the incumbent decides whether to poach and, if so, costlessly draws a match with the entrant's worker.[4] If the incumbent makes an offer, the entrant has an opportunity to match the

[2] That is, if the incumbent successfully poaches the entrant's worker, then it replaces the current match ($\hat{\theta}_I$) with the new match ($\theta_I$). If the incumbent fails, however, it is the current match ($\hat{\theta}_I$) that influences the incumbent's duopoly profits.

[3] For instance, when Google hired Kai-Fu Lee from Microsoft as the president of Google China, human resource experts pointed out that, although China has a population of 1.3 billion, there are very few mainland Chineses with more than 15 years relevant work experience and almost none with more than 20, most of whom have no overseas experience and lack intercultural understanding and communication abilities (Santonocito 2005).

[4] Even if this cost is positive, but sufficiently small, the results in this paper would remain unchanged.

outside offer before the worker decides whether to stay or leave. If the worker quits the job, then the entrant must decide whether to exit or not. If it stays in, then the entrant draws a replacement match and competes. If it exits, then the incumbent monopolizes the market. Finally, profits are realized, and the game ends. For simplicity, there is no discounting between stages.

For this model to generate nontrivial anticompetitive effects of poaching, the victim has to be sometimes better off and sometimes worse off by having its key employees poached by the rival. Thus, I make the following assumptions about relative match values: $\pi_E^d(\hat{\theta}_E, \theta_H) < w^\circ$ and $\pi_E^d(\hat{\theta}_E, \theta_L) > w^\circ$ for all $\hat{\theta}_E$. That is, the incumbent's lowest possible match ($\theta_I = \theta_L$) with the worker could benefit the entrant in duopoly competition, but the highest possible realization ($\theta_I = \theta_H$) can drive the victim out of business. Finally, I assume that there are two or more replacement candidates, so when negotiating the wages the firm has all the bargaining power. This simplifies the analysis, but it does not change qualitative results.

# 3 Benchmark Analysis

In this section, I assume that all matches are public information. Hence, the solution concept in this section is subgame perfect Nash equilibrium. Consider the subgame when the incumbent has poached the entrant's worker. If the entrant stays in, then its expected profits are $\pi_E^d(\hat{\theta}_E, \theta_I) - w^\circ$, where the entrant hires a replacement worker and pays his reservation wage. Since $\pi_E^d(\hat{\theta}_E, \theta_I)$ is decreasing in $\theta_I$, there is a value $\bar{\theta}$ such that the entrant decides to exit if and only if $\theta_I \geq \bar{\theta}$, where $\bar{\theta}$ satisfies $\pi_E^d(\hat{\theta}_E, \bar{\theta}) = w^\circ$. Notice that $\bar{\theta}$ lies strictly between $\theta_L$ and $\theta_H$. Taking one step backwards, this would affect how much the entrant is willing to match the incumbent's outside offer, which we denote by $w_I$.

Specifically, given its future move, the entrant's optimal decision is to match an outside offer up to $\pi_E^d(\theta_E, \hat{\theta}_I)$ if $\theta_I \geq \bar{\theta}$, and up to $\pi_E^d(\theta_E, \hat{\theta}_I) - (\pi_E^d(\hat{\theta}_E, \theta_I) - w^\circ)$ if $\theta_I < \bar{\theta}$. That is, if $\theta_I \geq \bar{\theta}$, then the entrant is willing to match an offer up to its expected profits, and if $\theta_I < \bar{\theta}$, this amount is reduced by the entrant's fallback payoffs from staying in the market. Now consider the incumbent's (i.e., hiring firm's) incentives. Since the incumbent knows the entrant's maximum willingness to match, if $\theta_I < \bar{\theta}$ then the incumbent can successfully poach the worker by making a wage offer that is slightly higher than $\pi_E^d(\theta_E, \hat{\theta}_I) - (\pi_E^d(\hat{\theta}_E, \theta_I) - w^\circ)$. Thus, the incumbent's problem boils down to the following comparison,

$$\pi_I^d(\hat{\theta}_E, \theta_I) - w_I \lesseqgtr \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ.$$

Proposition 1 describes the nature of poaching when there is no change in market structure.

*Proposition 1.* Suppose the entrant stays in the market after the incumbent hires away the worker. Then the poaching must be efficient.

The above proposition puts a high bar that any predatory hiring claims need to clear if the information structure is perfect. That is, unless the old (suing) firm is driven out of the market, the outside firm's hiring increases the total surplus, that is, the sum of the two firm's expected (gross-of-wage) profits. In the next section, however, I show that this need not be true under asymmetric information. For now, let me proceed to the case where the incumbent knows that the entrant would exit the market if it hires away the worker (i.e., when $\theta_I \geq \bar{\theta}$). To successfully poach the worker, the incumbent has to offer at least $w_I = \pi_E^d(\theta_E, \hat{\theta}_I)$. The next result is that the incumbent has an incentive to poach and profitably monopolize the market.

*Proposition 2.* There is a value $\theta'$, $\theta' \geq \bar{\theta}$, such that an equilibrium exists in which the incumbent poaches and the entrant exits if $\theta_I \geq \theta'$.

If the incumbent's match is above the certain threshold $\bar{\theta}$, then there are tradeoffs in making the decision to poach. On the one hand, since the entrant is willing to match an outside offer up to all its expected profits, this increases the wage offer to successfully poach the entrant's worker. On the other hand, if the poaching is successful, the incumbent knows that the entrant will exit the market, so the incumbent takes into account the added benefit from monopolization. The above proposition tells us that under the model's specification there is a range of parametrization where the incumbent poaches and the entrant exits. Further, if this occurs at a certain value of the incumbent's new match, then it occurs at all levels of $\theta_I$ higher than that.

Notice that Proposition 2 allows for the possibility that the increase in successful wage offer more than offsets the potential gain from reduced competition. Specifically, there could be an intermediate range of parameter value (i.e., $\bar{\theta} \leq \theta_I \leq \theta'$), where although the entrant would be driven out of the market, the wage offer would be too high to justify the potential gain in profit. Therefore, the incumbent poaches only when its match with the worker is sufficiently high. This brings up the question, "How can poaching be predatory if only it occurs when the new match is sufficiently high?" To address this question, I draw on the industrial organization literature and define what constitutes predatory hiring of the rival's worker as follows.

Ordover and Willig (1981) proposed a definition of predation that is "economically sound, judicially workable, and broadly applicable to a wide variety of business practices," of which the well-known cost-based test for predatory pricing is a special case. Specifically, "predatory objectives are present if a practice would be unprofitable without the exit it causes, but profitable with the exit. Thus, although a practice may cause a rival's exit, it is predatory only if the practice would not be profitable without the additional monopoly power resulting from the exit." Therefore, I define poaching as predatory if the incumbent's profits under the counterfactual outcome where the entrant stays in would be lower than its status quo payoffs, that is,

$$\pi_I^d(\hat{\theta}_E, \theta_I) - w_I < \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ.$$

*Proposition 3.* There is a value $\theta''$, $\theta' < \theta''$, such that an equilibrium exists with predatory hiring if $\theta_I \in [\theta', \theta'')$. The upper and lower bounds, $\theta'$ and $\theta''$, are non-increasing in $\Delta$.

Proposition 3 reveals that even with perfect information (hence the entrant observes the incumbent's predation), the incumbent can prey in equilibrium, where the upper and the lower bounds on the incumbent's new match are lower for an entrant with fewer viable replacements. The proposition also shows that the entrant's exit from the market does not constitute sufficient proof of predation. To the contrary, exit-inducing poaching is not predatory if it is a legitimate competitive decision. That is, if the incumbent's match with the worker is sufficiently high (i.e., $\theta_I \geq \theta''$), then the incumbent would poach even if the entrant were to stay in the market because the entrant's worker is a superior match, and it increases the profits.

# 4 Asymmetric Information

I show that the previous section's results hold in a more realistic information environment. To be more precise, in Section 2's base model, I argued that for those in visible key positions it is not difficult for outsiders to learn about their potential match with the key workers by looking at, for instance, appropriate performance metrics. However, one might question whether it is reasonable to assume that the current employer knows what the outside firm thinks its new match with the target worker will be. This may be, in fact, difficult to know. Therefore, this section focuses on the case where the incumbent continues to observe the entrant's match, but the entrant does not know the incumbent's potential match with the target worker.

This changes the model to a signaling game wherein the incumbent signals its match with the entrant's worker through its hiring decision. The appropriate solution concept is thus perfect Bayesian equilibrium, and as usual all equilibria are characterized by the following threshold strategy:[5] If the incumbent's match is above a certain threshold, then the incumbent poaches the entrant's worker. The incumbent's wage offer, $w^*$, together with the decision to poach signals to the entrant that the incumbent's match with the key worker lies in a certain range, so that the entrant updates its belief and optimally decides to exit

[5] It is straightforward to show that no fully revealing equilibrium exists. Suppose, to the contrary, that two incumbent types, $\theta_I^1$ and $\theta_I^2$, offer different wages, $w^1$ and $w^2$, and the entrant exits in equilibrium. Then the type offering a higher wage will have an incentive to pool with the other type to lower the wage bill. Given that the entrant exits, this does not affect its (gross-of-wage) profits, and hence constitutes a profitable deviation.

from the market. Specifically, the entrant would be induced to exit by the belief that $\theta_I$ is above a certain value $\theta^*$ if

$$\int_{\theta^*}^{\theta_H} \left[\pi_E^d(\hat{\theta}_E, \theta_I) - w^\circ\right] \frac{f(\theta_I)}{1 - F(\theta^*)} d\theta_I \leq 0.$$

The left-hand side of the equation is the entrant's expected profits if it decides to stay in the market, in which case the entrant draws a replacement match $\hat{\theta}_E$ by paying him a reservation wage $w^\circ$. The entrant also believes that $\theta_I$ lies between $\theta^*$ and $\theta_H$, and accordingly updates its belief in a Bayesian fashion. If the resulting payoffs are negative, then the entrant decides to exit. Thus, a threshold strategy by the incumbent and the entrant's beliefs constitute equilibrium under asymmetric information. Notice that Bayesian updating puts no restriction on the entrant's beliefs off the equilibrium path, which means that for any higher offer than $w^*$ the entrant would exit, and for any lower offer than $w^*$ it will stay in the market.

In particular, notice that since $\pi_E^d(\hat{\theta}_E, \theta_I)$ is decreasing in $\theta_I$, the left-hand side of the above equation is decreasing in the threshold $\theta^*$. Thus, there is a value $\theta^{**}$, $\theta^{**} \leq \theta^*$, at which the entrant's expected profits would be zero. A question of interest is whether this minimum threshold $\theta^{**}$ that drives the entrant out of market is lower than the corresponding cutoff value $\bar{\theta}$ in the perfect information benchmark, and the answer is yes. This is because $\pi_E^d(\hat{\theta}_E, \theta_I) = w^\circ$ at $\theta_I = \bar{\theta}$, so that $\theta^{**}$ has to be strictly lower than $\bar{\theta}$ in order for the average expected payoffs to be zero. Thus, $\theta^{**}$ is the lowest match the incumbent can signal by poaching, and in any equilibrium with a higher threshold than $\theta^{**}$ the entrant will be induced to exit.

*Proposition 4.* There is a continuum of equilibria. In each equilibrium, there is a value $\theta^*$, $\theta^* \geq \theta^{**}$, such that the incumbent poaches and the entrant exits if $\theta_I \geq \theta^*$.

However, given an unexpected (out-of-equilibrium) wage offer $w_I$, it seems reasonable that the entrant would try to infer the incumbent's match that is in fact more likely to benefit from making such an offer. As is well known in the literature on equilibrium refinements, such one-step-ahead forecast can eliminate equilibria sustained by out-of-equilibrium beliefs that are not credible, and this often leads to a unique prediction. Specifically, consider the equilibrium refinement criteria proposed by Grossman and Perry (1986) and Cho and Kreps (1987). The reason why any equilibria with a threshold $\theta^*$ higher than $\theta^{**}$ are not credible is because if the incumbent's match is in fact $\theta_I \in [\theta^{**}, \theta^*)$, then it can make a slightly higher offer to signal $\theta_I \geq \theta^{**}$. In the following, the threshold values, $\theta'$ and $\theta''$, in the benchmark analysis appear together with the new thresholds values.

*Proposition 5.* In the unique equilibrium with credible beliefs, predatory equilibrium exists if $\theta_I \in [\theta^{**}, \theta'')$, where $\theta^{**} \leq \theta' < \theta''$. The upper and lower bounds, $\theta^{**}$ and $\theta''$, are non-increasing in $\Delta$.

Hence, in the unique equilibrium, the range of the incumbent's match for which predation occurs can be larger than that under perfect information. The logic behind the above results is that if the entrant were to stay in the market and $\theta_I$ turns out to be $\theta^{**}$, then the entrant's expected profits would be positive. However, with uncertainty over $\theta_I$, the entrant perceives only a range of possible $\theta_I$ values, so that even the marginal match for the incumbent appears on average higher than it really is. This means that the incumbent's expected profits at the minimum threshold, had the entrant stayed in, could be in fact lower than its status quo profits, making the hiring decision predatory. As before, predation occurs for a lower range of $\theta_I$ values when the worker is harder for the entrant to replace.

# 5 Legal Implications

## 5.1 Effect of Lawsuits

As the anecdotes mentioned above suggest, raided firms are not shy about suing to recover damages for injury. To the suing firm, a lawsuit brings potential benefits in terms of increased payoffs. To the hiring firm, it adds to the potential costs of poaching the rival's employees. To analyze the effect of such lawsuits, in this subsection I extent the analysis in the previous sections by introducing a lawsuit that the entrant could bring at the end of the game. The mechanics of the lawsuit are that the entrant (plaintiff) seeks damages awards of $d > 0$ from the incumbent (defendant). For simplicity, I assume that filing and settling a lawsuit is costless, and the court will find the incumbent liable with an exogenously given probability $\lambda \in (0, 1)$.

The effect of lawsuit depends critically on how firms internalize the costs and benefits. First, the entrant foresees that if the incumbent poaches then it will bring a lawsuit and expect to receive $\lambda d$ from the incumbent, and this reduces the entrant's maximum willingness to match an outside offer. However, once the incumbent hires away its worker, the expected damages payments do not affect the entrant's exit decision. Second, the incumbent would take the expected payments into account when making a wage offer. Given the entrant's lower willingness to match, the incumbent can successfully poach at a lower wage, but it has to spend exactly the same amount as expected damages awards. Then the following result holds.

*Proposition 6.* Suppose the entrant can sue the incumbent as described above. The set of predatory equilibria is the same as those obtained in Propositions 3 and 5.

Notice that the lawsuit does increase the previous (suing) employer's expected profits by the expected damages awards conditional on poaching. In this sense, the lawsuit can compensate for the loss of the key employee to the competitor. However, the expected awards decrease the entrant's willingness to match an outside offer, and the incumbent's initial offer by the same amount, so that the threshold values are not affected. That is, the possibility of a lawsuit allows the incumbent to poach the worker at a lower wage, but the incumbent basically pays back the savings in wage costs in the form of damages awards. The entrant's payoffs unambiguously increase, but it does not affect the range of match values where predation occurs.

## 5.2 U.S. Case Laws

Although very few plaintiffs succeed in winning a predation lawsuit given the tone and points made by the Supreme Court, it is important to scrutinize theories of liability as more and more predatory hiring claims are being made.[6] In the early years of the Sherman Act, courts used predatory intent to condemn unfair competition without articulating whether the challenged behavior was harmful to consumers. For instance, in a landmark decision, *Albert*

[6] Judge Easterbrook (2003) said "[f]alse positives should be handled by grouping raising rivals' costs with predation into the set of practices governed by a wait-and-see attitude."

*Pick-Barth Co. v. Mitchell Woodbury Corp.* (1932), the court found that the conspiracy to eliminate a competitor by hiring away the competitor's key personnel violates the Sherman Act. Since then, however, the Pick-Barth line of cases has been largely repudiated.

Recent antitrust decisions require a high standard of proof for predatory hiring claims. For instance, 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 harm the rival's business by hiring away its key personnel does not amount to an antitrust violation. Similarly, in *Universal Analytics, Inc. v. MacNeal-Schwendler Corp.* (1990), the defendant hired away five of the plaintiff's six key technical employees, but the court ruled that as long as the employer did not hire the competitor's employees for the sole purpose of destroying the competitor, it will not be held liable for predatory hiring.

What this paper demonstrates, however, is that hiring away a competitor's key employees can result in monopolization and cause the old employer to exit from market, causing antitrust injury. The model also predicts that predatory hiring can occur precisely when the worker is relatively less valuable to the new employer. Regarding the sole-purpose element, hiring away a competitor's employees when they are not in fact good matches for the hiring firm seems close to having the sole purpose of denying them to the competitor. Although match qualities used in my analysis are hard to quantify in court proceedings, the paper is a first step towards studying factors that might impact the court's analysis of predatory hiring.[7]

[7] Courts try to elicit information where available. For instance, in *Eli Lilly & Co. v. Medtronic, Inc.* (1989), the court held that significant monetary rewards not commensurate with the skills and qualifications of the newly hired worker can be circumstantial evidence of predatory hiring.

# 6 Conclusion

This paper presents a framework to analyze poaching of essential inputs from rivals, where firms can bid up the price of scarce human resources. The key element of the model is that the poaching firm may force the victim to hire a replacement with a lower match quality by hiring away its key employees. Predation can occur because the value of poaching includes the extra profits obtained from the rival's exit. I discussed the implication of this model for simple legal actions as well as some real world cases. Predatory equilibria exist even with damages payment, and it arises when the worker is relatively a poor match to the hiring firm. Whether such a model can produce more practical antitrust implications is left for future research.

# 7 Appendix

*Proof of Proposition 1.* Since the incumbent need not offer anything more than $\pi_E^d(\theta_E, \hat{\theta}_I) - (\pi_E^d(\hat{\theta}_E, \theta_I) - w^\circ)$ to hire away the entrant's worker, the incumbent poaches if and only if $\pi_I^d(\hat{\theta}_E, \theta_I) - w_I = \pi_I^d(\hat{\theta}_E, \theta_I) - \pi_E^d(\theta_E, \hat{\theta}_I) + \pi_E^d(\hat{\theta}_E, \theta_I) - w^\circ > \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$, which can be rearranged as $\pi_I^d(\hat{\theta}_E, \theta_I) + \pi_E^d(\hat{\theta}_E, \theta_I) > \pi_I^d(\theta_E, \hat{\theta}_I) + \pi_E^d(\theta_E, \hat{\theta}_I)$. Thus, the incumbent optimally decides to poach if and only if the sum of the two firms' expected gross profits increase. ■

*Proof of Proposition 2.* The incumbent would not offer anything more than $\pi_E^d(\theta_E, \hat{\theta}_I)$ because by offering $w_I = \pi_E^d(\theta_E, \hat{\theta}_I)$ the entrant would not match. Notice that $\pi_E^d(\theta_E, \hat{\theta}_I)$ is increasing in the first element and decreasing in the second. Since $\theta_E > \hat{\theta}_E$ and $\pi_E^d(\hat{\theta}_E, \bar{\theta}) =$

$w^\circ$, it follows that there is a value $\beta$, $\beta > \bar{\theta}$, such that $\pi_E^d(\theta_E, \beta) = w^\circ$. Thus, $\pi_E^d(\theta_E, \hat{\theta}_I) < w^\circ$ if and only if $\hat{\theta}_I > \beta$. Because $\pi_I^m(\theta_I) > \pi_I^d(\cdot, \hat{\theta}_I)$ by assumption, it follows that $0 < w^\circ - \pi_I^d(\theta_E, \hat{\theta}_I) + \pi_I^m(\beta) - \pi_E^d(\theta_E, \hat{\theta}_I)$ for $\hat{\theta}_I > \beta$. By continuity, there exists a value, $\theta'$, $\theta' < \beta$, such that $\pi_I^m(\theta') = \pi_E^d(\theta_E, \hat{\theta}_I) + \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$. Hence, the incumbent is better off by poaching if and only if $\theta_I \geq \theta'$. If such $\theta'$ falls below $\bar{\theta}$, define $\theta' = \bar{\theta}$. ■

*Proof of Proposition 3.* By the definition given above, predation occurs when the incumbent poaches and $\pi_I^d(\hat{\theta}_E, \theta_I) - w_I < \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$. First, suppose $\theta_I < \bar{\theta}$. Proposition 1 says that the incumbent poaches only if $\pi_I^d(\hat{\theta}_E, \theta_I) - w_I > \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$. Therefore, poaching is not predatory in this case. Second, suppose $\theta_I \geq \bar{\theta}$. Then, from above the incumbent poaches if $\theta_I \geq \theta'$, where $\theta'$ satisfies $\pi_I^m(\theta') - \pi_E^d(\theta_E, \hat{\theta}_I) = \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$. Since $\pi_I^m(\theta_I) > \pi_I^d(\cdot, \hat{\theta}_I)$, it follows that $\pi_I^d(\hat{\theta}_E, \theta') - \pi_E^d(\theta_E, \hat{\theta}_I) < \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$. Because $\pi_I^d(\hat{\theta}_E, \theta_I)$ is increasing in $\theta_I$, there exists a value $\theta''$, $\theta'' > \theta'$, such that $\pi_I^d(\hat{\theta}_E, \theta'') - \pi_E^d(\theta_E, \hat{\theta}_I) = \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$. Since $\pi_E^d(\theta_E, \hat{\theta}_I) = w_I$, predation occurs if $\theta_I < \theta''$.

Suppose $\Delta$ increases. Since $\hat{\theta}_E = \theta_E - \Delta$, this means that the entrant's replacement match, $\hat{\theta}_E$, decreases. Notice that a firm's expected profits under competition depend positively on its own match and negatively on the other firm's match. Since $\pi_I^d(\hat{\theta}_E, \theta'') - \pi_E^d(\theta_E, \hat{\theta}_I) = \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$ defines the value $\theta''$, if $\hat{\theta}_E$ decreases, then $\theta''$ must decrease. Similarly, the equation $\pi_I^m(\theta') = \pi_E^d(\theta_E, \hat{\theta}_I) + \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$ defines $\theta'$, on which $\hat{\theta}_E$ has no effect. Thus, as long as $\bar{\theta} \leq \theta'$, then $\theta'$ is invariant to $\Delta$. On the other hand, the equation $\pi_E^d(\hat{\theta}_E, \bar{\theta}) = w^\circ$ defines $\bar{\theta}$, where $\bar{\theta}$ must decrease if $\hat{\theta}_E$ decreases. Therefore, if $\theta' < \bar{\theta}$, then $\theta' = \bar{\theta}$, in which case $\theta'$ is decreasing in $\Delta$. ■

*Proof of Proposition 4.* For this to be an equilibrium, the incumbent must make an offer that the entrant would not match and also must be better off by poaching. Since the entrant would exit in equilibrium if the incumbent offers $w^*$, the incumbent must offer at least $\pi_E^d(\theta_E, \hat{\theta}_I)$ to outbid the entrant's willingness to match. Note that from the previous proofs $\theta'$ satisfies $\pi_I^m(\theta') = \pi_E^d(\theta_E, \hat{\theta}_I) + \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$. If $\theta^{**} \geq \theta'$, then the incumbent for which $\theta_I \in [\theta', \theta^{**}]$ must not be better off by poaching. It suffices to set $w^* = \pi_I^m(\theta') - \pi_I^d(\theta_E, \hat{\theta}_I) + w^\circ$ for $\theta_I \in [\theta', \theta^{**}]$. If $\theta^{**} < \theta'$, then the incumbent for which $\theta_I \in [\theta^{**}, \theta']$ will not want to offer $w^* = \pi_E^d(\theta_E, \hat{\theta}_I)$ given lower expected payoffs; hence, $\theta^{**}$ is redefined as $\theta'$.

Then, poaching is indeed profitable for the incumbent since for all $\theta_I \geq \theta^*$, $\pi_I^m(\theta_I) - w^* \geq \pi_I^m(\theta') - \pi_E^d(\theta_E, \hat{\theta}_I) = \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$ in the latter case where $\theta^{**} = \theta'$; and also because for all $\theta_I \geq \theta^*$, $\pi_I^m(\theta_I) - w^* \geq \pi_I^m(\theta^{**}) - (\pi_I^m(\theta') - \pi_I^d(\theta_E, \hat{\theta}_I) + w^\circ) \geq \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$ in the former case where $\theta^{**} \geq \theta'$. Finally, there is no restriction on the entrant's off-the-equilibrium beliefs, so it can be any beliefs such that the entrant optimally exits if $w_I > w^*$ and stays in if $w_I < w^*$. For instance, it suffices to set for any off-the-equilibrium offer $w_I > w^*$, the entrant's belief is $\theta_I \in [\delta^*, \theta_H]$ for some $\delta^*$, $\delta^* > \theta^{**}$, and for any off-the-equilibrium offer $w_I < w^*$ the entrant's belief is $\theta_I \in [\delta^{**}, \theta_H]$, for some $\delta^{**}$, $\delta^{**} < \theta^{**}$. ■

*Proof of Proposition 5.* The entrant's optimal strategy 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 its beliefs are such that $\theta_I \in [\theta, \theta_H]$, where $\theta \geq \theta^{**}$. Suppose that the entrant observes the incumbent's out-of-equilibrium offer $w_I > w^*$. If $\theta_I \in [\theta^{**}, \theta_H]$, then the incumbent stands to gain from poaching, so an arbitrarily small increase in wage offer does not change the incumbent's optimal decision. However, if $\theta_I \in [\theta_L, \theta^{**}]$, then the incumbent would not gain from such a deviation. Therefore, the entrant puts zero weight on $\theta_I \in [\theta_L, \theta^{**}]$

upon observing $w_I$. If this is indeed the entrant's belief, then it would be profitable for the incumbent type $\theta_I \in [\theta^{**}, \theta_H]$ to poach by making a wage offer that signals $\theta_I \geq \theta^{**}$. That is, if the incumbent's match is $\theta^{**} \leq \theta_I < \theta^*$, then it is better off by deviating to the equilibrium with a lower threshold until the threshold level reaches the minimum, $\theta^{**}$.

Suppose $\theta' < \bar{\theta}$. There are two subcases: If $\theta^{**} \leq \theta'$, then from the previous proof $\theta^{**}$ is defined as $\theta'$. If $\theta^{**} > \theta'$, then $\theta^{**}$ remains the same. On the other hand, from the previous proofs $\theta'$ is defined as $\bar{\theta}$, where $\theta^{**} < \bar{\theta}$. Thus, $\theta^{**} \leq \theta'$. Suppose next $\bar{\theta} \leq \theta'$. Because $\theta^{**} < \theta'$, $\theta^{**}$ is defined as $\theta'$, and thus $\theta^{**} = \theta'$. Therefore, it holds that $\theta^{**} \leq \theta'$. Since $\pi_I^d(\hat{\theta}_E, \theta_I)$ is increasing in $\theta_I$, poaching is also predatory at any lower value of $\theta_I$ if it is predatory at a higher value of $\theta_I$. It thus follows that predation occurs for $\theta_I \in [\theta^{**}, \theta'']$.

That $\theta''$ is non-increasing in $\Delta$ was already proved in Proposition 3. Regarding $\theta^{**}$, consider any two values of $\Delta$, such that $\Delta_1 < \Delta_2$. Suppose $\int_{\theta(\Delta_1)^{**}}^{\theta_H} [\pi_E^d(\theta_E - \Delta_1, \theta_I) - w^\circ] \frac{f(\theta_I)}{1-F(\theta(\Delta_1)^{**})} d\theta_I = 0$. Since $\pi_E^d(\theta_E - \Delta_1, \theta_I) < \pi_E^d(\theta_E - \Delta_2, \theta_I)$ for any $\Delta_1 < \Delta_2$, it must be true that $\int_{\theta(\Delta_1)^{**}}^{\theta_H} [\pi_E^d(\theta_E - \Delta_2, \theta_I) - w^\circ] \frac{f(\theta_I)}{1-F(\theta(\Delta_1)^{**})} d\theta_I < 0$. Since the function, $\Psi(\theta_I) = \int_{\theta_I}^{\theta_H} [\pi_E^d(\theta_E - \Delta_2, \theta_I) - w^\circ] \frac{f(\theta_I)}{1-F(\theta(\Delta_1)^{**})} d\theta_I$, is a decreasing, continuous function, it follows that if $\Psi(\theta(\Delta_1)^{**}) < 0$, then there exists a value $\theta(\Delta_2)^{**} < \theta(\Delta_1)^{**}$ such that $\Psi(\theta(\Delta_2)^{**}) = 0$. ■

*Proof of Proposition 6.* Following the incumbent's poaching, the entrant expects to gain $\lambda d$ regardless of its exit decision. The exit decision is based on the condition, $\pi_E^d(\hat{\theta}_E, \theta_I) - w^\circ + \lambda d \leq \lambda d$, under perfect information, and $\int_{\theta^*}^{\theta_H} \left[\pi_E^d(\hat{\theta}_E, \theta_I) - w^\circ + \lambda d\right] \frac{f(\theta_I)}{1-F(\theta^*)} d\theta_I \leq \lambda d$, under asymmetric information. Therefore, the thresholds are the same as before. Conditional on the entrant's exit, the incumbent poaches when $\pi_I^m(\theta_I) - w_I^d - \lambda d > \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$.

Since the entrant's maximum willingness to match is $\pi_E^d(\theta_E, \hat{\theta}_I) - \lambda d$, it follows that $w_I^d = \pi_E^d(\theta_E, \hat{\theta}_I) - \lambda d$. Since then $\pi_I^m(\theta_I) - w_I^d - \lambda d = \pi_I^m(\theta_I) - \pi_E^d(\theta_E, \hat{\theta}_I)$, the threshold $\theta'$ remains the same. Finally, poaching is predatory if $\pi_I^d(\hat{\theta}_E, \theta_I) - w_I^d - \lambda d < \pi_I^d(\theta_E, \hat{\theta}_I) - w^\circ$. For the same reason, the threshold $\theta''$ remains unchanged. ■

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